The Impact of Multimedia Training Systems on Individual Performance

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Author’s biography: Dr. David McDonald is currently the Academic Program Director for the undergraduate and graduate programs in the CIS Department at Georgia State University. He is a generalist in all things computing. It is his belief that new and innovative approaches to technology are mandatory in today’s marketplace. Accomplishing this requires an increased partnership among academia, businesses and consulting firms. His research areas of interest are in the applied use of multimedia systems, interorganizational systems and organizational learning. He is also the founder of the McDonald Consulting Group, which has worked closely with some of Atlanta’s major businesses including: Nations Bank, the Sheraton Corporation, Cohen & Wolfe, and Scientific Atlanta.
The Impact of a Multimedia Training System on Individual Performance

Abstract: The workforce within the U.S. is increasingly culturally diverse and mobile. Coupled with the fact that technological change is occurring more rapidly, a critical issue that has emerged for the 1990s is how organizations can improve their training methods to adapt to these conditions. Effective learning systems enable employees to adapt more easily to change, thereby increasing their effectiveness. Multimedia systems can be the solution to enhancing performance effectively and efficiently by accelerated learning. This paper examines such a system developed by Holiday Inn Worldwide for the implementation of a new information system.

Individuals' performance and attitudes were tracked for two primary groups: those receiving training on a new information system using traditional training methods and those using a multimedia CDROM to acquire mastery of the same system. 826 employees participated, 467 of which were trained by the multimedia system. Attitude measures included attitudes toward self, job, training, and technology. Individual performance was measured by standardized tests on employees' knowledge of the new information system. Our findings demonstrated a significant improvement in employees' scores on system knowledge for employees in multimedia-trained sites when compared with traditionally-trained employees. This paper reports the results of the performance issue only.

Keywords: Multimedia, Training, IS Training, IS Performance, User Training

ISRL categories: EI, FD06, GB02, DA06, DA07
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Introduction

Since more than 90% of all private organizations have some type of systematic training program (Goldstein 1986), and virtually all organizations with more than 1000 people provide some form of systematic training (Saari, Johnson et al.), the need to justify the $44 billion spent annually on training initiatives appears obvious (Carnevale and Gainer 1989). Yet, in spite of its perceived importance, training method evaluations are rare. In the context of information system training, they are virtually non-existent. Today, with the suppliers of technology continually emphasizing the changeover to multimedia, it would appear an opportune time to discover if there really are any benefits associated with this new training technology.

The Research Problem

According to a U.S. Department of Education report, A Nation at Risk, (U.S. Department of Labor 1993) and the Hudson Institute's Workforce 2000 (Johnston and Packer 1987), the ability of companies to compete effectively will be determined by their success in employing productive workers in a labor market characterized by scarcity, skill deficiencies, and demographic diversity. Whether U.S. industry succeeds or fails in the coming decade will depend, in part, on how well it meets the challenge of adequately educating the work force to make use of the new technologies.

As firms face this challenge, the need for not only managers, but for all employees, to learn more rapidly and effectively assumes new urgency and complexity. Education and training are needed on a large scale in organizations for increasing the effective assimilation of new concepts, ideas, and strategies throughout the organization. Thus, there is a greater requirement for designing flexible learning systems, which may provide the foundation necessary for the organization to better respond to these environmental changes.

However, traditional training methods have often been too slow to accomplish the rapid dissemination of new ideas and concepts (Vadas 1986; Miller 1990; Micromentor 1992; Lloyd 1993; Pastore 1993; Tynam 1993). Additionally, today’s workforce is more mobile, with the individual less likely to be bound to any one company (Fullerton 1987; Napier, Lane et al. 1989; Dobbelare and Goeppinger 1991; Loveman and Gabarro 1991; Powers 1992). This implies a greater demand for a firm to provide the necessary skills to meet its objectives. Therefore, more effective and efficient human resource development programs are necessary to train and educate employees to be better able to adapt, adjust, and learn.
For example, there is an inherent benefit (i.e., gains in efficiency) of being able to supply "training on demand," which, for many large organizations, is a conceptual shift away from their concentration on training "events" (i.e., the use of traditional classroom or workshop training sessions, scheduled at regular times) (Fullerton 1987; Napier, Lane et al. 1989; Dobbelaere and Goeppinger 1991; Loveman and Gabarro 1991; Powers 1992; Lloyd 1993; Pastore 1993; Stamps 1993; Tynam 1993). Also, training and education improve the likelihood of greater customer satisfaction, leading to increased loyalty (i.e., gains in effectiveness) (Peters and Waterman 1982; Rosenberg 1990; Barney 1991; Ulrich 1991). Moreover, the greater the education and experience gained by the work force, the better an organization is able to adopt innovations, resulting in a greater ability to compete in a highly competitive global marketplace (Barney 1991; Fiol 1991; Ulrich 1991).

