PERFORMANCE DIFFERENCES: A COMPARISON BETWEEN COMPUTER-BASED AND PAPER-PENCIL VERSIONS OF A WORK SIMULATION EXCERCISE

by

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ABSTRACT

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Organizations use Assessment Center methods for selection and development of employees. Many organizations that offer assessment services have already made the transition from paper-pencil to computer-based assessments with little research available to justify the appropriateness of this transition. This study examined the differences in performance on four versions of the same work simulation exercise (i.e., in-basket). The content of the work simulation was not altered from one version to another. The study sought to determine if performance on a work simulation exercise changed due to the form in which it was administered. This was tested using four conditions: Paper-pencil, Computer-based, and 2 Mixed medium conditions. Results of this study did not support the hypotheses.

TABLE OF CONTENTS

LIST OF TABLES

CHAPTER 1

INTRODUCTION

Assessment Centers (AC) are often used to provide information regarding selection and development of managerial positions for organizations. Each AC may be comprised of a series of independent measures including cognitive ability testing, personality testing, multi-rater performance review (also known as 360 degree feedback), structured interviews, leaderless group discussions or exercises, in-basket simulations, and multiple variations of role-plays all of which are used to predict future performance on the job (Bray & Grant, 1966; Gaugler, Rosenthal, Bentson, & Thornton, 1987; Tziner, Ronen, & Hacohen, 1993; Schmidt & Hunter, 1998; Thornton & Mueller-Hanson, 2004). The information obtained in each of the exercises allows the AC assessors to detect areas of strength and weakness for each of the participants that go through the AC process. After the data is integrated and a report has been delivered to the employer or sponsor, the employer can use the recommendations of the assessors to make an informed decision in cases of selection, and can make development suggestions tailored to the participant's needs in cases of development (Joyce, 1991).

Organizations use AC methods for selecting and promoting candidates for new positions and for developing the skills and abilities of their current employees. In cases of selection or promotion, the objective is to predict future performance or performance potential, i.e. criterion validity (Rupp et al., 2006). Criterion validity refers to examining the selection measure in conjunction with a measure of job performance. This allows the test or assessment developer to know whether or not their results coincide with improved performance.

As the adage goes, the best predictor of future behavior is past behavior. Assessment centers provide organizations an opportunity to find out what a candidate's future behavior and job performance will be like by placing them in simulations that are similar to the actual job they will be doing if hired (or promoted). Assessment centers for selection are useful because they

minimize some unlawful effects that other selection procedures alone can produce. For example, cognitive ability measures are often assessed in one shape or another during a selection process. Alone, most cognitive ability tests can lead to adverse impact (Hoffman & Thornton, 1997). Adverse impact refers to a substantial difference in hiring decisions of minorities. This is often referred to as the "four-fifths rule" (uniformguidelines.com, 2007). A company that is accused of selecting employees using a test that leads to adverse impact may suffer financial cost to the organization, acquire a negative industry reputation, and develop problems with employee and shareholder commitment. Assessment centers used for selection measure much more than just cognitive ability – they incorporate multiple assessments (multiple hurdles), providing a more comprehensive view of the job candidate (Thornton & Byham, 1982; Thornton & Meuller-Hanson, 2004).

Where an AC for selection seeks to predict future performance an AC for developmental purposes aims to improve performance (Rupp et al., 2006). Rupp et al. (2006) state that many of the same procedures for validating an AC for selection may be appropriate for validating a developmental assessment center (DAC). Developmental assessment centers can be considered more of a training program when immediate feedback, as well as, developmental suggestions are provided. Training programs are used to help employees develop specific competencies important to their jobs. When an employee goes through a DAC, their needs and current competencies are being assessed. Feedback given on the employee's performance in the DAC can provide the tools necessary to develop areas of weakness. A benefit of a DAC for employees over a general training program is that DAC feedback is customized to the individual employee's performance on the exercises.

One reason organizations use ACs is because of the ample amount of quality information gathered during the assessment process. By using a combination of multiple assessments the amount of data gathered regarding a particular participant is extensive; but the real advantage of using an AC is that the assessors provide a more objective perspective to the

selection process. While many organizations conduct performance evaluations (i.e. a review of an employee's performance on his or her job over the course of a time period, usually six months to a year), it is typically done by and through people who, because of the working relationship, are likely to be non-objective. An employee's performance evaluation may be the ticket that gets him or her to the internal pool of possible candidates for a promotion – but it does not provide unbiased information preferred for selection. The AC is intended to minimize these biases by having a more objective perspective of participant performance (Warmke, 1985).

As previously mentioned, some of the more common exercises that comprise ACs include role plays, cognitive ability and personality testing, leaderless group discussions, multi-rater feedback, structured interviews, and an in-basket simulation. Role plays can be conducted in a number of ways and are developed to measure various workplace interactions. For example, in ACs for management positions, there is often a direct-report role play in which the participant is assessed on how he or she reacts and deals with a problem employee. There are any number of role-play combinations (team meeting, leader meeting; one role player, multiple role players) but the goal of most role plays is to assess performance in simulated interactions across levels and functions of an organization. In other words, the way in which a participant handles delicate conversations, deals with performance issues, and manages difficult people and situations. Generally, the participant will be in charge of the simulated meeting and will interact with a trained role-player (Thornton & Mueller-Hanson, 2004). This role-player may or may not be simultaneously assessing the participant's performance (Zedeck, 1986).

Another component to ACs that has already been briefly mentioned is a measure of cognitive ability. Cognitive ability refers to one's ability to learn and assess information. Cognitive ability testing is a strong predictor of job performance and is relatively budget friendly for large companies (Lievens, Reeve, & Heggestad, 2007; Jensen, 1998; Kuncel, Hezlett, &

Ones, 2001; Schmidt & Hunter, 1998). They can include measures of numerical reasoning, critical thinking, reasoning, and comprehension.

Personality inventories may also be used in ACs in order to predict certain components of managerial performance. Companies using personality inventories for selection will typically begin by assessing the ideal personality profile for a particular job (Martin, Bowen & Hunt, 2002). Candidates for a particular job that match this profile may be considered as being a good fit for the position. However, there is potential in personality testing for selection scenarios for "faking good" (Dalen, Stanton, & Roberts, 2001; Martin, Bowen, & Hunt, 2002). Assessment centers can dilute the effects of faking through the use of multiple exercises (Thornton & Mueller-Hanson, 2004).

