eBusiness Research Center Working Paper
10-2000

The Effect of Information Technology on Salesperson Performance

Michael Ahearne
Niels Schillewaert

eBusiness Research Center
401 Business Administration Building
University Park, PA 16802
Phone: 814.861.7575
Fax: 814.863.0413
Web: www.ebrc.psu.edu

A joint venture of Penn State's Smeal College of Business Administration
and the School of Information Sciences and Technology

The Effect of Information Technology on Salesperson Performance

Michael Ahearne
Assistant Professor of Marketing
The Pennsylvania State University

Niels Schillewaert
ICM Doctoral Fellow
The Vlerick Leuven Ghent Management School

WORKING PAPER

Please do not quote or distribute without permission of the athours

---

Key words: sales management, information technology, salesperson performance

Abstract: This study integrates a broad literature search with multiple qualitative interviews and observations to develop a solid theory on *information technology usage and salesperson performance*. Subsequently, the proposed theoretical model is empirically tested using a field study research design. The model tests the mediating effects of sales skills, smart selling and call productivity on the direct effect between information technology and salesperson performance. To the best of our knowledge, this study is the first to test and explain the relationship between information technology and salesperson performance. The study takes place within one company and mixes multiple data sources (i.e. sales representative and sales manager survey data, company performance and call reporting data) related to 187 salespeople.

The authors would like to thank the Institute for the Study of Business Markets (ISBM) and eBusiness Research Center (eBRC), Pennsylvania State University for its excellent financial and academic support of this study. The first author also wishes to thank the Intercollegiate Center for Management Science (ICM), Belgium, for the financial support in terms of a Ph.D. scholarship.

Correspondence may be addressed to Niels Schillewaert, The Vlerick Leuven Ghent Management School, Bellevue 6, B-9050 Ledeberg, Belgium, Europe; e-mail: niels.schillewaert@vlerick.be

Introduction

The rapid growth and advances in computerized technologies in the last decade have significantly changed the everyday life of the modern sales representative. Sales managers have experienced increased expenditures and competition in recent years, and try to find ways to counter this evolution. Thereby, managers generally believe the assumption that supplying information technology to their salespeople, will contribute to enhanced productivity, customer communication and relationships (e.g. Colombo 1994; Goldenberg 1996; Conlon 1998, 1999; Campbell 1998; Moncrief et al. 1991). Although the relationship between information technology and sales performance remains primarily unsubstantiated, many organizations spend considerable human and financial resources in equipping their sales force with information technology. Yet, organizations need justification for these substantial investments and can not afford to continue to invest in sales technology as a matter of blind faith alone. Moncrief et al.'s (1991) study confirms this thought. The study revealed that the "up-front investments in technology" and the "expected performance increases" were the most cited reasons for companies not to invest in laptops for the sales force. Hence, it is surprising that academic research on the effects of IT on sales person performance is lacking.

The effect of information technology has captivated the attention of many academics and several studies of information technology and performance/productivity have appeared. Most of these studies assess *the effects of information technology investments on productivity at the economy/industry-level* (e.g. Roach 1987, 1989, 1991; Bresnahan 1986; Osterman 1986; Baily and Chakrabarti 1988, Morrisson and Berndt 1990) or *firm-level* (Loveman 1994; Strassman 1990; Brynjolfsson and Hitt 1993; Lichtenberg 1993). However, the findings from these studies are mixed and sometimes contradictory. These findings have led to an ongoing discussion in the information systems area, labeled the "IT productivity paradox" (see Brynjolfsson and Yang 1996; Brynjolfsson 1993; Mooney et al. 1996 for a detailed overview). Many explanations have been suggested in an attempt to explain

this paradox. In summary, some of these main conclusions are that (1) these studies do not account for the many intermediate and intangible benefits that are associated with information technology and, consequently, provide little insight into how information technology can add value and (2) most studies suffer from methodological flaws in that they assess the relationship between technology investments and performance using cross sectional data, regardless of firm or industry context (Brynjolfsson and Yang 1996; Mooney et al. 1996; Ragowski et al. 1996; Pinsonneault and Rivard 1998).

Another stream of research has investigated the impact of information (systems) on *individual (decision) performance* in laboratory settings (see DeLone and McLean 1992 and Sharda et al. 1988 for a detailed overview) or on *white collar workers in general* (Millman and Hartwick 1987; Pinsonneault and Kraemer 1993; Sulek and Maruchek 1992). Nevertheless, few empirical attempts were made to investigate the effects of information technology on individuals and their work (Palmquist 1992; Torkzadeh and Doll 1999). Furthermore, this stream of research also generated mixed results (see DeLone and McLean 1992 and Sharda et al. 1988 for a review and study) or the survey based field studies used self-report perceptions in assessing individual performance impacts of information technology (Igbaria 1990; Igbaria and Tan 1997).

These findings combined with the fact that in the field of marketing and sales, we remain ignorant about the specific consequences of information technology for individual sales representatives, makes the relationship between information technology usage and sales performance of particular interest. In sales some studies on information technology or sales automation exist. However, most studies focus on the organizational adoption of sales technology (Gatignon and Robertson 1989; Moriarty and Schwartz 1991). A couple of authors tackle the issue of sales technology and sales performance, but either these studies lack solid empirical data (Moriarty and Swartz 1989; Collins 1984, 1985, 1989; Collins et al. 1987; Collins and Schribowsky 1990; Wedell and Hempeck 1987) or examine this relationship merely based on perceptions from sales managers (Moncrief et al. 1991) or salespeople

(Keillor et al. 1997).

Despite the insightful knowledge the information systems research and sales literature has generated, no studies have thoroughly examined the effect of information technology usage on sales person performance. In fact, Marshall et al. (1999, p.98) state that "*very little research has been devoted to investigating the impact of technology on individual salesperson effectiveness*" and "*future research needs to be directed toward understanding the impact of technology in selling*". The purpose of this study is to investigate "if" and understand "how" information technology helps sales reps to better perform. This process integrates a broad literature search with multiple *qualitative* interviews to develop a solid theory. Subsequently, the proposed model is *tested* using a field study methodology that combines *multiple data sources* (i.e. sales representative and sales manager survey data, company performance and call reporting data). Hence, this study overcomes the major limitations that previous studies in and outside the field of sales management have faced: this study takes place within one company and mixes multiple data sources (i.e. combined use of multi-source survey data and company records) rather than mere self-reported perceptions. We first hypothesize and test a *direct effect* of information technology on salesperson performance. In order to further our *understanding* of the value adding mechanisms of information technology for sales performance, we build and test a model with six *intervening* variables. Finally, the results, implications and suggestions for future research are discussed.

Theory Development Process

In this study we undertake an extensive model development process to construct a managerial model that explains the effects of information technology infusion on a sales person's performance. This approach integrates a detailed literature search, both within and outside the field of marketing and

sales, combined with multiple rounds of qualitative information gathering (i.e. interviews and field observations) to deductively and inductively construct a theoretical model. More specifically, the theory development process consisted of *two stages*. First, we conducted six one-on-one interviews with industry experts (i.e. sales automation experts) to explore the usage of different information technology tools by salespeople and how it could affect their work processes and performance. Next, we conducted a *qualitative* field study in a *mid-sized pharmaceutical company*. Data were collected by means of two *field sales trips* with sales representatives and four one-on-one *interviews* with sales reps. The field sales trips lasted an entire day and represented a "regular day in the life of each sales rep". In addition to the interviews, the field trips also generated information by means of short verbal protocols (Russo et al. 1989; Todd and Benbasat 1987; Ericcson and Simon 1980). In verbal protocols participants are asked to 'think out loud' and verbalize their thoughts during the performance of a task (Hayes 1982). As a supplement to other qualitative data collection methods, verbal protocols have proven to be useful for exploratory purposes, theory development and hypotheses formation concerning the use of specific information technology (Todd and Benbasat 1987; Russo et al. 1989). The demos lasted approximately one hour. Subsequently, two sales managers, which supervised the reps that participated earlier, were interviewed. The semi-structured interviews lasted 75 minutes on average. All interviews and discussions were recorded, transcribed and subjected to a thematic content analysis using established qualitative coding techniques prescribed in qualitative research methodology (Strauss and Corbin 1990; Miles and Huberman 1994). The coding process was conducted independently by two researchers. The preliminary results were corroborated and disagreements resolved through mutual agreement. After the researchers identified the key variables and relationships, the overall model was presented within the company. The inputs from this group feedback session served as a validity check and were used to evaluate the working version of the model. The research model was confirmed by the company executives. Hence, no major adjustments were made to the model as a result of this group feedback session.

Conceptual Framework

The conceptual model links key constructs explaining if and how a salesperson's usage of information technology affects his/her job performance. The basic premise of the model is that integrating information technology into the sales job, contributes positively to end-results sales effectiveness (Figure 1). Because these gains in effectiveness are supposed to run through information and knowledge based outcomes (Huber 1990; Grover et al. 1998), we propose that information technology infusion affects salesperson performance indirectly through its positive impact on a salesperson's *sales skills* (i.e. market and technical knowledge assets, sales presentation and targeting skills), *smart selling behaviors* and sales *call productivity*. In the following paragraphs, we explain the focal constructs of our model and develop the research hypotheses for each of them.

(Figure 1 about here)

INFORMATION TECHNOLOGY INFUSION AND SALESPERSON PERFORMANCE

In this study we looked at information technology as a set of software applications in support of salesperson activities. This implies that we assess the impact of information technology across a breadth of applications, beyond specific hardware technologies. It is our contention that the applications, as well as the underlying sales tasks the technology is able to facilitate, are important, rather than the naked "hardware" technology. In addition, the use of sales technology gains strength when salespeople use different tools in an integrated way. Thus, we define *information technology infusion* as the *degree to which a salesperson integrates different information technology tools into*

his/her sales activities. More specifically, information technology infusion pertains to the frequency of technology usage, the full use of the applications' capabilities, the level of integrated and complementary use of different technologies and the usage of technology for analysis purposes.