New computer technologies, in the form of multimedia-based systems, may provide the tools necessary to formulate a learning environment which will encourage this education and training. There may also be added benefits not found in traditional learning systems in using this new technology. With multimedia systems (MMS), "safe" environments can be simulated which encourage individuals to explore and take chances (Forman and Kaplan 1992; Ives 1993). As change and innovation occur more frequently in the workplace, the dynamics of the workgroup are bound to change. Used appropriately, multimedia can introduce new avenues of workgroup communication and collaboration.

A FRAMEWORK FOR PLANNED CHANGE

Organizations can be viewed as contexts within which individuals behave (Nadler 1981). According to Porras, an organizational setting is comprised of four major interrelated subsystems: organizing arrangements, social factors, technology, and physical setting (see figure 1) (Porras and Hoffer 1986; Porras and Robertson 1987; Porras and Robertson 1992). Each subsystem consists of specific elements that strongly influence the work behavior of individual organizational members. In turn, the behaviors collectively expressed by organizational members are a primary determinant of two categories of organizational outcomes: the level of organizational performance and the level of an organization members' development. From a research perspective, interventions constitute the independent variables, whereas organizational subsystem components, individual behaviors, and organizational outcomes can be presented as either dependent or independent variables.
In this study, the intervention is the utilization of a multimedia system for training employees on the components of a newly installed computer-based information system. As such, it can be viewed as the activity through which changes in the organizational setting are implemented. Since organizational characteristics strongly influence individual behavior, and individual behavior effects organizational outcomes, behavioral change can be seen as a necessary condition related to the intervention activity. Planned change is concerned with the flow of change from the organizational subsystems to individual behavior to organizational outcomes (Porras and Robertson 1992). It is also recognized within this framework that planned change consists of more than one cycle, with behaviors and performance, both on the individual and organizational levels, affecting organizational subsystem forces.

**A Model for This Research**

Technological impact models simplify the process of technological change in organizations by minimizing the interaction of implementation plans and efforts, the ongoing organizations system, and the technology (Kraut, Dumais et al. 1989). Yet their very simplicity provides a useful starting point in analyzing the impact of technology as a training tool on the individual and the organization. With these models, it is generally assumed that a fully formed technology is injected into a social setting and has direct causal effects on users’ behaviors and attitudes. Many past
studies are typical of this approach (Ginsburg 1981; Barki and Huff 1985; Baroudi, Olson et al. 1986; Rivard and Huff 1988; Bretz and Thompson 1992; Davis and Bostrom 1993).

For this research, the model in figure 2 depicts the impact of a new technological means for training

![Model Diagram]

- Attitude toward training
- Attitude toward technology
- Demographic differences

- Self-efficacy
- Job satisfaction
- Learning outcomes

- Customer service
- Reporting errors
- Yield index
- Penetration index
- Revenue
- Costs
- Turnover

Figure 2: Research Model Depicting the Impact of MMS Training

individuals within an organization by comparing the technological training intervention with more traditional training approaches. This model is consistent with the planned change framework developed by Porras and Robertson (Porras and Robertson 1992).

A review of the training literature has shown a scarcity of research including both individuals and their impact on the organization. Most often, the focus has been on the individual, with organizational outcomes omitted. Therefore, consistent with the Porras and Robertson framework, the focus of the model is on the effects of a training intervention on performance, both individually and organizationally. The literature has also shown very limited use of multiple measures. However, the Porras and Robertson framework accounts for the complexity of organizational interventions. Thus, our model has been designed to capture as much of the variation as possible for testing the hypotheses. It includes both attitude and performance measures along the dimensions of effectiveness and efficiency. For the sake of clarity, the variables we shall use in this study have also been shown in the model; however, this model is flexible and could easily be adapted to other studies, with different interventions and variables. In this paper, for the sake of brevity, the discussion will be limited to the effects of a training intervention on individuals' performance.
THE RESEARCH SETTING - HOLIDAY INN WORLDWIDE

Holiday Inn Worldwide (HIW) of Atlanta, Georgia, agreed to provide the setting for an empirical evaluation of the hypotheses. Holiday Inn Worldwide is a hotel chain comprised of approximately 2000 locations throughout the world. More than 95% of these hotels are owned by franchisees. This study was limited to a sampling of franchised Holiday Inn hotels in the United States.