For developmental ACs, multi-rater feedback can be used to determine how the participant's coworkers would evaluate the participant. A multi-rater evaluation is typically filled out by supervisors, self, peers, and direct reports with intentions of obtaining a 360-degree evaluation of an employee's performance. Because this type of evaluation is used for developmental purposes, the target individual will typically receive the results with some normative reference (London & Smither, 1995). These evaluations will help identify what areas of strength and weakness the target individual has throughout his or her workplace network.

Structured interviews are another element often used in ACs. The difference in a structured interview and a traditional interview is that a structured interview makes use of an objective assessor asking the participant standardized questions which are relevant to the job. The structure helps eliminate bias commonly associated with traditional interviews. These interviews give insight into the participant's past which may help gauge their future performance and also helps determine if the participant is a good fit with the organizational culture (Joyce, 1991).

A final element typical to ACs is the in-basket simulation. An in-basket simulation involves prioritizing and acting on items that would typically collect in a manager's in-tray or in-

basket if left unchecked for a certain amount of time. The in-basket can include items dealing with employee problems, financial issues, and public relations issues. Unlike many traditional problem solving tests, in-baskets have the added benefit of having high face validity (Rynes & Connerly, 1993; Thornton & Mueller-Hanson, 2004). The in-basket will be the focus of this study.

1.1 In-baskets

The in-basket is a "day in the life of" simulation which was first developed by the Educational Testing Services for the United States Air Force in 1953 (Thornton & Mueller-Hanson, 2004). The in-basket simulation was quickly adapted for use by business (Fredricksen, Saunders, & Wand, 1957). In an in-basket simulation, the participant is typically given background information on a hypothetical organization. This information usually includes a calendar, organizational charts, financial data, and a company timeline (Thornton & Mueller-Hanson, 2004). The materials inform the participant of the role they will be in and their position within the organization. In many cases the participant will play the role of someone with a different name than their own and typically, it is their first day on the job.

Next, information which includes a number of items that require quick response is distributed. These items reflect what would typically collect in an employee's in-tray (Thornton & Rupp, 2004). Performance on the in-basket is then rated by an assessor and depending on the purpose of the assessment feedback may or may not be given. By placing an individual in a workday that mirrors actual workday tasks, future performance on similar tasks can be expected. For example, an individual that is uncomfortable and avoidant in a simulated workplace situation that requires confrontation, is likely to avoid confrontation in actual uncomfortable workplace situations.

1.1.1 Reliability and Validity

Debates over the reliability and validity of in-basket simulations have been a topic of interest over the years. In-baskets are high in face validity and are often reported as a means

for predicting performance (Lopez, 1966). Relatively little quantitative validity and reliability information has been published up to this point. However, in a study by Wollowick and McNamara (1969), a predictive validity coefficient of .32 was reported for promotions using in-basket ratings of performance.

On the other hand, a qualitative review of the literature concerning in-baskets over a 30 year period of time discovered some less than promising conclusions (Schippman, Prien, & Katz, 1990). The Schippman et al. (1990) review suggests that there are inconsistencies across the literature; what's more, they suggest a general lack of reporting information in previous research. For example, it is noted that roughly 50 percent of the studies included in their review do not provide any information regarding their construction methods. Furthermore, over the course of 30 years, only 30 studies were identified to form conclusions about reliability and validity of the in-basket simulation. From the studies that did report reliability (inter-rater agreement, alternate-form, and/or split-half) it was concluded that in-baskets can be reliably scored. For validity (content, predictive, and/or construct), the evidence is "at best marginal…" (p. 856). Schippman et al. further mention that customization of in-basket simulation to a specific job can increase the validity and usefulness of the tool as a measure of performance. Instead of having one "off the shelf" in-basket for all jobs in all companies, creating an in-basket specifically for a particular job in a particular organization will produce a more reliable and valid selection tool. Since the Schippman et al. review, customized in-baskets are used more frequently in practice (Thornton & Rupp, 2004). Therefore, the usefulness of the in-basket for selection or development is considered valid and reliable when the in-basket is developed specifically for a given job.

One example of this would be of an organization looking to fill a Director level position in the Human Resources department. The selection process could use an in-basket simulation that reflects the responsibilities and duties required of an actual Director of Human Resources. The in-basket tasks might include dealing with problem employees, payroll issues, and

recruiting problems. The problems facing the participant in the in-basket would reflect current Human Resources problems and issues relevant to the given organization. Through the years, the content of in-baskets has evolved to match the various demands of current jobs and employees; however, the literature has not fully explored the various methods of administering in-baskets to participants.

When the in-basket process was developed, carbon copies, hand written memos, and steno pads were common in the workplace – as the workplace changed, so did in-baskets. In-basket processes began to incorporate "post-it" notes, highlighters, and binder clips. Telephone messages became transcribed voicemail messages and memos and letters were often changed to printed (hard) copies of e-mails. Technology has changed the workplace significantly and the use of computers in completing work related tasks is more than commonplace in today's organization, and often necessary. While in-baskets typically allow the participant to choose which method (electronic mail, voicemail, memo, etc.) they would like to communicate by, the response medium itself has generally remained paper-pencil. This reliance on paper-pencil responses when using in-baskets limits the degree to which they accurately reflect the job demands encountered in a computer-based world. On the surface it seems that in order to ensure the high face validity typically associated with in-baskets, it would be important for the in-basket process to reflect the technological advances where appropriate.

1.1.2 Assessment Mediums

Many of the practitioners using ACs have made the leap from paper-pencil in-baskets to computer-based in-baskets. Consulting firms such as Development Dimensions International, Wilson Learning, Center for Creative Learning, and Personnel Decisions International, currently use computer, even internet-based work simulations in practice. In fact, 16.5% of the respondents to a survey from The International Congress of Assessment Center Methods participants reported using computer-based in-baskets as one part of their ACs (Kudisch et al.,

1999). One would assume that this transition from paper-pencil to computer-based in-baskets was likely influenced by the research practice of using computer-based test administration.