Compared to traditional information and communication methods (e.g. face-to-face, telephone, written documents and reports), the electronic tools possess a number of new capabilities. Inspired by several authors (Rice and Bair 1984; Culnan and Markus 1987; Sproull and Kiesler 1986) Huber (1990, p. 50) claims that the communication capabilities of advanced information technologies enable individuals "*(a) to communicate more easily and less expensively across time and geographic location, (b) to communicate more rapidly and with greater precision to targeted groups, (c) to record and index more reliably and inexpensively the content and nature of communication events, and (d) to more selectively control access and participation in a communication event or network.* Furthermore, the author states that information technology can aid decisions because they facilitate the individual *(a) to store and retrieve large amounts of information more quickly …, (b) to more rapidly and selectively access information …, (c) to more rapidly and accurately combine and reconfigure information so as to create new information … (e) to more reliably and inexpensively record and retrieve information about the content and nature of organizational transactions.* Moreover, the advances in mobile technologies of the recent years, allows executives (here: sales reps) to use and access these electronic media almost at anytime, from any place and communicate information under almost any form (e.g. text, sound, image) (Jarvenpaa and Ives 1994; Bock and Applegate 1995). In summary, information technology increases the richness, the complexity and the mobility of knowledge and information, because of increased (a) communication speed, (b) information availability, (c) bandwidth, (d) connectivity, (e) remote accessibility and (f) computer memory (Fulk and DeSanctis 1995; Jarvenpaa and Ives 1994). Information has been suggested to be a crucial asset in today's market place (Higgins et al. 1991; Menon and Varadarajan 1992) as it allows

improved decision making and problem solving (Cravens 1991; Good and Stone 1995; DeLone and McLean 1992). Similarly, theories and empirical studies suggest that information technology increased personal effectiveness (Millman and Hartwick 1987; Igbaria 1990; Igbaria and Tan 1997), improved middle managers' decision making (Buchanan and McCalman 1988), enhances communication processes and, subsequently, the work performed (Huber 1990; Good and Stone 1995).

Hence, these technologies should smoothen sales executives' information and communication processes and their performance. In fact, we have indications that information technology savvy sales reps have the ability to build stronger customer relationships, provide better customer service and enhance their productivity and sales effectiveness (e.g. Duncan and Moriarty 1998; Keillor et al. 1997; Colombo 1994; Agency Sales Magazine 1997). Similarly, Moncrief et al. (1991) state that potential advantages of providing computers to salespeople can be found in e.g. information access, enhanced problem solving capabilities and better presentations, communication and service towards customers. The results of their study further indicate that the top reasons for companies to equip their sales force with laptops were to: improve sales presentations, better manage customer files, increase communication between the home office and the sales force and increase productivity.

As the majority of these articles in the sales area provide no empirical test of the effect of sales technology on salesperson performance, the common notion that it does, is left open to question. In addition, the studies that attempt to test the impact of sales technology empirically, have measured mere perceptions of technology usage and productivity at the same source. Therefore, the first issue is to examine if a salesperson's information technology infusion influences salesperson performance. Thus,

H1: A salesperson's information technology infusion has a positive effect on salesperson performance

INTERMEDIATE AND INTANGIBLE BENEFITS AS MEDIATING VARIABLES

Rather than merely studying the direct relationship between technology usage and sales performance, however, it is also of great managerial and research interest to provide insights into how salespeople realize these productivity gains. In an effort to identify and understand the value adding mechanisms of the relationship between information technology and productivity, several authors have suggested that studies should include intermediate benefits of information technology (Mooney et al. 1996: Brynjolfsson and Yang 1996; Ragowski et al. 1996).

Huber's (1990) theory about the effects of advanced information technologies asserts that the gains in individual and organizational effectiveness occur (indirectly) through the positive impact technology has on information and communication processes (see also Grover et al. 1998). In fact, information technologies may have *automational* or *efficiency* effects (e.g. doing things more quickly and cheaply), and *informational* and *transformational* outcomes which go beyond the automation of existing tasks (e.g. doing things more effectively, execute tasks that previously were not possible at all and develop new capabilities and skills) (Mooney et al. 1996; Day 1994).

In applying these theoretical assertions to our research model, the underlying notion becomes that if salespeople use information technology and improve their performance, this happens through sales processes, behaviors and skills which are affected by the enhanced information processing capabilities of advanced information technologies. Therefore, we include variables as mediators which are potentially enhanced by the properties of information technologies (i.e. in terms of automation or information processing) and which have shown to be important determinants of individual salesperson performance in previous sales research (Churchill et al. 1985; Behrman and Perreault 1981; Sujan et al. 1994; Brown and Peterson 1994). We propose six variables that may mediate the relationship between information technology and salesperson performance. With respect

to a sales rep's sales skills we include a sales rep's *market knowledge, technical knowledge*, *sales presentation skills* and *targeting skills*. For sales behaviors and processes we include *smart selling behaviors* (i.e. informational and transformational effects) and the personal productivity variable *call productivity* (i.e. automational effects). Complemented with the findings from our interviews, the existing literature and anecdotal evidence, we hypothesize that these variables are affected by information technology infusion and, in turn, impact salesperson performance.

Sales Skills

Market and Technical Knowledge Assets

Technical knowledge pertains to the development and use of technical expertise such as product applications, specifications and customer use situations (Behrman and Perreault 1982). Market knowledge reflects a sales rep's knowledge about the industry (e.g. competition, trends) in general. Thus, both knowledge assets refer to the level of understanding a sales person has about the business in which he operates. An extensive knowledge base is important for sales people, since it allows them to cope with the complex market environment. Several authors indicated that the ability of applying knowledge is a prerequisite for effective selling (Weitz et al. 1986; Weitz 1978; Leigh and McGraw 1989; Sujan et al. 1986; Behrman and Perreault 1982). Indeed, information processing and enhanced knowledge may prevent the sales rep from making blunders based upon false or rather incomplete information, and it may enhance his/her self-confidence. Hence,

H2: A sales rep's market knowledge levels have a positive effect on salesperson performance

H3: A sales rep's technical knowledge levels have a positive effect on salesperson performance

To effectively use their knowledge, salespeople need to be able to acquire information about sales and market situations (Weitz et al. 1986). The importance of information gathering skills and activities is well recognized in the personal selling literature (e.g. Ingram and La Forge 1997; Moncrief 1986).

Similarly, Sujan et al. (1988) suggest that a salesperson's effectiveness and knowledge can be enhanced by providing salespeople with market research information and encouraging them to unitize information. Due to its storage, retrieval and network capacities, information technology has the potential to enable and facilitate these processes of information acquisition, dissemination and utilization (Huber 1991; Glazer 1991; Fletcher 1990). Hence, salespeople may learn and enhance their knowledge levels, both more efficiently and effectively, by using information technology. In fact, information technology allows sales reps to draw upon an expansive (computerized) organizational memory of people and databases, and as such to update their beliefs and knowledge about business relationships (Sinkula 1994; Huber 1991; Day 1994). For instance, electronic communication media can link a salesperson to other professionals within and across organizational boundaries. Furthermore, when faced with an information need, sales reps can search and tap into vast amounts of information readily available in computer databases (e.g. in sales force automation systems). This implies that sales reps who exhibit high levels of information technology infusion, have access to an expansive base of external and organizational information sources, knowledge and people, which are likely to be underused by their less technology savvy counterparts. In their updated review of sales activities, Marshall et al. (1999) support this reasoning in stating that intelligence gathering and dissemination processes happen more and more through the use of computers.

Two comments of sales reps illustrate this:

> I use the computer to find out what topics a customer is interested in. I pull a lot from the internet (e.g. articles) and sometimes put together binders for my customers. It gives me ammunition to support my arguments.

> Information technology has brought information to use a lot quicker. Information can be shared on specifics of products and there is more communication in the field between managers and reps. Our Lotus Notes applications allow better communication of what is happening in the field. All this has increased the knowledge of people.

This suggests the following:

H4: A sales rep's information technology infusion has a positive effect his/her market knowledge levels

H5: A sales rep's information technology infusion has a positive effect his/her technical knowledge levels

Sales Presentation Skills

Sales presentation skills embrace factors that relate to the communication interactions between the customer and sales representative. Behrman and Perreault (1982) identified "giving high quality sales presentations and working well with customers" as an important behavioral dimension of salesperson performance. The factor concerns the role of the salesperson as an external representative of the firm and includes dimensions such as giving clear, well thought out presentations, responding to questions, and the like. The authors demonstrated that the factor was significantly correlated with a salesperson's overall performance. Thus,

H6: A sales rep's sales presentation skills have a positive effect on salesperson performance

Given the fact that information technology relates to the acquisition, processing and dissemination of information, it is not surprising that its usage is expected to have an impact on the process of customer communication (Flecther 1990; Duncan and Moriarty 1998). There are many ways in which information technology tools can contribute to the format and quality of the information a sales rep transfers to the customer. Today's computer technologies allow for multi-media communications that combine text, graphics and audio-visual materials. These tools facilitate that sales presentations are easily adapted to specific customers, enhanced product demonstrations and graphical visualizations. Furthermore, drawing upon the information that is available under computerized form improves the content of the information communicated (both during and outside of the sales call). For example a sales rep can search on-line databases or the open WWW for customer and business related information and use that information in customer interactions. This enables a sales rep to be pro-

active and provide customers with context specific information that answers their needs. Similarly, Marshall et al. (1999) mention that sales reps attribute a key role to computerized technologies in terms of the level and quality of information they are able to provide during sales calls. In addition, several authors (i.e., Duncan and Moriarty 1998; Keillor et al. 1997; Colombo 1994; Moncrief et al. 1991; Agency Sales Magazine 1997) have suggested that sales technology may lead to (1) quicker access to better information, (2) faster response and answers to customers, (3) enhanced quality of customer interactions, (4) increased personalization and customization of presentations and responses, etc. Due to the possibilities offered by remote and easy access and the speed of data transmission, sales reps can instantaneously retrieve information in order to reply to customer requests or objections. With sales force automation systems and database applications salespeople have the necessary information at their fingertips and should be able to provide real-time information to customers and assist them in their decision making. By the same token, interpersonal communication technologies (e.g. e-mail) allow the sales rep to respond to customers more promptly and eventually transfer specific information, while (s)he is at another location than the customer's site. Also, calendar and time management software allows sales representatives to be more responsive since these technologies provide modules for keeping track of previous meetings and engagements. Furthermore, due to the fact that database and networked applications provide access to vast information repositories and nodes, the odds of finding the solution to a customer's requests or problems are enhanced. Hence,