In an effort to standardize all information systems throughout the organization, HIW planned to provide to each of its franchisees a new information system termed the Encore™ system. This system was initially developed and implemented through all corporate-owned hotels upon its inception in 1992. According to Michael Leven, former Holiday Inn Americas Division president, Holiday Inn will be the only company of more 350 hotels that will have a single integrated property management system for the entire company.

The Encore™ System

The Encore™ system is the newly installed system for which the MMS will be used to train employees. The key component of the Encore™ operating system is the Front Office System. Its modules include a reservation system for a particular hotel, a front desk management system (or if a franchisee owns multiple hotels, a multiple property reservation and front desk system), an accounting system, a housekeeping maintenance system, an employee messaging system, a guest messaging system, and various utility programs, such as a currency conversion utility. The operating system also serves as a seamless interface to the two other Holiday Inn information systems, collectively known as Worldwide Hotel Systems (WwHS).

The Multimedia Training System

The MMS is Holiday Inn’s latest innovation in computer-based training. The multimedia training was designed to let managers and staff have control over instructional content. They can freely move from one topic to another, simply by clicking on an icon. Front desk personnel can better learn how to handle guests’ complaints and problems or how a “check-out” can be made a more efficient and pleasant experience for the customer. Managers, on the other hand, can key into the “Rate and Inventory Management” program, to improve their revenue enhancement skills.

In all, Holiday Inn will develop a total of twenty-four training modules over the next two years. Currently, there are fifteen multimedia modules in use. The initial use of these modules will be to train all levels of employees on
the use of the various sub-systems within WwHS, including the use of the Encore operating system, the Holidex Reservation system, and the HIRO yield management system.

MEASURES

Training Interventions

Reports in the literature of the beneficial effects of training are numerous. Training is an essential tool in the implementation of new information systems (Brancheau and Wetherbe 1987; Ives 1992). Training has also been identified as a key area necessary for the success of “Total Quality Management (TQM)” (Powell 1989). Training and education have been listed by the National Center for Education and the Economy (1990) as necessary to the development of a high-productivity workforce. Many researchers have cited training and development as “important competitive tools” (Fottler, Phillips et al. 1990; Kearns 1990; Barney 1991; Ulrich 1991).

Thus, testing the effects of training on employee attitudes and performance can significantly add to the present body of knowledge. The impact of a technological intervention is typically examined by comparing people exposed to the intervention with those unexposed and attributing differences between them to the technology. For this research design to lead to valid conclusions, the groups must have been similar to each other in all other significant ways prior to the introduction of the technology. While it is generally accepted that randomly assigning the intervention to people is the best way of assuring equivalence, this practice is generally impractical in the workplace. Instead, researchers typically compare groups who differ in their use of technology by comparing a group before and after a technology is introduced (i.e., by using pretest-posttest designs).

In this study, another unique condition occurs which will not allow the use of the simple pretest, posttest design. From the most recent study, the average annual turnover for the industry under consideration is 105% (Barrows 1990). As such, it is quite possible that an organizational unit can experience a twenty-five percent turnover in a ninety day period. Therefore, any study of the training interventions’ effect on individual learning outcome and attitudes must account for this expected high turnover (see the model in figure 3).

The intervention of a multimedia computer system in this study results in the formulation of six distinct groups within which employees are classified. The make-up of each of these groups is fully delineated in the Appendix. Please note that the use of the term ONLY in a group name indicates that group received only the initial certification exam and questionnaire. Similarly, the term FULL in a group name indicates that group received both the initial and follow-up certification exams and questionnaires.
### IMPACT OF TRAINING ON INDIVIDUALS

#### Performance Measures

Porras and Robertson (1992) assert that individual performance can be viewed as a summary measure of the *quality* of work behavior, with these performance measures correlating significantly with positive attitudes. Since this study focuses on the institutionalization and organizational outcomes resulting from the successful implementation of a new information system, it was necessary to demonstrate that adequate knowledge of the system was an antecedent to this success. Therefore, in this study, individual performance, as measured by standardized certification exams on the Encore system, was monitored. Identical exams were given twice, once as part of the initial training process, and then again in three months. The results from these exams were then used to test the following hypotheses:

**H1:** Individuals in organizational units receiving solely multimedia system training (MMONLY) will have higher scores on the certification exams than comparable individuals receiving traditional training alone (TRADONLY).

**H2:** Individuals in organizational units receiving multimedia system and on-the-job training (MMOJONLY) will have higher scores on the certification exams than comparable individuals receiving on-the-job training alone (OJTONLY).
H3: Individuals in organizational units receiving multimedia system and on-the-job training (MMFULL) will have higher scores on the certification exams than comparable individuals receiving traditional and on-the-job training (TRAFULL).