The use of computer-based personnel selection tests has been studied from a variety of aspects. In a timed test of cognitive abilities, Neuman and Baydoun (1998) found no differences in predictive validity between the paper-pencil and computer-based formats. However, in an untimed test of arithmetic reasoning, mode of administration did influence performance (Lee, Moreno, & Sympson, 1986). Lee, Moreno, and Sympson (1986) found lower performance on computerized versions of an arithmetic reasoning test compared to a paper-pencil version, regardless of the participant's ability level. In another study by Sachar and Fletcher (1977), no differences across modes of test administration were found for timed tests of verbal aptitude, but differences were found for timed tests of symbolic reasoning. Lower performance on a computer-based version of symbolic reasoning was explained by the demands of symbolic reasoning as compared to the demands on verbal aptitude. Symbolic reasoning requires a visualization process while verbal aptitude requires memory retrieval (Sachar & Fletcher, 1977; Wildgrube, 1982).

A meta-analysis of 29 studies conducted to determine whether there was a medium (computer vs. paper and pencil) effect on cognitive ability tests found no significant difference between paper-pencil and computer-based mediums on power tests of cognitive ability (i.e. not examining processing speed or un-timed; Mead & Drasgow, 1993). However, on speeded cognitive ability tests (i.e., examining processing speed or timed), Mead and Drasgow (1993) did find a significant difference between mediums. Mead and Drasgow suggest that the differences between speeded and power measures of cognitive ability may be due to the different motor skill requirements associated with paper-pencil and computer-based testing mediums.

The computerization of traditionally paper-pencil job attitude scales (the Job Descriptive Index, JDI; Smith, Kenall, & Hulin, 1969) was found to have measurement equivalence in a

study by Donovan, Drasgow, and Probst (2000). Similarly in a study involving a selection assessment for pilots, where traditional paper-pencil formats were replaced with computer-based formats, the computer-based assessment battery was found a comparable predictor of success (Martinussen & Torjussen, 2004).

1.1.3 Computerization of the In-basket

While researchers have investigated the computerization of paper-pencil tests and other measures (job knowledge, personality, etc.), relatively few studies have examined in-basket simulations. In their review, Kleinmann and Straus (1998) support the use of computer-based testing for personnel decisions noting that computer-based business scenarios are similar to other assessment exercises. They further mention that intelligence, decision-making, and information-seeking behaviors are especially promising when it comes to being measured using computerized simulations. They reiterate, however, that "there is still not enough methodologically sound studies" (pg 103).

There is a lack of published research which has examined paper-pencil in-baskets and computer-based in-baskets and the potential performance differences that may arise from the different administration methods. An examination of the predictive validity of a computer-based simulation for insurance agents found acceptable validity and positive reactions from the participants (Shotland, Alliger, & Sales, 1998). The simulation in this case was a multiple choice, job knowledge test which did not involve interpersonal problems, management issues, setting priorities, or delegation. Another limitation to this and other research that has examined the predictive validity of computer-based selection techniques is the lack of direct comparison between the paper-pencil process and computerized process. Presently, no research has appropriately accounted for the open ended format of in-basket simulations and how this format may lead to significant differences in performance when delivered on a computer-based platform. Because selection decisions are made using in-baskets, it is imperative to understand

any differences in participant performance, participant perceptions, and potential bias that may occur between these in-basket administration mediums.

A review of the relevant psychological literature reveals several reasons and theories that predict why there might be differences in performance between paper-pencil and computer-based formats. One potential reason for difference in performance may be attributed to computer anxiety (Llabre, Clements, Fitzhugh, & Lancelotta, 1987). People with high levels of computer anxiety may achieve lower levels of performance on computer-based tests. Familiarity with the technology of computers has also been found to effect performance on a test of transcription (Dunn & Reay, 1989). Students who were not familiar with computer technology did not transcribe as much and made more mistakes when compared to those who were familiar with the computer technology.

Another possible reason for differences in performance could be that people tend to type much faster using a keyboard than they hand-write (Rogers & Case-Smith, 2002). Research also shows that the ability to type increases the amount written. In other words, in a comparison of handwriting and typing, students who used the keyboard wrote more in quantity than students who handwrote (Collier, 1983; Engberg, 1983; Aumack, 1985, Haas, 1989). In an exercise that is timed and often measures time management skills, this difference in speed could certainly impact performance on dimensions like communication skills and People Skills. Due to the word processing programs typically used, automatic spell checking and automatic formatting may aid in generating more eloquent responses possibly affecting dimensions measuring communication and interpersonal skills.

Completely electronic formats may hinder performance on dimensions of critical thinking in which the act of organizing documents and marking on documents aid in performance. In-basket activities typically require a degree of prioritizing. Being able to physically sort and organize tasks in order of importance may be an advantage to having paper documents.

Last but not least, the high fidelity of a computer-based version may impact performance. Shotland, Alliger, and Sales (1998) compiled five advantages of having high face validity in personnel selection: 1) the higher the face validity the more motivated an applicant will be to complete the assessment, 2) the more trust the applicant will display towards the organization, 3) the more comfortable the applicant will be with the process and the company, 4) the more the assessment is viewed as a realistic job preview, and 5) the less susceptible the organization is to legal challenge.

The purpose of this study was to determine whether differences exist between ratings of in-basket performance and testing across different administration media. It is important to note that the scope of this study is limited to computer-based and not internet-based simulations. While there are certainly benefits for using internet based selection tools (namely cost and time), there are a number of disadvantages and risks involved when using the internet as a selection platform (namely false identification and confidentiality leaks; Jones & Dages, 2003). Internet-based comparisons were out of the scope of this study. Thus this study solely focused on differences between paper-pencil and computer-based in-basket simulations.