H7: A sales rep's information technology infusion has a positive effect his/her sales presentation skills

Targeting Skills

Targeting skills are defined as a salesperson's ability to identify, select and call on profitable customers. Targeting skills have not been included in previous theoretical models of salesperson performance, but it is a basic part of marketing strategy (Kotler 1994) and thus intuitively logic to

assume its positive impact on sales performance. Applying the old Pareto-principle (i.e. the 80-20 rule) on a salesperson's customer base it is clear that focusing on the right customers is much more important than simply making calls. Furthermore, the importance of effective prospecting for a salesperson's success is widely recognized in selling textbooks (e.g. Stanton and Spiro 1999). So,

H8: A sales rep's targeting skills have a positive effect on salesperson performance

The database possibilities laptops and sales automation systems offer, allows a sales rep to adequately target those customers that have the highest potential at the right time. Actually, by running specific data queries, sales reps can list and sort customers and determine call priorities. Hence, these computerized customer and prospect files enable salespeople to analyze purchase patterns, identify customer needs in a timely manner, classify the most profitable customers and efficiently put sales effort into those products and customers that are most lucrative. A sales manager described the importance of information technology for targeting and performance as follows:

> The technology tools make it easier for them to understand where the business is. A salesperson who knows how to use the systems can use our databases, export it to Excel and then sort and analyze the data differently. You have to be a little computer savvy to do this kind of thing, but the salespeople who pick it up quickly can move much quicker, it helps them target key customers. There is a clear difference between these people and the ones who use their gut feeling or a shotgun approach. If you target the right customers, you get the highest chances of meeting your quota.

This suggests:

H9: A sales rep's information technology infusion has a positive effect on his/her targeting skills

Smart Selling Behaviors

Salespeople's smart selling behaviors are characterized by altering sales approaches across and during customer contacts (Weitz et al. 1986; Spiro and Weitz 1990; Sujan 1986; Sujan et al. 1988) and

engaging in sales (call) planning (Sujan et al. 1994). Through the practice of adaptive selling, salespeople exploit the unique opportunities of personal selling. Salespeople have the possibility to research the customer and implement a sales presentation that is tailored to that customer, as opposed to a canned presentation across all customers. In addition, they can sense customer reactions during the call and make instant adjustments (Weitz et al. 1986; Spiro and Weitz 1990). Similarly, by engaging in planning behavior salespeople can judge the suitability of specific sales behaviors and alter their approach depending upon situational considerations (Sujan et al. 1994). Although the theoretical underpinnings of the effect of smart selling on performance are strong, empirical support is still scarce and inconclusive. For example, salespeople's self-assessed performance and adaptiveness were found to be significantly related (Spiro and Weitz 1990; Boorom et al. 1998) and working smart (i.e. adaptiveness and sales planning behavior) positively affects self-reported sales performance (Sujan et al. 1994). However, in Spiro and Weitz' (1990) study, adaptive selling was unrelated to manager rated performance. In light of these findings we propose:

H10: A sales rep's smart selling activities have a positive effect on salesperson performance

Salespeople report that sales technology helps in the professionalism by which sales calls are prepared (Marshall et al. 1999). Because of its comparative advantage in gathering and processing market and sales information, sales technology can smoothen the process of a salesperson's planning behavior. Sales automation and database applications, for example, often have capabilities that allow sales reps to keep records about clients and calls. Calendar and routing tools allow a sales rep to effectively manage time, set up appointments accurately and do weekly planning. Our interviews also indicated that using information technology impelled salespeople to engage more in planning behaviors by itself. The salespeople were using sales technology for planning because it provided better and more detailed information and, in turn, prompted them to think about their sales strategy and approach even more. Reviewing the account history in the sales databases right before the actual sales call, for instance, enhances salespeople's ability to think over the steps necessary to close a deal

and plan the sales strategy up-front. One of the salespeople provided a good illustration of this phenomenon:

> Information technology does increase our effectiveness because it helps in planning so much. It is funny, I know there is a part you miss when using traditional paper versions. With the computer it is different, because it is so easy to access. You really need to bring everything up and analyze it to see if you are where you need to be.

Additionally, with vast amounts of information at their fingertips as well as search and analysis capabilities at the click of a button, sales reps can tailor their sales messages to a specific customer. For example, based on a customer's buying history, the sales rep can determine which products to prioritize in the sales call. Such background information can also enhance a salesperson's empathy with a customer's situation and flexibility to adapt to opportunities that arise during the sales call. Another example is using the web. Salespeople can thoroughly research clients and prospects and script their sales presentations in such a way that it is adapted to each individual customer (Marshall et al. 1999). In other words, sales technology enhances a sales rep's ability, and reduces the effort needed to fine-tune a sales message instead of delivering the same generic sales talk. A salesperson illustrated this in the following way:

> If you know a lot about the buying behavior of your customers before you go in, you have an edge. I assemble each customer's prescribing behavior, look at the application where I have my call notes and determine what message I want to focus on this time. In stead of having a generic message with my customer, I can go in and focus on their needs and wants. It is up to each individual to gather all that information and mold it into a good presentation. Also, if a customer has question, I do a search on the web, for instance, and provide them a personalized answer.

In addition, the literature on smart selling proposes that adaptive selling can be improved by providing salespeople with the necessary market information and resources such that they can link insights from other sales situations to the customer contacts in which they are currently engaged (Weitz et al. 1986; Sujan et al. 1994; Sujan et al. 1988). Thus, we expect the following:

H11: There is a positive relationship between a sales rep's information technology infusion and his/her smart selling activities

Call Productivity

Call productivity is defined here as the number of sales calls (or visits) (=output) a sales rep makes over the course of the year (=input) (Brinkerhoff and Dressler 1990). In the sales literature, the number of calls made is considered as an aspect of a salesperson's effort. Several empirical studies in sales provided clear evidence for the logical relationship that effort (e.g. the number of sales calls made) is a significant determinant of salesperson performance (Churchill et al. 1985; Brown and Peterson, 1994). Hence,

H12: Call productivity has a positive effect on salesperson performance

An important reason why companies supply their salespeople with information technology is to increase the efficiency of the sales staff. Advocates of sales technology propose that technology reduces the time salespeople spend on repetitive support and non-selling tasks (e.g. administrative tasks) and consequently allows salespeople to make more sales calls (Moncrief et al. 1991; Moriarty and Swartz 1989; Goldenberg 1996). Similarly, it has been proposed that the use of decision support systems shortens decision making time of managers (Sharda et al. 1988). Also, Good and Stone (1995) assert that information processing and communication are improved and facilitated by computer technology and, by consequence, increases work productivity in terms of the quantity of work performed. Hence, freeing up time for salespeople to make more sales calls might be an important gain from information technology. A sales manager illustrated this in the following way:

> Technology helps their productivity and efficiency. Based on their computer analyses, what they know about the customer and determining when is the best time to see a specific

customer, they can make eight calls a day.

Thus,

H13: There is a positive relationship between a sales rep's information technology infusion and his/her call productivity

Method

The research approach used for testing the effects of information technology usage on salesperson performance involved a field study design (Stone 1978). The field study design consisted of an in-depth study within one company research site, with data collected from multiple respondent surveys combined with data from company records. The choice for a field study design within a *single* company was inspired by our concern *to control for confounding and external effects* due to the variability in market contexts (e.g. competitive situations) and organizational factors (e.g. information systems and sales management practices).

Pharmaceutical Research Site: Background

Our study participants were salespeople who worked for a mid-sized pharmaceutical company in the U.S.. The salespeople were responsible for marketing and selling (in the industry referred to as "detailing") two product lines directly to physicians. This pharmaceutical company provided a good sample frame for testing our empirical model for several reasons. First, a careful selection of a research site based on conceptual and theoretical premises (Eisenhardt 1989) was mandatory for our research purposes to succeed. Considering our research objectives and the individual sales rep being our unit of analysis, companies had to fulfill three major conditions in order to qualify for our research: (1) a broad array of information technology applications had to be available to the sales

force, (2) the usage of technologies had to be volitional to some extent such that variance in terms of information technology usage among sales reps existed and (3) the company's sales force had to be significant in size in order to allow for advanced statistical analyses (e.g. min. 200 salespeople). During our recruitment and screening process of potential research sites, we made sure that the participating field research site corresponded to these requirements.

Second, the pharmaceutical selling context is highly information and data intensive (Ahearne et al. 1999) which allows sales reps to manipulate and analyze sales and market data by using information technology (e.g. database applications). Further, in the pharmaceutical industry many Web-initiatives have been set up to provide information that is important to the industry. Also, "missionary selling" (e.g. pharmaceutical selling) is highly characterized by information management tasks (e.g. communication with colleagues and the home office) (Moncrief 1986). Thus, information technology tools such as e-mail or groupware may facilitate the communication process between the sales rep, his colleagues and the home office. In other words, the usage of different information technology systems can serve the pharmaceutical sales rep throughout his/her sales activities.

Data Acquisition Procedure and Sample

The sales force used as our sample frame consisted of 238 sales representatives and 29 sales district managers. Each manager supervised from 5 to 12 sales representatives. Mail surveys were sent out to all 238 sales representatives including (1) a letter from the vice-president of sales supporting this research and (2) a postage paid business reply envelope addressed to the researchers. The sales reps were asked to accurately and completely fill out the survey. As each survey was labeled with the sales reps individual territory number, the letter explicitly instructed the sales reps to return the surveys directly to the researcher using the enclosed envelope. Further, the letter explicated that individual responses would not be divulged and that only aggregate results would be reported. Consequently, all participants were assured complete confidentiality. The 29 sales managers received a survey packet

including a letter of the vice-president of sales and a business reply envelope. The managers were instructed to rate the sales skills of all of the sales reps under their supervision. The questionnaire was tailored to each sales district manager by means of a mail merge and contained all the names and territory numbers of the salespeople in their district.