H4: Individuals in organizational units receiving multimedia system and on-the-job training (MMFULL) will retain more knowledge on the Encore™ system as shown by the change in certification exam scores after 90 days than those receiving traditional and on-the-job training (TRAFULL).

Intervening Variables

Individual’s Attitude Toward the Information System

Since the object of the training interventions is the mastery of a computerized information system, accompanied by positive changes in users’ attitudes toward their jobs and capabilities, it is imperative to assess if their attitudes toward technology in general intervened in the successful use of such a system (Ilves and Olson 1984; Baroudi, Olson et al. 1986; Davis 1989; Davis, Bahozzi et al. 1989). Perceived ease of use and perceived usefulness are two possible mediating variables which may be used to measure the users’ attitudes toward technology.

Performance gains are often affected by users’ willingness to accept and use systems (Baroudi, Olson et al. 1986; Davis 1989; Moore and Benbasat 1991). Davis (1989) has explored perceived ease of use and perceived usefulness as two theoretical constructs that help define what constitutes a determinant for successful system use. The perceived usefulness variable is designed to measure the extent to which users believe a particular application/system will help them perform their job better. Perceived ease of use, on the other hand, is a measure by which users believe that using a particular application/system would be relatively free of effort. The results of Davis’s study showed perceived usefulness strongly influenced people’s intentions. Perceived ease of use had a small, yet significant, effect on intentions.

For this study, the perceived usefulness/ease of use scale, originally developed by Fred Davis (1989) was used. Individuals’ perceptions of technologies’ usefulness/ease of use consistently appear as prime determinants of positive attitudes toward technology (Baroudi, Olson et al. 1986; Davis 1989; Davis, Bahozzi et al. 1989; Moore and Benbasat 1991) and thus are important to track as mediating variables. The Cronbach alpha (0.98) for this instrument was shown to be consistent and reliable in the original Davis study (1989) and then again, when it was reevaluated for use in an instrument developed by Moore and Benbasat (1991).
Individual’s Attitude Toward Learning

In addition to individuals’ attitudes toward the job they perform, their feelings toward technology, and their attitude toward themselves, it is also believed that attitudinal measures must also include those of individuals’ perceptions of the instruction method utilized.

Motivation and attitudes toward training have been discussed by I/S academicians, educators, and psychologists from a technical, social, and psychological perspective (Lewin 1938; Nelson and Cheney 1987; Olfman and Bostrom 1990; Nelson 1991). Some studies have focused on individual differences among students (Thorndike 1908), others have centered on the learning task (Lewin 1938; Nelson and Cheney 1987; Olfman and Bostrom 1990; Nelson 1991), while still others have examined the impact of technological factors and on learning (Nelson and Cheney 1987; Nelson 1991). For this study, employees’ attitudes toward the training they have received might confound the results of the self-efficacy and satisfaction measures.

Therefore, this dimension will be controlled through the measurement of individuals’ attitudes toward the instruction they have received. A four-item scale developed by Perez and White (1985) was used to determine individuals’ predisposition toward the methods of instruction received (Perez and White 1985).

Procedure

The above hypotheses were tested against data collected from Holiday Inn franchise hotels. The sample was not random; however, the research design chosen should eliminate most validity problems associated with non-randomization. It should be noted that the use of the multimedia training was determined by the HIW management in charge of the Encore™ installation. Although, individual hotel managers were allowed to volunteer for the MMS, those who did not volunteer were assigned either traditional training or MMS training depending upon the availability of trainers or MMS hardware.

Once a site was scheduled to have the Encore™ system installed, their personnel underwent training utilizing either a traditional training method or a traditional method supplemented with the MMS. Regardless of which intervention was used, employees were required to fill out a brief questionnaire prior to receiving any training to gather demographic information such as their experience levels (hotel and computer) and dependent variable measures on attitudes toward self-efficacy and job satisfaction. After the training sessions, and upon working with the Encore™ system for a few days, another set of questions were given to employees to determine their attitudes toward the training just completed and the technology it
involved. Additionally, individuals' performance levels were measured by a validated certification exam for the Encore™ system. All employees trained on Encore™ were required to take this exam as part of the installation process. In this study, this same exam was given at two different time intervals to both the traditionally trained and the traditionally trained with MMS-supplemented groups.

First, as was always done, the certification exam was administered as part of the Encore™ installation process. Then, all employees using Encore™ at the study sites were given the same questionnaire and certification exam again after 90 days. Thus, after the 90-day period, there were data points for six distinct sub-groups, two of which allowed for pairwise comparisons (see Appendix).