1.1.4 Hypotheses

Overall ratings as well as three dimension level ratings were examined. Overall performance was defined as “Behaviors would likely be effective, producing positive outcomes and results. Effectively uses communications skills, people skills, and critical thinking skills to generate ultimate performance.” The first dimension measured, Communication Skills, was defined as “Expresses thoughts and ideas clearly and concisely using appropriate basic language guidelines (i.e., grammar). Effectively provides information to relevant others.” The third dimension measured, Critical Thinking Skills, was defined as “Prioritizes information and tasks. Makes decisions that are in the best interest of the organization. Identifies central issues and root causes of problems. Draws reasonable conclusions based on given information.” The second dimension measured, People Skills, was defines as “Responds appropriately to

supervisors, subordinates, clients, guests, and other co-workers. Expresses empathy and shows support for others when appropriate. Collaborates with others when necessary."The first hypothesis suggests that Overall performance on an in-basket simulation will be highest for participants who receive paper background and respond electronically, while the condition in which participants receive electronic background information and respond on paper will yield the lowest Overall performance. The first hypothesis is the logical conclusion derived from three other hypotheses (hypotheses 2-4) which will be explained below in detail. The first hypothesis will then be revisited in the context of the other three.

Given that current students tend to be highly practiced and efficient typists and their speed of typing on a keyboard is likely to be much faster than their handwriting ability/speed, participants that type were predicted to have the ability to answer more quickly on a timed exercise. Specifically, this "extra" time may be used developing more eloquent responses, in turn improving communications. The second hypothesis proposed that the electronic response conditions would produce higher levels of performance on Communication Skills.

Individuals, who are quicker in their typing responses than they are in hand writing their responses, may also have more time to attend to interpersonal issues and niceties in their responses. Therefore, the third hypothesis proposed that individuals responding electronically would have higher ratings of People Skills.

The fourth hypothesis suggested that the ability to sort papers and make notes on memos, letters, graphs, and figures would provide an advantage on tasks where integrative thinking and decision making is required. Thus, the third hypothesis proposed that individuals who receive the in-basket content on paper (regardless of response medium) would have higher ratings on Critical Thinking Skills.

Thus, the additive effects of having the ability to sort and write on background information coupled with the ability to respond electronically should logically provide the highest advantage and produce the highest Overall ratings. So, the first hypothesis suggested that

Overall performance will be highest for participants who receive paper in-basket materials and respond using computer-based response forms (Hypothesis 1a), and the lowest for participants who receive electronic in-basket materials, and respond using paper response forms (Hypothesis 1b).

Differences in performance between four in-basket administration conditions were examined in the present study. The first condition was a traditional paper and pencil condition in which the participant was presented with paper in-basket materials and paper response forms (P-P Condition). The second condition presented the participant with paper in-basket materials and computer-based response forms (P-C Condition). The third condition presented the participant with computer-based in-basket materials and computer-based response forms (C-C Condition). The fourth and final condition presented the participant with computer-based in-basket materials and paper response forms (C-P). More details regarding these four conditions are presented in the method section of this paper. Using these four conditions, the following four hypotheses were tested in this study:

Hypothesis 1a – Overall performance will be highest for the P-C condition.

Hypothesis 1b – Overall performance will be lowest for the C-P condition.

Hypothesis 2 – Performance on Communication Skills will be higher for C-C and P-C conditions than for P-P and C-P conditions.

Hypothesis 3 – Performance on People Skills will be higher for C-C and P-C conditions than for P-P and C-P conditions.

Hypothesis 4 – Performance on Critical Thinking Skills will be higher for P-P and P-C conditions than for C-C and C-P conditions.

CHAPTER 2

METHOD

This study experimentally investigated the aforementioned hypotheses by conducting a laboratory study in a controlled environment. The research was conducted according to ethical guidelines regarding human subjects as outlined by UT-Arlington Office of Research Compliance and Institutional Review Board.

2.1 Participants

University of Texas at Arlington (UT-Arlington) undergraduate students had the opportunity to participate in this research. Students were recruited via the university experimentation website (SONA). Upon completion of participation, students received credit. Each condition included approximately 30 participants for a total sample size (N) of 124. Demographic characteristics of the sample such as age, sex, ethnicity, and work experience are provided in Table D.1. All data was collected over a three month time frame during one semester. Each session time was randomly assigned to a condition.

2.2 Materials

A hypothetical sports arena company (SportsDome International; SDI) was the basis for the in-basket used in this study. Portions (background information etc) of the SDI in-basket were developed by the I/O Psychology Lab at UT-Arlington while other aspects of this version of the SDI in-basket were created specifically for the present study (specific item content, computer response forms, new roles, etc). All in-basket development steps followed the applicable development guidelines provided by Thornton and Mueller-Hanson (2004). It is often difficult to develop an in-basket simulation that is general enough to apply to most participants (i.e. college students) yet specific enough to measure relatively complex performance variables. In response to the aforementioned difficulty, the context of this simulation purposefully emphasized a "recently promoted intern" position. The issues were developed to test performance dimensions

common across a multitude of jobs yet not require specialized knowledge in any one area. Participants received background information on the character they were to assume during the simulation (Alex Verret, a recently promoted intern with a new title of Special Projects Coordinator), as well as the organization itself. This in-basket included 9 items to be addressed within specific time constraints (one hour). The challenge of this type of simulation is a matter of organization, decision making, and delegation.

All participants were given appropriate options of ways to address these tasks (memo, voicemail, email, etc). Lines appeared on the paper-pencil response form for writing convenience and clarity. Lines are unnecessary when using a word processor. P-P responses were transcribed to an electronic format prior to being rated. Thus, all responses were rated from the electronic response format in order to reduce opportunity for rater error due to differences in readability and presentation of the different response forms.

2.3 Experimental Conditions

Four conditions were examined in which participants were randomly assigned. The first condition consisted of participants receiving all information and making all responses via paper-pencil. This group is referred to as the P-P condition. In the second condition participants received all materials (background information, items) in paper form and respond using the computer. The electronic response forms were identical to the paper-pencil response forms. The second condition is referred to as the P-C condition. In the third condition participants received all materials electronically and were required to respond electronically. The third condition is referred to as the C-C condition. Finally, participants in the fourth condition received all materials electronically and respond using paper forms. The fourth condition will henceforth be referred to as the C-P condition. The four in-basket conditions were identical with the exception of medium of administration; the content and format remained consistent throughout the various conditions.