This data acquisition procedure yielded a response of 203 sales reps or a 87.5% response rate[1]. In addition, all 29 sales district managers returned their surveys (i.e. a 100% response rate). Merging both survey data sets with the company records (i.e. bonus and call data), using the territory number as a unique identification key and deleting unsable responses, resulted in a data set containing 187 full data records (relating to the same number of sales reps). This is a usable response rate of approximately 83%. These response rates are in the same line with other studies in a sales management context, even though our study combines data from two different survey respondents (e.g. Ahearne 1998; Challagalla and Shervani 1996). In the sample, 50% were males and the median age was between 26 and 35 years old. The average experience in a sales job was 9.5 years (st.dev.=7.4), their tenure within the company was 6.8 years (st.dev.=7.2) and the salespeople worked in their territory an average of 4.7 years (st.dev.=5.9) . The average year end bonus level was $10,362 (st.dev. = 3.901).

Construct Measures

The measures used in this study were obtained from three different sources: (1) the sales reps (i.e. Information Technology Usage levels, Smart Selling), (2) their first line sales district managers (i.e. Market and Technical Knowledge Assets, Sales Presentation Skills and Targeting Skills) and (3) company records (i.e. Call Productivity and Sales Performance).

[1] During the period of data collection 6 sales reps resigned. Hence, the response rate can be calculated as $206/(232-6) = 87.5\%$

Information Technology Infusion. The measure for information technology infusion or usage was developed in this study. The measure reflected the *integrated usage of different information technology tools* and the *use of information technology for sales analysis* purposes. A pool of 6 items was developed and tested to measure the concept. Items were worded according to our definition. Hence, the measure reflects the extent to which sales reps frequently use the technology, use it to the fullest of its capacities, use technologies in an integrated manner and use information technology for analysis purposes. A seven-point rating scale (anchored 1 = Strongly Disagree and 7 = Strongly Agree) was used as a response format.

Market Knowledge. Market knowledge reflects a sales rep's knowledge about the industry (e.g. competition, trends) in general. The scale was developed in this study. We created a pool containing five-items of market knowledge based on the findings of our qualitative research. The items asked the sales district manager to rate each of his/her salespeople in terms of their knowledge about the industry and competitive actions. A seven-point response format (ranging from 1 = "Strongly Disagree" to 7 = "Strongly Agree") was used to measures these items.

Technical Knowledge. Technical knowledge pertains to the development and use of technical expertise such as product applications, specifications and customer use situations (Behrman and Perreault 1982). The original items of Behrman and Perreault (1982) were developed for industrial salespeople and did not relate well to a pharmaceutical selling context (e.g. being able to detect causes of operating failure of company products). The items that were applicable, were reworded and included in the scale (e.g. knows all the specifications and applications of our products). Because after this process too few items remained, the set of items was complemented with measures from Ahearne et al. (2000) which have been used previously in a pharmaceutical sales setting. The final

item pool consisted of 13 items. The scoring format consisted of seven-point ratings (anchored 1 = "Strongly Disagree" – 7 = "Strongly Agree") where managers had to indicate the technical knowledge level of each salesperson.

Sales Presentation Skills. Similarly, as the measures of Behrman and Perreault (1982) for sales presentation skills were developed in an industrial setting, we used their concepts and items as a basis. In their original item development procedure, Behrman and Perreault (1982) identified a dimension related to customer interaction, i.e. "giving high-quality sales presentations and working well with customers". This dimensions was defined as the role of the salesperson as an external representative of the firm and includes dimensions such as giving clear, well thought out presentations and responding to questions. These conceptualizations were used in combination with verbatims from our qualitative research to construct an item pool of 10 measures. The scoring format consisted of seven-point ratings (anchored "Strongly Disagree" – "Strongly Agree") where managers had to indicate the extent to which each salesperson performed according to the statement.

Targeting Skills. The scale measuring targeting skills is new. A pool of 6 items was developed based on the verbatims from our qualitative study. The scales reflected the extent to which a sales rep adequately targets and calls on those customers with the highest sales potential. A seven-point response format (ranging from 1 = "Strongly Disagree" to 2 = "Strongly Agree") was used to measures these items.

Smart Selling Behaviors. Adaptive selling was measured using a shortened version of the scale developed by Spiro and Weitz (1990). Practicing adaptive selling can be defined as "*the altering of sales behaviors during a customer interaction or across customer interactions*" (Weitz et al. 1986). According to Spiro and Weitz (1990) adaptive selling consists of different aspects, namely (1) the

motivation and confidence to practice adaptive selling, (2) their capabilities needed to practice adaptive selling effectively and (3) the actual adaptive behavior of salespeople. From their original 16 item scale we selected those items that were applicable to our research model based on the findings from our qualitative research. The items in our shortened scale are still fairly consistent with the original conceptualizations of Spiro and Weitz (1990). In fact, the items pertain to the sales rep's confidence to practice adaptive selling, his/her adaptive selling abilities and their actual adaptive behavior. Engaging in planning behaviors was measured using a shortened version of the scale used by Sujan et al. (1994). Again those items were retained that were applicable to our research model. More specifically, those items relating to the energy devoted to planning and the degree to which a sales rep develops plans were retained. In fact, our qualitative insights showed that using information technology "automatically" stimulates these salesperson behaviors. In both instances, the two researchers involved in the coding process of the theory development stage, discussed the deletion of these items and decided on using the reduced scale versions based on mutual agreement.

Call Productivity. Call productivity was obtained from company records, namely the sales reporting system. The measure reflects the total number of calls each sales rep has made over the entire year. Productivity measures are traditionally expressed as ratios of output divided by input. Here, the productivity measure is expressed as "the number calls made" (=output) divided by "one year" (=input) (Brinkerhoff and Dressler 1990). Goldenberg (1996) suggests using the same measure for assessing a tangible benefit of sales automation, namely the fact that salespeople can spend more time selling in the field and calling on customers. This measure was obtained at the end of the year.

Sales Performance. The ultimate dependent variable (i.e. sales person performance) was obtained from company records. Sales performance was operationalized using the total year bonus per sales rep. Sales boni are based on (1) achieved sales levels (80% of bonus) and (2) behavioral sales

performance criteria (e.g. professional development and customer focus) assessed by the focal sales rep's immediate supervisor (20% of bonus). This measure was assembled approximately two months after the final survey data collection was completed.

Control Factors. Control factors were added to our model to test the effects of information technology usage, and the related information based benefits on sales performance, in the presence of other important variables which may also affect sales performance. The purpose of examining covariates is to help rule out rival explanations for our findings as well as to look for the boundaries of the hypothesized effects (Draper and Smith 1980). The covariates we used were: (1) the length of time a sales reps has been with the company, (2) the length of time a sales rep has been working in his/her territory, (3) total sales experience, (4) the average number of hours a sales rep works in a week. Including these control factors is consistent with many other studies from the sales literature that have found these effects to significantly explain individual sales person performance (e.g. Churchill et al. 1985; Brown and Peterson 1994; Sujan et al. 1994; Ahearne 1998).

Results

Measurement Model and Covariates

The psychometric properties of the scales with multiple items were assessed by conducting a series of separate confirmatory factor analyses on the construct measures. This was accomplished using the maximum likelihood estimation procedure in Lisrel 8.30 (Jöreskog and Sörbom 1996) and the covariance matrix as input. The guidelines for testing structural models proposed by several authors were followed (Anderson and Gerbing 1988; Costner and Schoenberg 1973; Bentler and Chou 1987). Once the reliability, validity and model fit within each category of constructs was established, an overall confirmatory factor analysis on the entire set of constructs was conducted. The findings of the

overall confirmatory factor analyses can be summarized as follows (see Table 1). The model does not contain offending estimates. Although the χ^2 statistic is significant, the model fits the data very well when considering alternative fit indices. Hence, each latent construct used is unidimensional. All individual item reliabilities are larger than .40, the lowest composite reliability is .70 and the lowest average variance extracted is .53. Hence, all constructs possess adequate convergent validity and reliability. Further, all squared correlations between the latent constructs are smaller than the average variance extracted of the respective constructs (see Table 2). This provides support for the discriminant validity of the measures (Fornell and Larcker 1981).

In line with the procedures recommended by Draper and Smith (1980) and Green (1978), the influences of the control variables on sales performance were removed from the performance data prior to estimating the hypothesized structural relationships. A similar procedure was used by Ahearne (1998). The results of this regression indicated that two of the four control factors were found to significantly influence sales performance (i.e. experience with the company and experience in the sales territory).

Test of Direct Effect

Hypothesis H1 (i.e. a salesperson's information technology usage has a positive effect on salesperson performance) was tested by means of a regression analysis. The performance indicator was regressed on a composite score of information technology usage. This analysis found that a salesperson's information technology infusion significantly impacts his/her sales performance (after partialling out the effects of experience in the company and territory) (β=.242, standardized β=.255, $F_{(1,186)}$ $p<0.00$, R^2=.065). Hence, hypothesis H1 is supported.

Test of Mediating Factors

The tested hypothesized model is visualized in Figure 2. Significant paths in the models are bold and underlined. These significant relationships are indicative for a supported hypothesis. The coefficients of determination (i.e. percentage of variance explained in the latent construct), is also represented for the endogenous constructs. The hypothesized model fits the data well (χ^2 statistic was 559.83 (df=361, p=.00), RMSEA equaled .067, SRMR was .087, NNFI equaled .92 and CFI was .93) and all significant relationships are in the hypothesized direction, thus providing evidence for the nomological validity of our model (Steenkamp and van Trijp 1991).

(Figure 2 about here)

The final step in our estimation procedure was to remove all non-significant paths from the hypothesized model. The rationale for doing so is based on the reasoning of parsimony: it is better to have more degrees of freedom, all else being equal. The end result of this procedure can therefore be labeled as the "best" model. The model fit of the revised model was good: χ^2 statistic was 660.74 (df=363, p=.00), RMSEA equaled .066, SRMR was .086, NNFI equaled .92 and CFI was .93. These results are summarized in Figure 3. Although the $\Delta\chi^2$ test between the "best" and hypothesized model is not significant (i.e. χ^2 of 0.91 with 2 df) and the alternative fit indices are similar in both cases, the "best" model is preferred because it is more parsimonious (i.e. more degrees of freedom) and only little explanatory power is lost.

Hypotheses Test Results

In summary, our analyses provide support for most of our hypothesized main effects. As predicted in our first hypotheses H1, a sales rep's information technology infusion had a significant effect on performance. Our analysis in Lisrel supports this finding. The decomposed total (here: indirect) effect

of information technology infusion on salesperson performance is significant: path coefficient .26, t-value=4.30, p<.00.