All employees in the study took the Encore™ system certification exam at the time of the system installation. After 90 days, follow-up, identical certification exams were administered to those individuals still working on-site and to newly hired employees. Data on individuals' attitudes and organizational variables were also collected and tested. However, these results are not reported in this paper. Overall, data were collected from 826 Holiday Inn employees. The data from 748 employees were considered usable since both the certification exam and the survey form were completed. Most of those considered non-respondents did not complete the second certification exam (the first certification exam was a mandatory component of the Encore™ system installation). Once a hotel's manager agreed to participate in the study, employee participation was ensured. The result was a 90 percent participation rate.

**INDIVIDUAL PERFORMANCE OUTCOMES**

The set of hypotheses reported in this paper seek to determine whether there is a performance difference for hotel employees who have had the benefit of a multimedia training system. A single performance variable, TSCORE, was used to measure the overall ability to master the Encore™ system. TSCORE is an average of the scores from each component section of the certification exam. Thus, in this hypothesis, the analysis is designed to assess the **effectiveness** of a multimedia training system compared to traditional training systems.

Respondents were grouped into ten different job categories: guest service representative (GSR), night auditor, general manager (GM), guest service manager (GSM), administrative assistant, comptroller, account receivable clerk, executive housekeeping (management), and PBX operator. The greatest number of respondents fell into the GSR category. These job groups were determined by discussion with the general managers, other job incumbents, and by this author observing workers in each of the aforementioned categories.

Since a random selection of sample organizations was not possible, great care was taken to collect data on possible confounding variables. To ensure that variation due to these variables did not affect the statistical analysis,
analysis of covariance and multiple analysis of covariance were conducted utilizing each of these possibly
confounding variables as covariates. Interaction effects were also tested. Testing for intervening and demographic
variables was done for the statistical models developed for both the performance and attitudinal effects. Once again,
for the sake of brevity, only performance measures are reported here. Table 3 contains a full listing of all the variables
(organizational level and individual level) tracked for covariate testing.

Initially, the General Linear Model (GLM) was used to determine if there were any significant relationships
with each of the six groups and the dependent variable, certification exam scores. The rationale for choosing the GLM
was as follows: 1) it allows for the greatest amount of flexibility, accounting for covariates as well as multiple
dependent variables; 2) the ANOVA/MANOVA models, variants of the GLM, do not allow for cells with blank
values, whereas the GLM can utilize “dummy-encoded” variables without such a limitation; and 3) population
designator independent variables (dummy-encoded) can be used with independent variable containing measures
(Neter, Wasserman, & Kutner, 1990). Upon initial analysis, none of the covariates significantly impacted the
statistical model. Thus, the final statistical analysis used the GLM in the basic form: $Y_j = b_0 + b_1X_{1j} + b_2X_{2j} + b_3X_{3j} + b_4X_{4j}$ with the following dummy-coded variables: $X_1 = \text{Traditional PLUS OJT}$, $X_2 = \text{Traditional PLUS MMS}$, $X_3 = \text{OJT}$, with $X_{1,2,3}$ set to 0 = MMS, $X_4 = \text{Old/New employee}$ and $Y_j = \text{certification exam score}$.

Within group analysis was performed to determine if there were significant differences between the initial
test scores and those taken 90-days later for the two groups who were present for the entire test period (TRADFULL
and MMFULL). Paired t-tests were used to make this determination. As expected, individuals’ test score after 90 days
within the TRADFULL group were significantly less than their initial test scores (see Appendix - table 6). Those
employees within the MMFULL group also showed a decrease in scores over the 90-day period; however, it was not
by a significant amount. From this analysis, it shows that traditional methods of teaching showed a significant decay in
mastery of a subject. Cooper and Krinsky (1991) documented the amount of decay in learning that can be expected
from various teaching methods (Cooper and Krinsky 1991). The results for the TRADFULL group are consistent with
this study. What is interesting is the lack of decay in learning from the MMFULL group. In other words, from the
results of past research (Cooper and Krinsky 1991), it was expected that individuals would experience a significant
amount of decay in learning from their training sessions over time. Yet, after the 90-day period, the test scores for
employees within the MMFULL group were essentially the same as their initial test scores. Two facts should be noted.
First, the MMS was left on-site as a tool to be used by employees between performing their regular duties. Employees
were not forced to use the system, nor were there any formal MMS sessions (i.e., training sessions mandated by
Holiday Inn Worldwide) assigned by management. Second, all employees participating in this study, whether at a
traditional or MMS site, were not told about the follow-up surveys and exams. However, the general manager at each participating site was aware of the 90-day follow-up. Whether or not this was communicated to the employees of a given hotel is not known.