2.4 Procedure

Each work station included a computer to ensure the same amount of workspace was available for participants in all conditions. See Appendix A for a picture of the experimental workspace for all conditions. Seven computers were available to use during each session, yet only five were used for any one session. All conditions were randomly assigned to session times. The seven computers used did not have access to the internet during the experiment. Participants were asked to take a seat at a work station which was already prepared for them. Participants were given written instructions outlining the activities for which they participated. See Appendix B to review the written instructions provided. Consent forms were distributed to the participants and their questions were answered. The consent forms were then signed by the participant, and one copy of each consent form was collected by the researcher. The participant also kept a copy of the consent form for their own records. Participants were then given 10 minutes to review background information via paper-pencil (P-P and P-C) or electronically (C-C and C-P). After the 10 minute background period was complete, the participants were given 40 minutes to complete the first part of the in-basket and 10 minutes for the second part of the in-basket. Participants were allowed continued access to the background information while completing the in-basket.

For P-P and P-C conditions, a paper-pencil packet labeled “Background Information” was handed out and participants were instructed to review all information provided. Participants had available for their use materials such as paper clips, sticky notes, pens, pencils, and highlighters. Participants were told that there was a 10 minute time limit to review the background materials, after which any questions or concerns pertaining to the study were addressed by the experimenter. The simulation then ensued.

Participants of the remaining conditions (C-C and C-P) were asked to take a seat at a computer work station already prepared for them. Computer monitors were turned off, but the computers were logged on to, and set up for the in-basket exercise prior to the participants’ arrival. After informed consent was collected, participants were instructed to turn their computer monitors on. An Adobe PDF file labeled “Background Information” was then opened and

participants were instructed to review the information provided. The electronic background information was a single file that included information intended to set the context for the following simulation. The content and format of this background material was identical to the paper-pencil version of the background materials. After the allotted 10 minutes for review passed, any questions the participants had were addressed and then the simulation itself began.

All participants had a total of one hour to complete the in-basket. The items for each participant in the P-P and P-C conditions were distributed by means of paper-pencil. The items for participants in the C-C and C-P conditions were individual documents located in a single electronic file labeled “items.” C-C and C-P condition participants were instructed to open the file and begin working. Participants in the P-C and C-C conditions responded electronically, while participants in the P-P and C-P condition responded via paper-pencil.

After 40 minutes passed, the “afternoon mail” was delivered which contained a message to be addressed immediately. P-P and P-C participants were hand-delivered this message while C-C and C-P participants were asked to open up a file labeled “Mail” located on their desktop. To secure the content of the simulation and to make certain that the file would not be accessed before it was supposed to be, this file required a password to open. At this time, the administrator provided the correct password to unlock the file marked “Mail.”

Participants then had 10 minutes to address any remaining issues. All correspondence was saved to a file labeled accordingly on the computer for P-C and C-C participants and collected for P-P participants. Finally, all participants were given a debriefing form and any general questions were addressed.

After the participants had left, the experimenter collected all forms and created individual files for each participant. Each file included a signed consent form, all in-basket responses made (for P-P and C-P conditions), and the post-survey. A unique identification number was assigned to each file. Participants in the C-C and P-C conditions had a file with

only their informed consent and their post-survey. All electronic responses were saved immediately following the experiment in an electronic file with a matching identification number.

2.5 Performance Ratings

Prior to rating in-basket performance, all P-P and C-P condition responses were transcribed electronically. Individuals who transcribed in-basket responses were not permitted to be raters. This was intended to eliminate the possibility of rater error as an effect of response presentation. Raters were unaware of the condition they were rating. Performance ratings were obtained using trained researchers with previous experience rating in-basket simulations. The ratings of performance were based on behavioral observation scales similar to those used in practice. There were three dimensions on which performance was rated; Communication Skills, People Skills, and Critical Thinking skills. Performance was rated at the dimension and overall levels. The number of addressed issues was also collected.

Raters were trained via frame of reference training (Schleicher, Day, Mayes, & Riggio, 2002). Frame of reference training involves having raters make their ratings of the same participant separately and then discussing their ratings with one another. This is a technique used to calibrate responses between raters to ensure that all raters are using the rating scale the same way (i.e. a rating of a “3” by Rater A will also be a “3” by Rater B). Raters were calibrated on in-basket responses collected during a brief pilot study. Responses collected from participants in this study were not used for training raters. The in-baskets were scored using a 1-5 range; a “1” representing low performance, a “5” representing high performance, and “0” representing no performance. Performance (the dependent variable) was assessed at the dimension and overall levels. The in-basket measures three dimensions (Communication skills, People Skills, and Critical Thinking skills). Raters were also instructed to give an Overall performance rating on the in-basket exercise.

CHAPTER 3

RESULTS

3.1 Overall Performance

To test for differences in Overall performance between the four conditions (Paper-Paper, P-P; Paper-Computer, P-C; Computer-Computer, C-C; and Computer-Paper, C-P) on the in-basket, a between-subjects 2 (Background) by 2 (Response Form) Analysis of Variance (ANOVA) was conducted using SPSS. It was predicted that the P-C condition would have the highest Overall ratings of performance due to the advantages of both paper-pencil information, and electronic response capabilities. Likewise, it was predicted that the C-P condition would have the lowest Overall ratings of performance due to the disadvantages of both electronic information, and paper-pencil responding.

Prior to analysis, data screening was conducted using SPSS EXPLORE. The assumptions of normality, linearity, and homogeneity of variance were inspected and sufficiently met. No significant outliers were detected. The skewness of the distribution was minimal; however, it was slightly platykurtic, meaning there was flatness to the distribution, indicating ratings were more uniform than normal. Because ANOVA is a fairly robust statistic, this slight departure from normality did not warrant a transformation. The assumption of linearity was checked by examining plots; this assumption was met. Finally, Levene's test of homogeneity of variance was inspected and found non-significant.

The results indicated that there was not a significant difference in Overall performance between conditions, $F(3,120) = 1.37$, p = n.s., partial $\eta 2 = .03$. Sample sizes, means, and standard deviations are reported in Table D.2. These results do not support Hypotheses 1a and 1b.