Hypotheses H4, H5, H7 and H9 state that a sales person's sales skills are expected to be enhanced by a sales rep's usage of different information technology tools. As expected, our results show that information technology usage has a significant effect on market knowledge, technical knowledge and targeting skills (H4, H5, H9 supported). Although all three skills are significantly enhanced, the pattern of the results suggest that the effects are very modest. The amount of variance explained in a salesperson's market and technical knowledge and his/her targeting ranging from 4 to 5 percent. The effect of information technology on sales presentation was found to be borderline significant (H7 partially supported) and, thus, weak (only two percent of the variance in sales presentation skills were accounted for by information technology). As predicted, a sales rep's information technology infusion was also found to positively affect smart selling behaviors (H11 supported). The effect of information technology was very strong, explaining 30 percent of the variance in a sales rep's smart selling behaviors. Next, hypothesis H13 maintains that integrating an array of information technologies throughout a sales rep's sales process activities, improves call productivity. Based on our data, this assertion seems to hold. The level of sales technology infusion was positively related to the number of calls a sales rep is able to make over the course of a year. The effect was also strong with information technology infusion explaining 12 percent of the variance in call productivity.

In turn, it was hypothesized that these intermediate variables would all positively affect salesperson performance and, thus, mediate and explain the direct relationship between information technology and salesperson performance. As predicted, a sales rep's market knowledge and targeting skills were found to significantly impact salesperson performance (H2 and H8 supported). Similarly, hypothesis H10 is supported by the significant path coefficient (.16) from a sales rep's smart selling behaviors to

performance. The significant path (.22) from call productivity to salesperson performance provides support for H12. In contrast, the hypothesized effect of the sales skills technical knowledge and sales presentation were not found to be significantly related to performance (H3 and H6 not supported). The results indicate that, altogether, these predictor variables explain a substantial proportion (i.e. 30 percent) of the variance in salesperson performance.

Further, an analysis of the modification indices for the Γ-matrix indicates that the index for a direct path between information technology usage and salesperson performance is not significant. This implies that the mediators included in our model, *fully mediate and explain* the effects of information technology infusion on salesperson performance (i.e. there is no direct effect of technology usage on salesperson performance over and above the intervening variables included in our model).

Still, the path coefficients of technical knowledge and sales presentation skills to performance, should be interpreted with caution. Although, the coefficients are not significant, both have a negative sign, which is counter to the related hypotheses (see Figure 2). Analyzing Table 2 reveals that the correlations among the constructs market knowledge, technical knowledge, targeting skills and sales presentation skills, are high (i.e. ranging from .61 to .84). Although our data show discriminant validity between these constructs and the effects of information technology are differential on each of these sales skills, these high correlations could be partly explained by halo-effects and common method variance. Hence, the counter-intuitive signs of technical knowledge and sales presentation may be misleading due to multi-collinearity among these four constructs. The problem of multi-collinearity implies that the independent variables can not make much of a unique contribution to explaining the dependent variable if they are substantially correlated, and hence share a lot of variance (Cohen and Cohen 1983). The occurrence of multi-collinearity may result in path coefficients being incorrectly estimated and even having the wrong signs (Hair et al. 1998). A number

of options exist to remedy multi-collinearity. First, the intercorrelations between each independent variable and the criterion variable can be used to understand the independent-dependent relationships under investigation (Hair et al. 1998). In this regard the entries of Table 2, reveal that all four constructs reflecting a salesperson's sales skills are positively and significantly correlated with salesperson performance. Still, a salesperson's market knowledge and targeting skills have the highest correlation with performance, which supports our findings. An alternative solution to multi-collinearity, is to combine the focal constructs if "*it is thought that the shared variance is attributable to a single central property*" (Cohen and Cohen 1983, p. 115). Although we have provided evidence for the fact that the four latent constructs posses adequate discriminant validity, all four constructs relate to the higher order trait of salesperson sales skills. Hence, we re-tested the structural relationships modeling the four sales skills as a second order factor. These results are reported in Table 3. The re-test of the model shows good fit statistics and confirms our findings. Overall, our data indicate that a salesperson's sales skills are significantly enhanced by the use of information technology and in turn, these sales skills significantly affect salesperson performance. Based on the analysis of the correlation matrix and the re-estimation of the model, we conclude that a sales rep's technical knowledge and his/her sales presentation skills significantly contribute to performance, although the contributions of a salesperson's market knowledge and targeting skills is higher. In addition, we conclude that a sales rep's sales skills are the most important contributors to salesperson performance, followed by call productivity and lastly smart selling behaviors.

General Discussion

Direct Relationship between Information Technology and Salesperson Performance

The study findings support the overall assertion that a salesperson who *integrates different*

information technology tools into his/her sales activities *can significantly improve his/her performance*. Our data suggest that a salesperson's information technology infusion explains almost seven percent of the variance in his/her performance, after controlling for variables that have previously shown to be very important in explaining salesperson performance (i.e. experience in the company and territory). This is an important finding in light of the ongoing debate about the theoretical link between information technology and performance. While many organizations continue to invest heavily in advanced information technology, formal empirical evidence investigating the relationship between information technology and performance has produced mixed results (i.e. the IT-productivity paradox). The promising empirical evidence of this study, provides some resolution to the ambiguity and lingering question of an eventual similar IT-productivity paradox at the level of the individual salesperson. These study results also keep with the early evidence on sales automation which reports huge productivity gains due to sales automation (Moriarty and Swartz 1989; Rivers and Dart 1999).

Although one can make the reasonable comment that the amount of variance explained by this direct effect is rather low, one also needs to consider the following while interpreting this relationship. First, the effect is 'robust' because it links two different data sources. Second, this seven percent of variation in salesperson performance is explained by only one variable. Third, the amount of variance explained in salesperson performance compares favorably to the *individual* contributions made by other variables in previous sales studies. For instance, in Churchill et al.'s (1985) meta-analysis 'role perceptions' alone explained on average 8.6 percent of the variation in performance, while 'skill levels' and 'motivation' individually explained 7 and 3.3 percent respectively. Challagalla and Shervani (1996), for example, only explained 16 percent of self-reported salesperson performance using 4 self-reported predictors. Another example can be found in MacKenzie et al. (1998) were self-reported role ambiguity and role conflict concurrently explained 5 percent of objective in-role performance (i.e. measured by using company records). This is no to say, however, that an 'IT-

productivity paradox' is non-existent at the level of the individual salesperson (see 8.3.3. below).

Effects of Information Technology on Intermediate Variables

Although this overall relationship is an important finding, it is of little help in understanding "how" information technology may be beneficial at the level of the individual sales rep. The assessment of the mediating variables for the overall direct relationship between information technology and salesperson performance, provide some interesting insights. Our findings provide support for the fact that information technology improves performance through *efficiency gains* as well as *information based benefits*.

Call Productivity. It was found in this study that information technology usage increases a salesperson's efficiency in terms of the number of calls made. This finding supports the assumption that salespeople can *reduce time spent on non-selling tasks*, such as scheduling sales calls, updating customer records, compiling sales reports or assembling market information (Moriarty and Swartz 1991). The data further suggest that this impact of information technology is quite substantial as it explains twelve percent of a sales rep's call productivity. This is not to say that sometimes the use of information technology tools might be a loss of time to the rep or make them less efficient in some tasks (e.g. due to an information and communication overload a rep can search for hours on the Web to find nothing or spend the entire morning reading junk e-mails). However, our findings suggest that the benefits seem to outweigh the costs, in our sample.

Salesperson Skills. The information processing and communication properties of computer based technologies appear to significantly impact a salesperson's market and technical knowledge assets as well as his/her targeting skills. The positive influence of information technology on both knowledge assets, confirms the reasoning that using different information technology applications *helps*

salespeople's information processing and allows them *to update their knowledge* about important business relationships (Huber 1990). Similarly, the properties of information technology appear to facilitate a salesperson's *ability to identify, select and call* on their most profitable accounts. However, the fact information technology supports a salesperson in configuring sales presentations and dealing with customers, was only partially supported. This is a surprising finding, because one would expect technologies such as electronic mail, electronic presentation tools or databases to be effective in responding quickly to customers' questions and structuring information in a clear and concise manner. An explanation for this finding may lie in the fact that the sales context and setting under investigation does not allow information technology to make any difference in that area. Pharmaceutical sales calls are usually stand-up calls and only last up to approximately fifteen minutes. This reality practically excludes the opportunity for salespeople to use information technology during the sales call. Furthermore, sales reps call on physicians approximately every two weeks. This call pattern may point to the fact that information technology tools may add less to relationship building as customer relationships are much more built on frequent face-to-face contacts and familiarity with the representative (Ahearne et al. 1999).

Still, in interpreting the effect of information technology on a sales rep's sales skills, one needs to acknowledge that the main effect of technology is small. This may indicate that there are many other important variables which explain the enhancement of a salesperson's skills (e.g. experience, training) and that information technology is only a secondary tool for enhancing sales skills.

Working Smart. In addition, our data find support for the fact the information technology *helps salespeople to work smarter*. It seems that relying on an array of information technology tools, prompts salespeople to engage in more thorough planning behaviors. Sales technology helps salespeople to develop goals and strategies for each call and, thus, enhances the professionalism of sales planning and preparation. Similarly, accessing and unitizing information allows representatives

to adopt a flexible selling approach both during and across sales interactions. In other words, information technology provides the sales rep with a pallet of market and customer information, which enhances the ability and flexibility to tailor their sales style.

Finally, the data suggest that the *intermediate variables* included in our model *fully mediate* the direct relationship between information technology and salesperson performance. This implies that we were able to include the key mediators for adequately explaining this relationship in our model. This is an important finding because it supports our theoretical assertion that the improvement of salesperson performance due to information technology, can be explained by means of variables that are on the one hand important for salesperson performance and on the other hand benefit from enhanced information processing capabilities. In fact, the mediating model learns that the direct information technology effect works through the mechanism of a sales rep's improved sales skills, smart selling behaviors and call productivity. In other words, it implies that relying on information technology helps a salesperson *only if* (s)he actually transforms the technology use into effective sales processes, behaviors and skills (i.e. work smarter, build skills or make more calls).