Between group comparisons were then performed using paired t-tests to compare each of the sub-groups with one another (see table 7). Of the fifteen possible comparisons, there were significant differences in mean scores for eight of these paired groups: TRADONLY and MMONLY groups scoring higher than the OJONLY group, indicating that some formal training is better than none; the MMONLY group scoring higher than the MMOJONLY group, again, formal training was present for the MMONLY group, while the MMOJONLY group had none; and finally, the MMFULL group scored significantly higher than the TRADONLY, MMONLY, OJONLY, MMOJONLY, and most importantly, the TRADFULL groups. In other words, the MMFULL group consistently outperformed each of the other five groups. Additionally, all groups supplemented with multimedia training scored higher than those using traditional methods only (see table 8).

FINDINGS AND CONCLUSIONS

There are three key findings resulting from this research. First, employees having the benefit of MMS training were more likely to retain knowledge on the use of a newly installed information system. Second, employees in this study perceived that training via the MMS led to less positive perceptions of their work. Almost without exception, MMS subjects perceived changes in their work environment to be in the direction of making their jobs less enriching and satisfying. Finally, although subjects’ knowledge of the Encore™ system increased for those trained with the MMS, no complementary increase was found in any of the organizational performance measures.

Individual Performance

The individual performance results are consistent with some other computer-based training research (D’Souza 1988; Marcoulides 1990; Vogler, O’Quin et al. 1991; Davis and Bostrom 1993) which also found that computer-assisted learning can assist in the retention and use of material and result in a significant knowledge gain.

The four hypotheses were formulated to test the validity of the research question regarding the effectiveness of the multimedia system during and after the initial installation of the Encore™ system. In general, the differences in scores between a control group, which received training on the Encore™ information system through traditional training methods, and an experimental group, which had the MMS-supplemented training, were consistently and
significantly greater for the group which had the benefit of multimedia system training. The results, reproduced in tables 6 and 7, indicate a difference in the performances of employees as defined by their scores on standardized certification exams and lead us to conclude that the assertion made in the four hypotheses is valid and true. A closer examination of this phenomenon is presented below.

<table>
<thead>
<tr>
<th>Grouping</th>
<th>n</th>
<th>Mean Change</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRADFULL</td>
<td>128</td>
<td>-5.91</td>
<td>.004 *</td>
</tr>
<tr>
<td>MMFULL</td>
<td>181</td>
<td>-2.52</td>
<td>.850</td>
</tr>
</tbody>
</table>

Note: * indicates p-values ≤ .005.

Table 6: Learning Decay for Both Tradition and Multimedia Groups

<table>
<thead>
<tr>
<th>Grouping</th>
<th>n</th>
<th>Mean Change</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRADONLY</td>
<td>(n=103)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MMOONLY</td>
<td>(n=215)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OJONLY</td>
<td>(n=50)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MMOJONLY</td>
<td>(n=71)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TRADFULL</td>
<td>(n=128)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MMFULL</td>
<td>(n=181)</td>
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</tbody>
</table>

Table 7: Between Group Comparisons of Certification Exam Scores for All Cohorts

<table>
<thead>
<tr>
<th>Grouping</th>
<th>n</th>
<th>TRADONLY (n=103)</th>
<th>MMOONLY (n=215)</th>
<th>OJONLY (n=50)</th>
<th>MMOJONLY (n=71)</th>
<th>TRADFULL (n=128)</th>
<th>MMFULL (n=181)</th>
</tr>
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<tbody>
<tr>
<td>TRADONLY</td>
<td>(n=103)</td>
<td>---------------</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>MMOONLY</td>
<td>(n=215)</td>
<td>*P. = .000</td>
<td>*P. = .000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OJONLY</td>
<td>(n=50)</td>
<td>*P. = .000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MMOJONLY</td>
<td>(n=71)</td>
<td>*P. = .185</td>
<td></td>
<td>*P. = .015</td>
<td></td>
<td>*P. = .402</td>
<td></td>
</tr>
<tr>
<td>TRADFULL</td>
<td>(n=128)</td>
<td>*P. = .929</td>
<td>*P. = .077</td>
<td>*P. = .129</td>
<td></td>
<td>*P. = .627</td>
<td></td>
</tr>
<tr>
<td>MMFULL</td>
<td>(n=181)</td>
<td>*P. = .000</td>
<td>*P. = .000</td>
<td>*P. = .000</td>
<td>*P. = .000</td>
<td>*P. = .000</td>
<td></td>
</tr>
</tbody>
</table>

Note. Arrows point to the group scoring higher.

* indicates p-values ≤ .05.