3.2 Dimension Level Performance

To examine performance differences at the dimension level, a 2 (Background) by 2 (Response Form) Multivariate Analysis of Variance (MANOVA) was conducted on three dependent variables: People Skills, Communication Skills, and Critical Thinking Skills. All three dimensions were entered as dependent variables, while experimental condition, P-P, P-C, C-C, and C-P, was entered as the independent variable. Means and standard deviations for dimension level performance variables (Communication, People, and Critical Thinking Skills) by Condition (P-P, P-C, C-C, and C-P) are reported in Table D.3.

Prior to main analysis, assumptions of MANOVA were examined. Box's M test of homogeneity of variance-covariance matrices was examined, $F\ (18, 50190) = 1.33$, $p > .05$, thus providing evidence that the slightly uneven sample sizes do not invalidate the appropriateness of using a MANOVA. No other violations of assumptions were detected.

MANOVA indicated that Condition, Wilkes' $\Lambda = (.94)$, $F\ (9, 287.33) = .90$, had no significant effect on dimension level performance variables (i.e., Communication, People, and Critical Thinking Skills). Full results of this MANOVA are reported in Table D.4. Hypotheses 2, 3, and 4 were not supported.

CHAPTER 4

DISCUSSION

While many practitioners already use computer-based in-baskets, no previous research has examined the degree to which performance between the two testing forms of in-baskets are similar or different. Schuman and Pressor (1996) note that even slight changes to a measure can produce significant changes in results. Because this method is already used in practice for selection and development purposes of employees, it was important to examine differences in rated performance due to the form of administration and response

Overall and dimension level performance differences between the various paper-pencil and computer-based versions of the in-basket simulation were anticipated. It was expected that the P-C condition will yield the highest Overall ratings of performance because it represented the “best of both worlds” while it was expected that the C-P condition would yield the lowest Overall ratings of performance because it is “worst of both worlds.” Specifically, the freedom to sort and organize paper versions of the materials coupled with the speediness of using a keyboard to deliver responses was thought to produce the most advantage of the four conditions while the analogous restrictions of the opposite condition was thought to produce the most disadvantage. It was also anticipated that the C-C and C-P conditions would yield the lowest rating of Critical Thinking Skills. No differences were expected between the P-P and the P-C conditions on dimensions of Critical Thinking Skills. However, the C-C and P-C conditions were expected to receive higher ratings of Communication and People Skills than the P-P and C-P conditions.

4.1 Overall Findings

The results of this study do not support any of the aforementioned hypotheses. There were no significant differences across conditions on overall performance or dimension level

ratings of performance. While the omnibus ANOVA for Overall performance ratings was not determined significant, it is worth noting that pairwise comparisons revealed a difference between Paper-Computer (P-C) and Computer-Paper (C-P) conditions ($p = .053$). These results suggest that the condition in which participants received background materials on the computer and responded on paper forms (C-P) had higher overall ratings of performance than those in the paper background, computer response (P-C) condition. Unexpectedly, this finding is opposite of the direction anticipated. Furthermore, both paper response conditions (P-P and C-P) had higher Overall performance ratings than the computer response conditions (C-C and P-C). While these differences are not significant and must be interpreted with caution, the differences provide further description of the data and the trends found. Specifically, these findings suggest that performance may tend to be better when responding via paper-pencil method as opposed to computer-based methods.

A brief post-AC survey, located in Appendix C in which participants reported their preference for in-basket media (Background – paper vs. computer and Response Form - paper vs. computer) revealed that most (51.6 %) participants reported that they would prefer to participate in a C-C in-basket (See Table D.5). While the condition in which the participants were assigned did not produce differences in their ratings of performance, participants who reported that they used computers frequently (Daily; 2-3 times a week) responded to significantly more items when they were typing responses on the computer. Likewise, participants who reported that they did not use a computer frequently (Once a week; A couple of times a month; Hardly ever) and assigned a condition with electronic response forms did not respond to as many items and issues as their counterparts. This would suggest that familiarity with computers could potentially influence performance in terms of quantity on an in-basket exercise. However, these finding must be interpreted with a great deal of caution due to the unique characteristics of the sample used in this experiment. Specifically, all participants were students enrolled in a state university with computer labs available and assignments often

requiring the use of a computer. Therefore, very few participants reported that they did not use a computer daily. In fact, of 124 participants, only six indicated that they did not use a computer on a daily basis. While this is not a large enough number to draw any conclusions from, it is enough to justify more research on this topic. A follow-up study to answer the question of whether frequency of computer exposure influences performance on an in-basket exercise must be conducted to fully understand the extent of these effects.

Another avenue that requires further inspection concerns condition-preference alignment. Participants were asked in a survey following the completion of the in-basket exercise to indicate what combination (paper-pencil or computer-based) of background materials and response forms they would prefer on future in-basket exercises. When the participant's preference was in or out of alignment with their condition did not differentiate between performance on the in-basket exercise. Even when parsed out by condition, the results did not suggest that preference influenced performance on the in-basket exercise.

4.2 Implications

The current research addresses relevant issues regarding selection and development procedures. Currently both forms, paper-pencil and computer-based in-baskets are used interchangeably. Because of this practice, it is pertinent for businesses to know empirically that both paper-pencil and computer-based versions measure performance equally. The results of this study provide encouragement to those organizations that currently employ the practice of technologically aided simulations and exercises for the purposes of selection and development. Again, however, it is in the best interest of these organizations and researchers in this field to more critically examine the various intricacies prior to making the technological dive "head-first" especially for selection purposes. For example, if during a selection process, individuals who do not frequently use computers are assessed via computer, the performance of the individual may be rated poorer, as a function of unfamiliarity with the computer and typing media. Unless the assessment is justified in testing computer savvy (e.g., for a computer programmer),

performance differences due to specialized knowledge of computers could result in a class action lawsuit. This is simply the first step in examining the multitude of perceivable issues regarding the conversion of assessment procedures from one medium to another.

4.3 Limitations

As with all research, this study is not without its limitations. Most of the participants in this study reported frequent computer use and experience with computers. This makes identifying differences based on use of computer technology difficult. However, in today's marketplace it is likely that many members of the normal population have been exposed to computer technology on a somewhat regular basis. This limitation should be addressed to ascertain if people who may not use computers regularly and who belong to protected classes perform differently from the general population.