The Effects of the Intermediate Variables on Salesperson Performance.

This study also makes some interesting empirical contributions for the study of salesperson performance.

Call Productivity. The significant impact of call productivity on salesperson performance is consistent with previous research regarding the influence of effort/motivation on sales outcomes. Using manager ratings as measures of salesperson performance and salesperson self-reports for effort, Brown and Peterson (1994) show that effort had a strong positive effect on performance. Churchill et al.'s (1985)

meta-analysis also indicated that motivation/effort was a strong predictor of salesperson performance. The finding of this study *adds important empirical support* to the effort – salesperson performance link, *combining two different company records* as sources for both variables.

Sales Skills. Of all the mediators included in our model, *the overall sales skills had the strongest impact on salesperson performance*. This finding corroborates with Churchill et al.'s (1985) meta-analysis. In an analysis of 116 studies, using 1653 associations between performance and determinants of performance, their study results indicated the set of sales skill variables as the second most important predictor of salesperson performance. Due to the high correlations among the sales skills, the assessment of the impact of the individual skills on sales performance is more challenging. However, our analysis seems to rank the skills as follows (in order of importance): targeting skills, market knowledge, technical knowledge and sales presentation skills. To the best of our knowledge, this study is the first to assess targeting as a sales skill, hence, no empirical benchmark for this relationship exists. Still, it supports the widely accepted assumption that effective prospecting and the Pareto-principle hold in a personal sales setting. The positive effect of both knowledge assets on performance is in line with previous research which has shown the importance of knowledge and use of knowledge in sales interactions (Szymanski 1988; Leigh and McGraw 1989; Sujan et al. 1988). Similarly, Behrman and Perreault (1982) showed a significant correlation between the construct of 'understanding and use of technical knowledge' and overall performance. In the same study, Behrman and Perreault (1982) also provided evidence for a significant relationship between a sales rep's 'sales presentation' and overall performance. The association of sales presentation was smaller than the one found for knowledge, as was the case in our study.

Smart Selling Behaviors. The finding of a significant relationship between a salesperson's smart selling behaviors and his or her performance, contributes *important empirical evidence* for this

unquestioned, but *still underreported relationship*. Linking self-report assessments of smart selling and performance, Sujan et al. (1994) report a significant relationship between working smart and performance. Similarly, Boorom et al. (1998) find a strong effect of adaptive selling on salesperson performance using self-ratings. Weitz and Spiro's (1990) study find a significant correlation between adaptive selling and self-reported performance, but not between adaptive selling and manager rated performance. Our study confirms these findings and even improves the nomological validity of the concept of smart selling because both constructs were obtained from different sources (i.e. the sales rep and company records).

Managerial Implications

This study also has implications for sales management. First, companies need their salespeople to be productive so that they sustain themselves as well as the firm. Hence, the positive relationships between information technology, performance and the intermediate benefits, provide a basis for *justifying* the implementation of information technology into the sales force. More specifically, it provides a justification towards top management as salesperson performance can be increased by means of information technology in return for the considerable investments made in these technologies. The study helps organizations to quantify some of the intangible benefits associated with computerization of the salespeople, an issue which has proven to be difficult before (Rivers and Dart 1999). Furthermore, when salespeople can see the positive outcomes of information technology usage, they may value these tools more highly and be prepared to bear the high levels of effort in learning to work the systems. Hence, the firm may spur the company-wide acceptance and use of information technology. This reasoning keeps with the finding from our acceptance study, which revealed that salespeople accept technology if they perceive that it enhances their job performance and that they learn from their peers about the usefulness of information systems.

With respect to recruiting sales personnel, our findings imply that a salesperson's computer skills and

abilities to apply computer technologies in the daily activities might be given more attention. Similarly, training efforts should emphasize information gathering and communication by means advanced information technologies. Considering the previous implication, an effective way in doing so may be to actively involve high performing, information technology savvy salespeople in the training process. Such an approach could learn other salespeople how to apply each technology effectively, as well as increasing their attitudes and comfort levels with all relevant technologies.

Our assessment of the correlates between specific technologies and the different constructs from our model, also provided interesting managerial insights. It offers the possibility to managers to assess the use and impacts of currently available technologies. These insights allow sales managers to evaluate the usefulness of different systems for specific aspects of the sales process and performance and take corrective action (e.g. by discouraging salespeople to put effort in the useless applications; improve or eliminate those applications in the systems' next upgrade).

Methodological Contributions

Although this study is only the first to explore the effect of information technology in personal selling, the findings are promising because we resolved a number of methodological issues often cited as an explanation for the IT-productivity paradox. First, we assessed the relationship *within* a company research site, thus allowing to control for externalities such as organizational and industry contexts. Lumping together salespeople from different firms, with different information technologies would have blurred the analyses of the relationships in our study. Second, we used multiple data sources and, hence, reduced the effect of common method variance as a potential explanation of the found effects. Third, our model also included adequately measured intangible and intermediate benefits associated to information technology, which help to explain and understand the effects of information technology.

Furthermore, in testing our research model four different information sources were combined. While many survey research studies suffer from common method bias as an alternative explanation for the falsified hypotheses, this study has seriously reduced this weakness. This strength has added to the robustness of our findings.

Also, by using established qualitative research techniques we were able to adequately identify and measure the most important intangible and intermediate benefits associated with information technology.

As such, research design can serve as a blue print for subsequent studies, in and outside the field of personal selling, in studying the consequences of information technology implementation.

Limitations and Suggestion for Future Research

This exploratory study is suggestive for the positive relationship between information technology and salesperson performance, but certainly not definitive. Although the impact of information technology was found to be positive and significant, it does not rule out the absence of an 'IT-productivity paradox' at the level of the individual salesperson. Perhaps the single most important limitation of our study is the single-company frame. In terms of generalizability it would be interesting to investigate the relationship between information technology and salesperson performance in other sales situations and industries. Note, however, that the choice to focus on a single site was inspired by the fact that we wished to control for contextual factors (e.g. market and organizational factors). Insufficient attention for the organizational context and lumping together data from different firms, are frequently mentioned as potential explanations for the mixed findings in the area of information technology and performance. Furthermore, it may be difficult, if not impossible, to gather data across industries and companies if one wishes to use multiple source data. Hence, future research is needed to replicate this main effect and shed light on the generalizability of our findings by means of testing the model with

independent samples from a variety of sales situations.

Despite the single empirical context of our study, however, the substance and implications of the proposed research model are readily applicable to other personal selling situations. In fact, the mediating variables incorporated in our model have shown to be relevant predictors of salesperson performance in previous research, conducted in different settings. Still, other selling contexts may require slight changes in the model. For instance, in sales situations with a lower frequency in customer visits or smaller customer bases, the automational effects of information technology might translate into another efficiency advantages than call productivity. Or, some effects of information technology may be different (i.e. stronger or weaker) in other contexts. For instance, the effect of technology may be more apparent in sales situations where sales calls are more elaborate and where salespeople can use technology in front of the customer.

Although we combined multiple data sources in the test of our model, the research design is still cross-sectional in nature. Hence, purely causal inferences remain difficult to make. However, the sales performance indicator was collected after the measures assessed with sales reps and managers. Although this does not imply causality, it gives the findings a causal touch (Ahearne 1998).

The significant relationship between technology and smart selling may be somewhat inflated due to common method variance. Indeed, the link between technology infusion and smart selling is the only relationship in our model where the independent and dependent variables were measured at the same source, namely the sales rep. However, the data collection procedure ensured confidentiality which should have reduced the motivation, if any, for respondents to provide an overly favorable impression.

Similarly, although our findings add support to the importance of sales skills for salesperson performance, these relationships could be somewhat inflated due to the subjective component

incorporated in our indicator of salesperson performance. Still, the performance measure was assembled approximately two months after the collection of the managers' assessment and the subjective component only accounts for 20 percent of a salesperson's performance.

The choice of the sales managers as informants for the evaluation of all sales skills, may imply some limitations. The argument can be made that the dimension relating to sales presentation and dealing with customers is best assessed by customers. Customers can rate the salesperson on those aspects that impact customer attitudes and their purchases (Behrman and Perreault 1982). In an additional mailing to a sample of customers per sales representative, some of these variables (e.g. information communication, responsiveness and customer satisfaction) were measured among customers. In consultation with the advisors of this research, we have decided to analyze and report these results in a later stadium of the research.

Some of the limitations mentioned above provide interesting avenues for future research. Longitudinal research using a field experimental approach would be a valuable contribution to the limitation of the cross sectional design and the making of causal inferences. Tracing information technology usage, sales performance and sales behavior from the outset of information technology implementation would demonstrate how both the acceptance process unfolds and when and how (performance) benefits are generated through information technology. Currently, we are collecting these kind of data in a large U.S. equipment manufacturer. Laptops and an array of software tools have been rolled out to the sales force. Surveys were/are administered at three points in time: after initial training, two months after implementation and five months after implementation. Similarly, research designs combining multiple rounds of qualitative and quantitative data collection techniques, could add a lot of valuable knowledge to the interplay between individual acceptance, its consequences and the intra-firm adoption process over time.

In this research, we focused only on the effects of information technology in terms of salesperson performance. Models in future research could also seek to incorporate other effects of information technology on the individual salesperson, that are also important for salespeople and sales management. For instance, it would be useful to explore the psychological outcomes (e.g. job satisfaction, commitment, role ambiguity and complexity) of introducing advanced information technologies in the life of salespeople. Or, assess the effects of technology on social and group interactions in a sales environment.

Third, additional research should attempt to explore the moderators of the relationship between information technology, the intermediate variables and salesperson performance. It is possible, for instance, that the empirical findings are contingent on individual factors, such as experience and computer ability of the salesperson.