H1 tested for the effectiveness of the MMS in the initial training of subjects. Since a high degree of turnover was expected, a comparison was made of those individuals who left prior to the end of the 90-day test period to test the effectiveness of the MMS training at the time of the Encore™ system installation. No significant difference was found between the traditional and multimedia groups and thus H1 was not supported. This gives some preliminary indication
as to the significance of an initial formal training session for increased effectiveness. Further evidence of this supposition is provided in the data analysis. Although not explicitly tested in any of the hypotheses, the group hired after Encore™ system installation and that received only on-the-job training, scored significantly lower than either of the two groups mentioned above.

Similarly, H2 was included to test whether the MMS could significantly improve the on-the-job training employees receive. Here, the focus was on those two groups that were hired after the Encore™ system installation and received no formal instruction. Again, a comparison of these two groups did not prove significant. This portion of the hypothesis was not supported. However, both these OJT groups showed significantly lower certification exam scores than those groups with employees which left before the end of the study. This provides additional credence to the importance of an initial training session for employees.

The third, and perhaps the most important part of the first hypothesis, examined the two groups of employees that were present for the entire test period. This comparison was found to be highly significant at the p. < .0001 level. Therefore, H3 is supported. In fact, when comparing the certification exam scores for this MMS-supported group against the test scores against each of the other five groups of employees, this group consistently scored higher at the same level of significance. One possible explanation is a multiplicative effect of the MMS for employees who went through a formalized training session, and had it supplemented with both on-the-job training and MMS training. No such effect is seen when comparing the traditionally-trained group’s certification exam scores with the five other groups. Since care was taken to insure the homogeneity of the groups, it is a reasonable assumption the difference lies with the use of the MMS.

Additionally, to further strengthen this claim, within group analysis was performed to examine the change in the performance of the two groups present for the entire test period. For H4, the results demonstrated a significant decrease in the retention of subject matter for the traditionally-trained group. This was expected and is in accordance with the literature review (Craik and Tulving 1975; Carroll and Aaronson 1988; Cooper and Krinsky 1991; Davis and Bostrom 1993). However, the lack of a similar decay experienced by the MMS group is counter to the findings in the general body of literature in training and education, but is consistent with some of the findings in computer-based training literature (Avner, Moore et al. 1980; Defense 1989; Marcoulides 1990; Summers 1990). Yet, the fact that the MMS group better retained knowledge of Encore™ system functions gives credence to H4 and thus is supported.
Conclusions

In keeping with these findings, Reisman and Carr (1991) argue that a majority of learners who have participated in MMS studies prefer multimedia training over traditional lecture formats because of the privacy, easy access to learning, and self-direction it provides (Reisman and Carr 1991). Factors other than the employees’ personal learning styles also figure in to the finding indicating preference for the MMS learning. Unlike computers, teachers can have bad days, are sometimes inconsistent in their instructional style, and may even lose interest in teaching a particular subject matter. While a computer does not suffer from these human frailties, it also lacks the capacity to give the reassuring smile or other emotional cues the student may need to keep going. These trade-offs in advantages of learning methods must be weighed against the needs and limitations of the existing system (e.g., costs, space availability for training, etc.) and its target population.

Another explanation of these findings may be found in the interactive component of multimedia computer training programs as demonstrated in this study. Unique to the MMS method of training is the element of non-linear interactivity, allowing the control of the training session to reside with the user. The MMS also provides the user with multi-sensory inputs, allowing for greater experiential learning. The performance improvement of subjects can be attributed, at least partially, to the benefits of this learning environment. Pavio (1985) was one of the first to suggest the possible benefits of an interactive system (Pavio 1971). He observed that when learners in memory experiments were exposed to both words and pictures of items to be remembered, they often obtain significantly higher recall scores if they received only words or pictures. Similarly, Brown (1983) had shown that instruction using both word and picture media together, along with subject control over the media, enhanced learning capacity (Brown 1983).

Past research has also illustrated that, with an MMS, non-linear interactivity in simulated environments is superior in developing technology-related concepts. Accordingly, David Hon (1989) suggests that interactive training is “an ideal combination of the best teacher, the best facilitator, the best manager, and the best friend of the system designer” (Hon 1989), p. 18).