The participants used in this study may not have been as motivated to perform well on the in-basket exercise as compared to individuals in the workplace. An individual whose employer requests their participation on an assessment such as an in-basket are highly motivated to perform at their best – especially when promotions and other career related advancements are contingent on their performance. This is when performance differences would be most exaggerated and more likely to detect. While participation in this study did provide necessary credit, it likely did not produce the same level of motivation for quality of performance.

4.4 Future Research

In research such as this, where the results have "real-world" implications, the use of a student sample may not be accurately representing the target population, or a working sample. Thus, future research needs to utilize "real-world" samples. For students preparing to take the SAT, GRE, and the like, the choice is given for whether paper-pencil or computerized versions of the test will be administered. This choice is given to reduce the anxiety that being tested in an unfamiliar way can produce. It seems that the same problems associated with transferring an in-

basket from an established and validated paper-pencil medium to a computer-based medium face these tests which are used for selection of students by various schools. Research needs to focus on going to the same lengths for the electronic versions of assessments that was taken for their paper-pencil counterparts.

Again, a follow-up study to answer the question of whether frequency of computer exposure influences performance on an in-basket exercise is warranted. The computer applications used in this study were not advanced nor sophisticated by any means. In fact, careful attention was placed to ensure that the only difference between the conditions was in fact, the use of paper and pencil or the use of a computer. However, as electronic in-baskets get more sophisticated and face valid in terms of using email and data management programs (e.g., Microsoft Outlook®), researchers and practitioners need to be wary of exacerbating this "frequency effect." Using advanced software applications begins to require specialized knowledge that may unfairly affect performance. Performance differences due to an individual's familiarity with a computer program could give some people and unfair advantage over those who are less familiar. Researchers and practitioners alike need to understand the extent of this "frequency effect" so as to not trade high levels of fidelity for accurate predictions of future job performance.

Another interesting area of research that merits exploration is in the perceived differences in performance in reference to the quality versus the quantity of performance. If the results of this study are confirmed in future studies, then those who type responses, do in fact, benefit by responding more in quantity.

4.5 Conclusion

The assessment of individuals' performance is a practice that is becoming more widely used in business for selection and development purposes. Tools, such as the in-basket, tend to be largely accepted due to the face validity associated with them. Many practicing assessors can speak to the frequent complaint of hand-writing responses given by participants as a

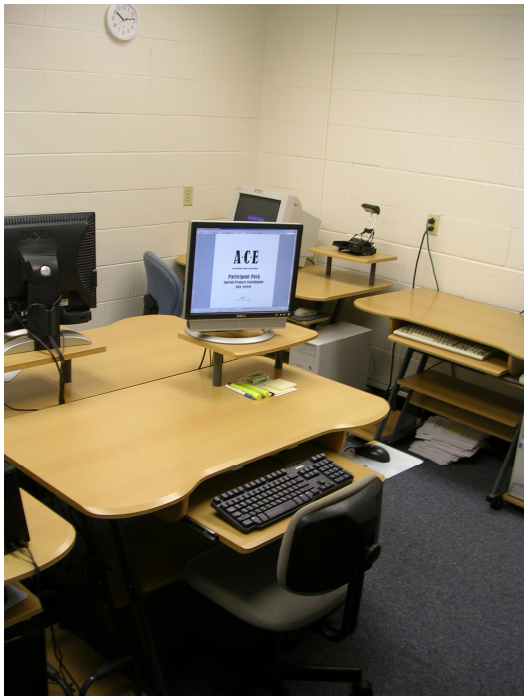
justification for their performance. However, this study does not support that argument; if anything, this study hints at supporting the exact opposite. Based on the research presented here, practitioners can now reassure their participants that using a computer does not enhance their performance – with a caveat for those individuals who do not frequently use a computer.

As more and more companies are "going green" today, altering practices to reduce the use of paper becomes very appealing. Transitioning many traditionally paper practices to computer practices can get very expensive, especially for smaller organizations. This study made this transition with minimal costs by simply using Adobe PDF documents and Microsoft Word documents. Both of these programs are becoming more standard and reasonably affordable, such that the cost of paper, ink, and copy machine costs or maintenance outweighs the costs of making the paper to computer transition for most companies. Again this was a first step in a marathon necessary to ensure fair tools for use in the selection and development of employees.

APPENDIX A

EXPERIMENTAL SETTING

Electronic Condition Work Station



Paper Condition Work Station

APPENDIX B

WRITTEN INSTRUCTIONS

Participant Instructions for In-Basket

1. Welcome to the SportsDome International in-basket experiment!

2. Now that you are at your desk, please read the consent form and sign it.

3. After you have done this, your experimenter will collect the consent form from you.

4. Please note that this is a business simulation experiment and you will soon be receiving
information about a fictitious company called SportsDome International that was created for experimental purposes.

5. Next, you will receive SportsDome International's company information. You will also receive information about the role you will be playing: Alex Verret, Special Projects Coordinator.

6. You will have 10 minutes to review the information.

7. After you have reviewed the information, you will be taking part in an in- basket simulation playing the part of a newly promoted employee by the name of Alex Verret.

8. Please inform your experimenter of any questions or concerns you may have.

9. After all your questions and concerns have been addressed, the in-basket items will be given to you and the simulation will begin.

10. You will have 40 minutes to complete the simulation.

11. You will need to record every action you take on any item---memos, letters, meeting plans, delegation, etc., and you need to document actions on the forms provided, indicating the item number(s) when appropriate.

12. Work with the materials at hand, use your own experience and judgment, and pay attention to what issues need to be addressed first, etc.