FIGURE 1 CONCEPTUAL MODEL OF THE EFFECTS OF IT ON SALES PERFORMANCE

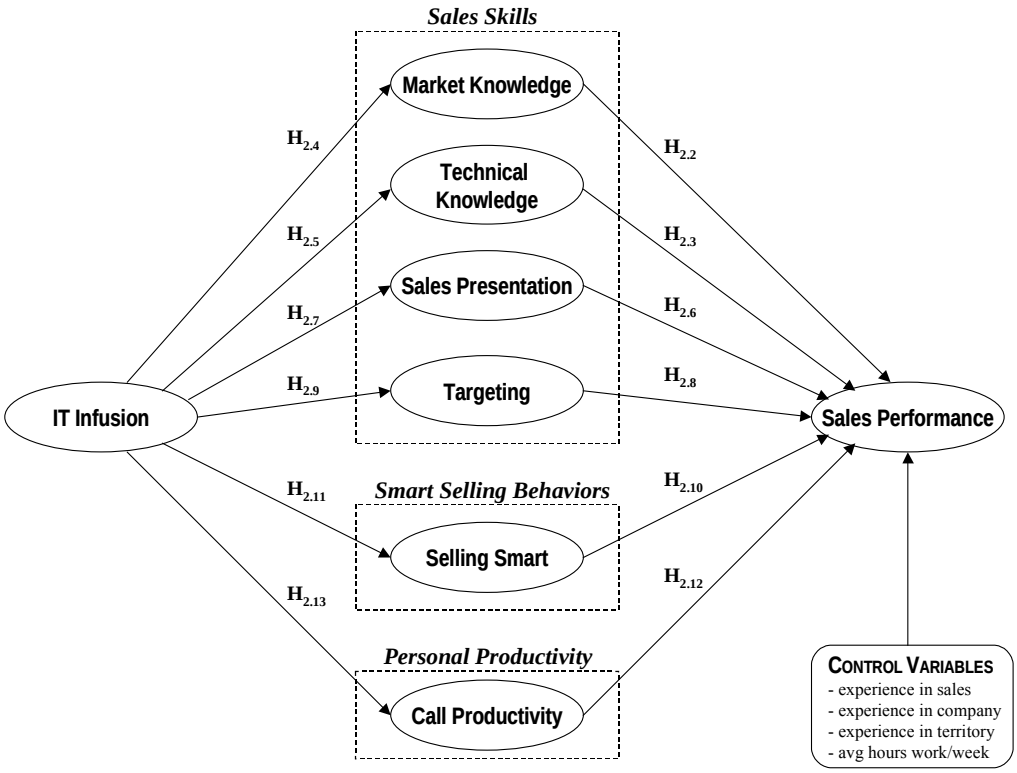

TABLE 1: FINAL CONFIRMATORY FACTOR ANALYSIS - OVERALL MEASUREMENT MODEL

	Standardized Loadings	Squared Multiple Correlation	Composite Reliability	Average Variance Extracted
IT Usage			**.85**	**.53**
I consider myself a frequent user of IT	.71	.50		
I fully use the capabilities of our IT	.72	.52		
I have completely integrated our IT-applications into my sales process	.81	.65		
I frequently use IT to sort, visualize and analyze market data	.70	.49		
I utilize different IT in an integrated way so that they work well together	.69	.48		
Smart Selling			**.70**	**.53**
Composite for adaptive selling	.72	.52		
Composite for sales planning	.75	.56		
Market Knowledge			**.94**	**.84**
Is an excellent resource of competitive information	.90	.81		
Has a lot of information on industry trends	.95	.89		
Is well-informed about important events in our industry	.91	.83		
Technical Knowledge			**.91**	**.72**
Knows all the specifications and applications of our products	.82	.67		
Is an excellent source of information about pharmaceuticals	.93	.87		
Keeps abreast of technical developments	.82	.67		
Knows and understands very well what a physician's patients are going through	.81	.65		
Targeting Skills			**.95**	**.80**
Always targets the right doctors in his/her sales approach	.92	.85		
Always calls on those physicians that have potential	.86	.74		
Constantly works on the highest priority customers first	.87	.76		
Is very good at identifying, selecting and calling on profitable physicians	.93	.86		
Consistently calls on doctors that provide the most business	.87	.76		
Sales Presentation – Dealing with Customers			**.96**	**.75**
Presents information to customers in a clear and concise manner	.89	.80		
Is very responsive in handling customer questions	.85	.72		
Provides a lot of new information to customers	.88	.77		
Is aware of the personal interests and hobbies of his/her doctors and talks about them	.84	.70		
Always asks physicians the appropriate questions	.84	.71		
Demonstrates the product value well	.90	.81		
Addresses doctors' objections and issues adequately	.91	.83		
Gains customer commitment	.81	.66		
	Goodness of Fit Statistics			
	df = 309			
	χ^2 = 561.92 (P = 0.00)			
	RMSEA = 0.066			
	SRMR = 0.052			
	Non-Normed Fit Index (NNFI) = 0.93			
	Comparative Fit Index (CFI) = 0.95			

TABLE 2: CONSTRUCT CORRELATIONS[a]

Construct	1	2	3	4	5	6	7	8
1. IT Usage	--							
2. Smart Selling	.53** (.08)[b]	--						
3. Market Knowledge	.19** (.08)	.18* (.09)	--					
4. Technical Knowledge	.19** (.08)	.23** (.09)	.78** (.03)	--				
5. Targeting Skills	.17** (.08)	.19** (.09)	.64** (.05)	.76** (.04)	--			
6. Sales Presentation	.12 (.08)	.17* (.09)	.61** (.05)	.84** (.03)	.81** (.03)	--		
7. Call Productivity	.32** (.07)	.32** (.08)	.43** (.06)	.44** (.06)	.40** (.06)	.40** (.06)	--	
8. Sales Performance[c]	.27** (.07)	.30** (.08)	.47** (.06)	.43** (.06)	.50** (.06)	.39** (.06)	.44** (.06)	--

* p<.10; ** p<.05 N = 187

[a] Intercorrelations are among latent constructs (Φ matrix from confirmatory factor analysis) and thus corrected for attenuation due to measurement error.

[b] Entries in parenthesis are standard errors.

[c] Effects of covariates partialled out, see next section 7.4.