In this study, it appears that the MMS allowed employees to understand better the steps needed to navigate through the Encore™ system, as well as the ability to identify and implement the varying procedures correctly found within the system. Mistakes in understanding procedures within the Encore™ information system became apparent as their effect in simulated scenarios became apparent. We found empirical support, then, that multimedia training can help employees learn better than traditional, classroom approaches by allowing individuals to abstract from concrete, simulated examples rather than learning abstract procedures in classrooms and then try to adapt them to specific cases on the Encore™ system.
Furthermore, any method that can assist in the development of competency in information system utilization should be considered important to the training of individuals. Thus, the two methods examined, a traditional, classroom-based instructional method and a computer-based multimedia system, were both instrumental in training employees. Although we found the MMS was effective in training, the manager or training director should note the use of the MMS was found to be most effective when used in conjunction with those training methods already used by most organizations, namely classroom-based instruction and on-the-job training.
Bibliography


Appendix

A description of the six groups:

1. A fully traditionally trained group (TRADFULL). These employees were trained in a typical classroom setting with an instructor presenting a pre-defined lesson plan. This training is termed the “traditional” method. All management, front desk, housekeeping, accounting, night audit, food & beverage, and sales personnel received this training. The focus for each group was how to use the components of Encore™ system with which they interacted. In the training sessions, individuals related to instructors in a conventional, teacher-student mode with, generally, a student-instructor ratio of 3 to 1. The classes were presented around the clock, in a six-day period, prior to the installation of the new system. Each class session was approximately two hours long. The classes were held either in a small conference room or in one or two vacant guest rooms. Employees were paid to attend the training sessions. Breaks were frequent, with the hotel management supplying beverages and snacks. For four to six days following the system installation, the trainers remained available for on-site support. For the next 90 days, on-the-job training (OJT) was the primary method used for reinforcing the training on the Encore™ system. This group received the certification exam and attitude questionnaire twice; once, during the initial installation, and again, 90 days later (n=128).
2. A traditional training alone group (TRADONLY). The same group as above; however, they have not remained at the site for the full 90-day test period. This group received only the initial certification exam and attitude survey instrument. This group received the classroom training sessions. It should be noted that no determination was made as to the reasons for the employee’s departure (n=103).

3. An on-the-job training alone group (OJTONLY). This group was hired at a “traditional” site after the installation of the Encore™ system. Thus, these are newly-hired employees who have never received the benefits of the classroom instruction. As time passed, this group became much larger and therefore, more significant. In fact, in the long run, it will be the largest group of employees. This group received only one certification exam and attitude measure at the end of the 90-day period (n=50).

4. “Traditional” training, reinforced with a multimedia system, group (MMFULL).

In other words, the MMS training supplemented the “traditional” training each hotel received. It should be noted that the traditional training sessions were greatly reduced (from two weeks to four days) for this group. The Cyntergy trainers main purpose at these sites was to confirm that the multimedia system was being used (by administering the Certification exam) and to provide a source for employees to ask questions. All applicable hotel employees had unlimited access to the multimedia system. Lessons were presented using a combination of video, animation, graphics, sound, and text. Hypermedia was also supported; i.e.,
an employee could fully explore the material by clicking a mouse on various objects on the screen, linking to other related subject matter. The MMS supported random exploration in a non-linear manner. It encouraged employees to re-discover how procedures are accomplished that were either not learned initially in the “traditional” training sessions or were subsequently forgotten (see Appendix D for a detailed description of the MMS). However, employees were expected to use the system as part of their normal work duties (i.e., no extra compensation or time was given for training with the MMS). Holiday Inn Worldwide did not suggest nor provide instructions for training employees on how to use the MMS. This group was present for the entire 90-day period and thus, received initial and follow-up certification exams and attitude surveys (n=181).

5. A multimedia alone group (MMONLY). This group received the initial classroom instruction for sites that had the supplemental MMS. However, these employees left before the end of the study period and therefore received only the initial certification exam and attitude survey (n=215).

6. A multimedia system plus OJT group (MNOJTONLY). This group was for newly-hired employees at what was termed a “multimedia” site. The MMS provided the training of these employees who did not have the benefit of the initial “traditional” classes. Rather than having to rely solely upon the strengths and weaknesses of fellow employees (for OJT), the MMS allowed for “learning-by-discovery” in a consistent, validated, and well-designed tutorial. This group received only the certification exam and survey instrument at the end of the 90-day period (n=71).
### Table 1: A General Description of Key Groups in the Study

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### Table 2: Variables Which May Possibly Confound the Results of the Study

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<td>Physical Setting</td>
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<td>Market-niche of site</td>
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Table 3: Group Membership Relationship to Certification Exam Scores

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Table 4: Learning Decay for Both Tradition and Multimedia Groups

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Table 5: Between Group Comparisons of Certification Exam Scores for All Cohorts

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* Note. Arrows point to the group scoring higher

* indicates p-values ≤ .05.

Table 6: Certification Exam Score Comparisons for Significant Groups

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