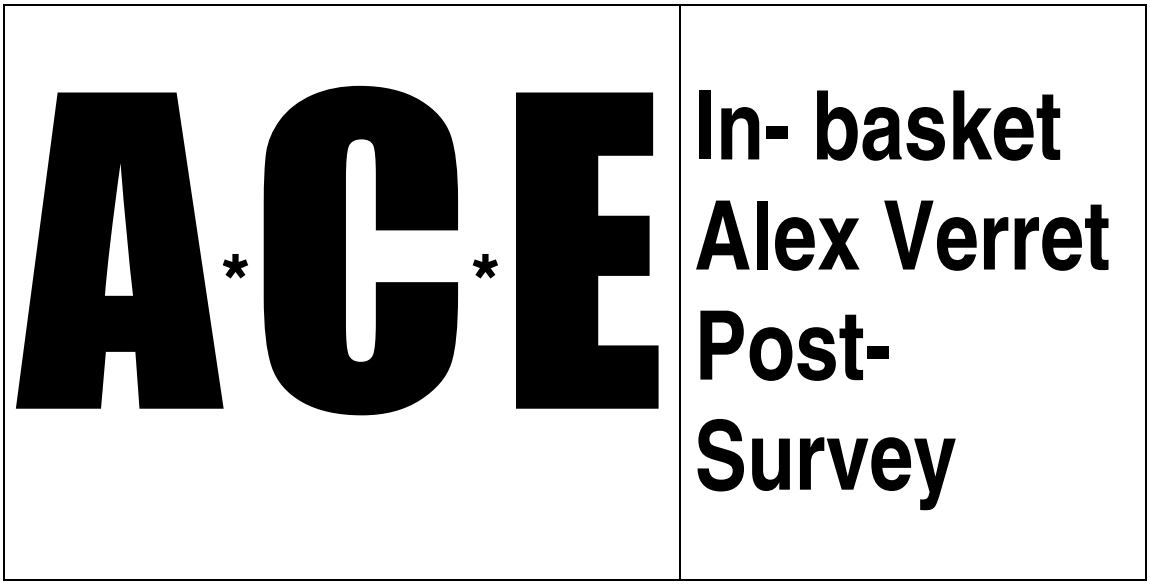
13. When the 40 minute time frame is up, all items, response forms, and any other materials will be collected from you.

14. After the completion of the in- basket, you will be given an experiential judgment post-test. Please complete the post-test honestly and remember that there are no wrong answers. The post- test should take no longer than 15 minutes to complete.

Thank you for your time and cooperation!

APPENDIX C

POST-SURVEY



Below are several statements pertaining to your feelings and thoughts about the **in-basket simulation** you just completed. Although some of the questions are similar, there are differences between them and we ask that you treat each one as a separate question.

Please indicate your preference.

There are two parts to every in-basket, the **background materials** (in-basket items) and the **response forms**. Please circle your preference for administration of materials for each part below:

1. **Background materials**

□ Paper □ Computer

2. **Response forms**

□ Paper-Pencil □ Computer-Keyboard

Please answer the following questions to the best of your ability.

3. How familiar are you with the In-Basket process?

□ Not a Bit	□ A Little	□ A Fair Amount	□ Quite a Bit	□ A Great Deal

4. I use a computer…

Daily	2-3 times a week	Once a week	A couple times a month	Hardly Ever

5. To what extent was this exercise similar to my actual job experiences?

Not a Bit	A Little	A Fair Amount	Quite a Bit	A Great Deal

---

6. Have you ever completed and In-Basket exercise before?

Yes No

7. If yes, have you completed one here at UT-Arlington?

Yes No

8. Are you currently working?

Yes No

9. If you have had previous work experience, please indicate how many years of work experience you've had:

_____

10. What best describes you?

Male Female

11. What is your age?

_____

12. What best describes your ethnicity?

White	Black	Hispanic	Asian	Other

13. What is your GPA?

Less than 2.0	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0

14. What is your classification at UTA?

Freshman	Sophomore	Junior	Senior	

15. What is your UTA student ID number? (i.e. 1000-99-9999)

__ __ __ __ __ __ __ __ __ __

Please write clearly

One least step…

Prior to completion of your participation in this research, you will be asked to complete one additional short in-basket exercise. There are two parts to every in-basket, the background documents (in-basket items) and the response forms. Please select which administration you prefer:

- Paper background information and handwrite responses
- Paper background information and keyboard responses
- Electronic background information and handwrite responses
- Electronic background information and keyboard responses

THANK YOU!

APPENDIX D

RESULTS OF ANALYSIS

Table D.1. *Description of Sample (N = 124)*

Age	%
17-21	67.5
22-26	23.5
27-31	3.2
32 +	5.6
Gender	
Male	48.4
Female	51.6
Ethnicity	
White	45.2
Black	22.6
Hispanic	11.3
Asian	16.1
Other	4.8
Currently Working	
Yes	70.2
No	29.8
Years of Work Experience	
1 or less	15.4
2	15.4
3	16.3
4	22.1
5 +	30.8

Table D.2 *Descriptive statistics of Overall Performance by Condition*

Condition	Sample Size *n*	Mean	Standard Deviation
P-P	31	2.16	.97
P-C	32	1.84	.77
C-C	29	2.14	.88
C-P	32	2.28	.96

Table D.3 *Descriptive Statistics of Performance Dimensions by Condition*

Variables	People Skills		Communication Skills		Critical Thinking Skills	
	M	*SD*	*M*	*SD*	*M*	*SD*
Condition						
P-P	2.47	.94	2.76	1.09	2.00	.87
P-C	2.31	.95	2.50	.82	1.88	.89
C-C	2.57	1.02	2.50	.94	2.21	.70
C-P	2.68	1.00	2.42	.84	2.16	.76

Table D.4 *Results for MANOVA*

Source	Dependent Variable	Wilks' Lambda	F	df	Effect Size
Condition		.94	.90	9, 287.33	.02
	Communication Skills		.39	3, 120	.01
	People Skills		.97	3, 120	.02
	Critical Thinking Skills		.84	3, 120	.02

Table D.5 *Condition Preference*

Condition	Percentage Preferred
P-P	10.7
P-C	32.0
C-C	50.8
C-P	5.6

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BIOGRAPHICAL INFORMATION

Cara L. Fay graduated from Baylor University in 2002 with her Bachelor of Arts degree in Psychology and a minor in English Literature. Her research interests include job performance, assessment center methods, and workplace stress. She has been involved with research concerning the regulation of emotion in the workplace, scale development, and assessor ratings. For the future, Cara plans to expand upon this research and continue to be actively involved in research concerning selection and development practices. She is continuing her education in the University of Texas at Arlington's Experimental Psychology PhD program with an emphasis in Industrial Organizational Psychology.