FIGURE 2 EMPIRICAL TEST OF HYPOTHESIZED MODEL

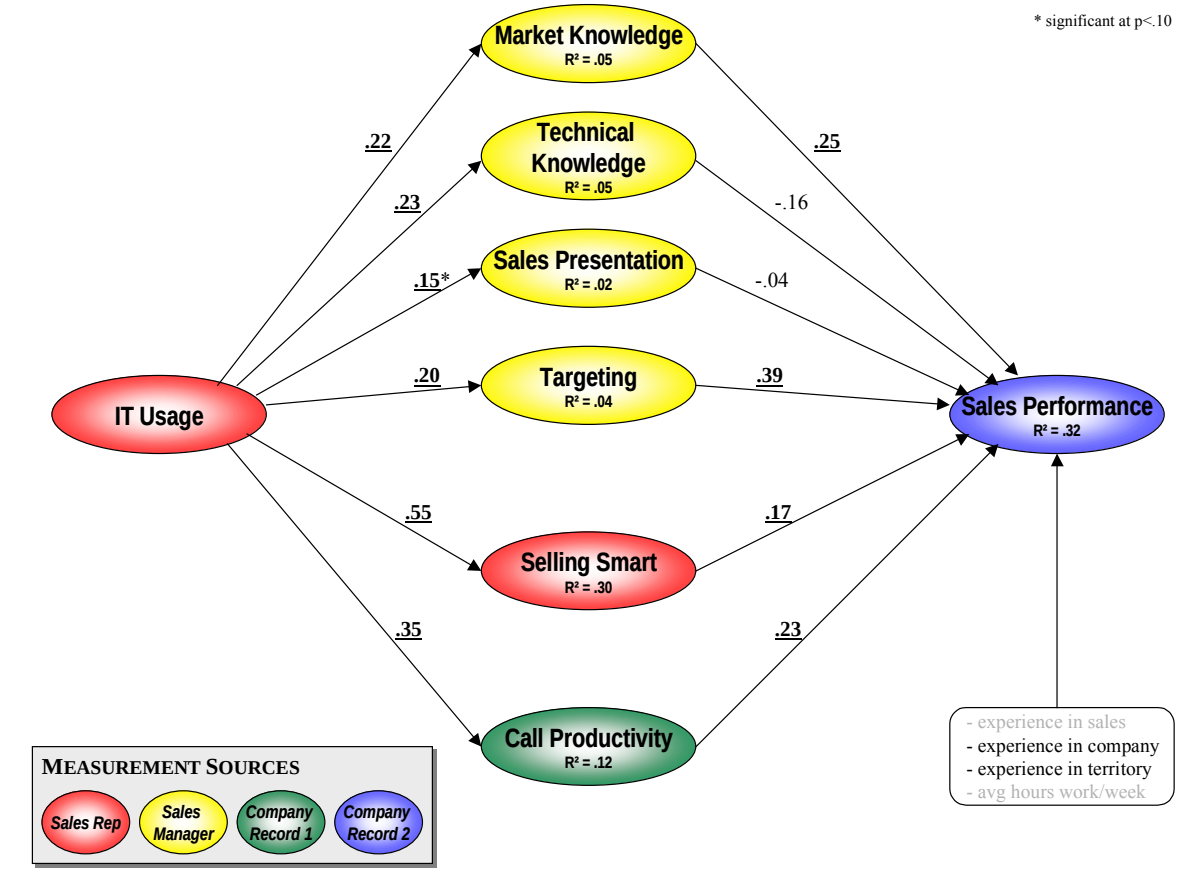

FIGURE 3 EMPIRICAL TEST OF "BEST"/REVISED MODEL

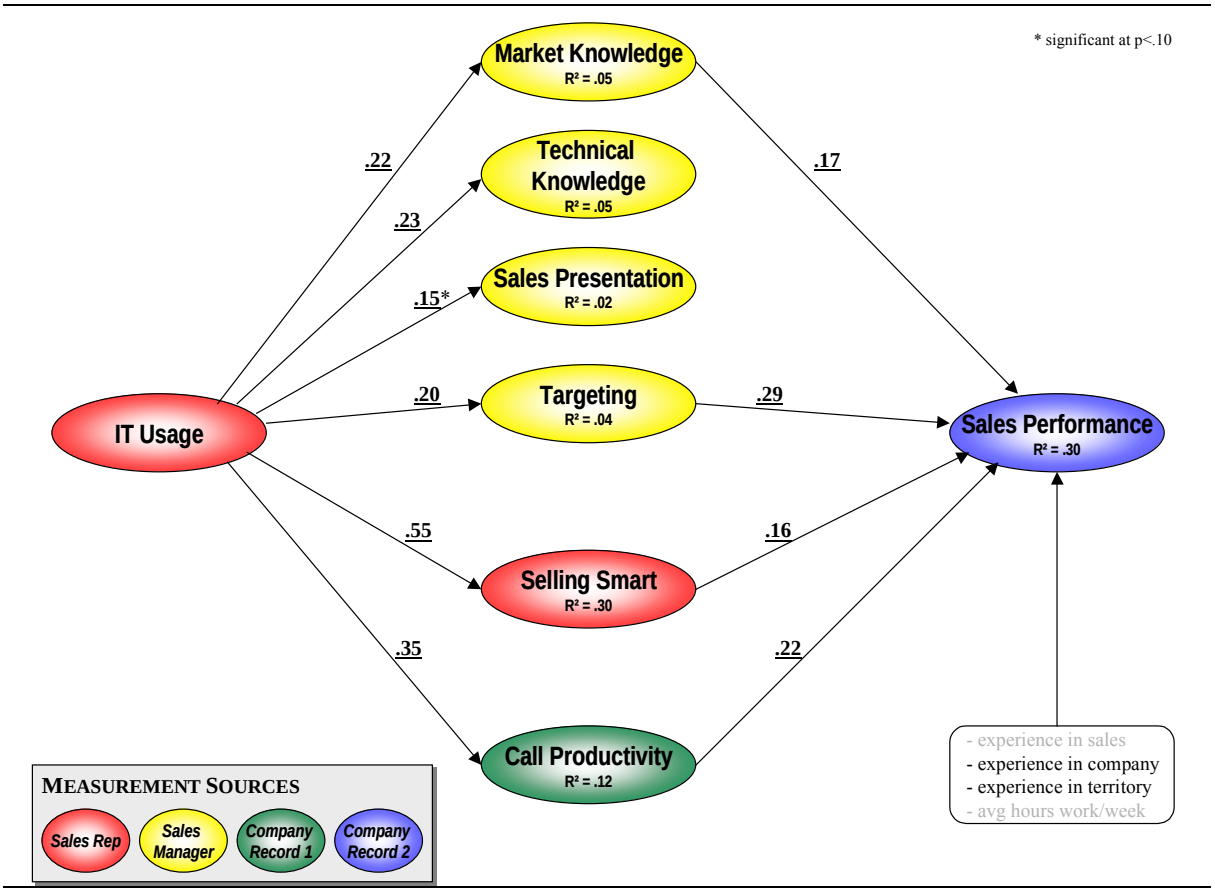

TABLE 3: RE-TEST OF MODEL WITH SALES SKILLS AS SECOND ORDER FACTOR

Fit statistics		Re-tested Model
	df	60
	χ^2	131.21
	χ^2 /df	2.19
	RMSEA	0.077
	SRMR	0.057
	NNFI	0.92
	CFI	0.94
IT Usage → Salesperson Skills		**.20**
IT Usage → Smart Selling		**.54**
IT Usage → Call Productivity		**.33**
Salesperson Skills → Sales Performance		**.36**
Smart Selling → Sales Performance		**.16**
Call Productivity → Sales Performance		**.23**
Salesperson Skills ↔ Call Productivity[1]		.40
% variance explained	Sales Performance	.31
	Salesperson Skills	.04
	Smart Selling	.30
	Call Productivity	.11

All *underlined* and *bold* coefficients significant at a $p<0.05$ level.
[1]Intermediate constructs were allowed to freely correlate.

References

Behrman, D.N. and W.D. Perreault (1982), Measuring the Performance of Industrial Salespersons, *Journal of Business Research*, 10, 355-370.

Bresnahan, T.F. (1986), Measuring the Spillovers from Technical Advance: Mainframe Computers in Financial Services, *The American Economic Review*, 76, 4, 742-755.

Brown, Steven P. and Robert A. Peterson (1994), The Effect of Effort on Sakes Performance and Job Satisfaction, *Journal of Marketing*, 58, April, 70-80.

Brynjolfsson E. and L. Hitt (1993), Is Information Systems Spending Productive? New Evidence and New Results, *Proceedings of the 14th International Conference on Information Systems*, Orlando, FL, 47-64.

Brynjolfsson, Erik and Shinkyu Yang (1996), Information Technology and Productivity, A Review of the Literature, *Advances in Computers*, 43, February, 179-214.

Buchanan, D. and J. McCalman (1988), Confidence Visibility and Pressure: The Effects of Shared Information in Computer Aided Hotel Management, *New Technology, Work and Employment*, 3, 1, 38-46.

Campbell, T. (1998), Beating the Sales Force Technophobia, Sales and Marketing Management, December, 68-72.

Churchil, G., Ford, N., Hartley, S., Walker, O. (1985), The Determinants of Salesperson Performance: A Meta-Analysis, *Journal of Marketing Research*, 12, May, 130-118.

Churchill, G. (1979), A Paradigm for Developing Better Measures of Marketing Constructs, Journal of Marketing Research, 16, February, 64-73.

Colombo, G. (1994), Sales Force Automation, McGraw-Hill, New York, NY.

Conlon, G. (1998), Plug and Play, Sales and Marketing Management, December, 64-67.

Conlon, G. (1999), They Like Ike, Sales and Marketing Management, January, 72-73.

DeLone, W., McLean, E. (1992), Information System Success: The Quest for the Dependent Variable, Information Systems Research, 3, 1, 60-95.

Draper, N.R. and H. Smith (1980), *Applied Regression Analysis*, Wiley, New York.

Duncan, T. and Moriarty S. (1998), A Communication-Based Marketing Model for Managing Relationships, *Journal of Marketing*, 62, 1-13.

Fletcher, Keith (1990), *Marketing Management and Information Technology*, Prentice Hall, U.K.

Fulk, J., DeSanctis, G. (1995), Electronic Communication and Changing Organizational Forms, *Organization Science*, 6, 4, 337-349.

Glazer, R. (1991), "Marketing in an Information Intensive Environment: Strategic Implications of Knowledge as an Asset", *Journal of Marketing*, 55 (October), 1-19.

Goldenberg, B. (1996), Re-Engineering Sales & Marketing with Advanced Information Delivery Systems, *Sales and Marketing Management*, Special Supplement, S 1-31.

Good, David J. and Robert W. Stone (1995), Computer Technology and the Marketing Organization: An Empirical Investigation, *Journal of Business Research*, 34, 197-209.

Green, Paul (1978), *Analyzing Multivariate Data*, The Dryden Press: Hinsdale, IL.

Huber, G. (1990), A Theory of the Effects of Advanced Information Technologies or Organizational Design, Intelligence, and Decision Making, *Academy of Management Review*, 15, 1, 47-71.

Igbaria, M., Tan, M. (1997), The Consequences of Information Technology Acceptance on Subsequent Individual Performance, *Information & Management*, 32, 113-121.

Jarvenpaa, S., Ives, B. (1994), The Global Network Organization of the Future: Information Management Opportunities and Challenges, *Journal of Management Information Systems*, 10, 4, 25-57.

Jöreskog, Karl and Dag Sörbom (1996), *LISREL 8: User's Reference Guide*, SSI, Chicago, IL.

Keillor, B., Bashaw, E., Pettijohn, C. (1997), Salesforce Automation Issues Prior to Implementation: The relationship between attitudes toward technology, experience and productivity, *Journal of*

Business and Industrial Marketing, 13, ¾, 209-219.
Kotler, Philip (1994), *Marketing Management: Analysis, Planning, Implementation and Control*, 8th ed., Prentice Hall, NJ.
Loveman, G. W. (1994), An Assessment of the Productivity Impact on Information Technologies. In: *Information Technology and the Corporation of the 1990s: Research Studies*, T.J. Allen and M.S. Scott Morton (eds.), MIT Press, Cambridge, MA, 84-110.
Marshall, Greg W., Moncrief, William C. and Felicia G. Lassk (1999), The Current State of Sales Force Activities, *Industrial Marketing Management*, 28, 87-98.
Millman, Z. and Hartwick, J. (1987), The Impact of Automated Office Systems on Middle Managers and their Work, *MIS Quarterly*, 11, 4, 479-491.
Moncrief, W. C., Lamb, C. and J. M. Mackay (1991), Laptop Computers in Industrial Sales, *Industrial Marketing Management*, 20, 279-285.
Mooney, John G., Gurbaxani, Vijay and Kenneth L. Kraemer (1996), A Process Oriented Framework for Assessing the Business Value of Information Technology, *The DATA BASE for Advances in Information Systems*, Spring, 27, 2, 68-81.
Moriarty, Rowland T. and Gordon S. Swartz (1989), Automation to Boost Sales and Marketing, *Harvard Business Review*, 67, 1, 100-108.
Pinsonneault, A., Kraemer, K. (1993), The Impact of Information Technology on Middle Managers, *MIS Quarterly*, 17, 3, 271-292.
Roach, S. S. (1987), America's Technology Dilemma: A Profile of the Information Economy, *Special Economic Study*, Morgan Stanley, April.
Sharda, Ramesh, Barr Steve H. and James C. McDonnell (1988), Decision Support System Effectiveness: A Review and An Empirical Test, *Management Science*, 34, 2, February, 139-159.
Spiro, R., Weitz, B. (1990), Adaptive Selling: Conceptualization, Measurement, and Nomological Validity, *Journal of Marketing Research*, 17, February, 61-69.
Sujan, H., Weitz, B., Kumar, N. (1994), Learning Orientation, Working Smart, and Effective Selling, *Journal of Marketing*, 58, July, 39-52.
Sujan, H., Weitz, B.A., and M. Sujan (1988), Increasing Sales Productivity by Getting Salespeople to Work Smarter, *Journal of Personal Selling and Sales Management*, August, 9-19.
Sulek, J., Maruchek, A. (1992), A Study of the Impact of an Integrated Information Technology on the Time Utilization of Information Workers, *Decision Sciences*, 23, 1174-1191.
Weitz, B., Sujan, H, Sujan, M. (1986), Knowledge, Motivation and Adaptive Behavior: A Framework for Improving Selling Effectiveness, *Journal of Marketing*, 50, 174-191.