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Factors affecting the effectiveness and acceptance of electronic selection systems

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ABSTRACT

There has been a rise in the use of electronic selection (e selection) systems in organizations. Given the widespread use of these systems, this article reviews the factors that affect their effectiveness and acceptance by job applicants (applicant acceptance), and offers directions for future research on the topic. In particular, we examine the effectiveness and acceptance of these systems at each stage of the selection process including (a) job analysis, (b) job application, (c) pre employment testing, (d) interviewing, (e) selection decision making, and (f) evaluation and validation. We also consider their potential for adverse impact and invasion of privacy. Finally, we present some implications for e selection system design and implementation.

Contents

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1. Introduction

Organizations use a number of strategies for improving their operations, one of which is the development and use of human resource management (HRM) systems. Two key components of such systems are employee recruitment and selection. The overall purpose of recruitment is to provide the organization with a large pool of job applicants (applicants hereinafter) who are well suited for existing openings in terms of their knowledge, skills, abilities, and other attributes (KSAOs hereinafter). And the overall objective of selection is to maximize the quality of individuals who are hired from among the set of applicants in terms of their potential to contribute to organizational goals and objectives through their job performance.

In the typical selection system (traditional system hereinafter) applicants complete an application blank, take one or more pre employment tests (e.g., cognitive ability, job related knowledge, work sample), and sit for a face to face interview with a personnel specialist. The information derived from these measures is used to estimate their job performance and job offers are made to the top applicant or applicants (dependent on the number of individuals that are to be hired).

In recent years, however, there has been a rise in the use of technology as a means of facilitating the selection process. More specifically, electronic selection (e selection) is being used increasingly by organizations. It typically refers to the use of various forms of technology (e.g., web based job applications, web based tests, videoconference interviews) to help organizations with such tasks as conducting job analyses, gathering applicant data, assessing individuals' KSAOs, and making selection decisions. Interestingly, results of one survey showed that 74% of large organizations now use electronic technology for recruiting and selection (CedarCrestone, 2010).

Traditional selection systems typically require applicants to visit an organization to complete paper applications and pre selection measures. However, technology has changed this process dramatically (Kehoe, Dickter, Russell, & Sacco, 2005). For instance, with the advent of computers, organizations began using mainframes and dumb terminals to allow applicants to submit job applications (Kavanagh, Gueutal, & Tannenbaum, 1990). However, as microcomputers (PCs) became more readily available, organizations began using client server systems run over wide or local area networks (WANs and LANs, respectively). Although these systems provide applicants with access to an organization's central server, they are somewhat limited because individuals often need a code to use them. However, with modern e selection applicants have improved access to an organization's resources. For example, they can log onto recruiting or selection websites anytime of the day or night, and perform such tasks as completing application blanks and taking online tests. (See Kehoe et al., 2005, for a detailed review of the evolution of technology in the selection process.)

E selection systems are thought to offer a number of important advantages over traditional systems (e.g., Kehoe et al., 2005; Reynolds & Dickter, 2010; Tippins, 2009). For instance, they (a) provide organizations with large numbers of recruits, (b) simplify the job analysis process, (c) accelerate the development and assessment of selection procedures, (d) reduce administrative

burdens by automatically screening applications to ensure that applicants meet basic job requirements, (e) allow organizations to interview applicants using web based or videoconference methods, and (f) facilitate the storage and use of applicant information, allowing for the assessment of selection system effectiveness (e.g., by validating inferences made in the selection process). Often this results in savings of both time and money. Overall, e selection systems are thought to (a) enhance efficiency, (b) reduce costs, (c) promote the hiring of qualified employees, and (d) manage the flow of new members into the organization (e.g., Bartram, 2006; Buckley, Minette, Joy, & Michaels, 2004; Kehoe et al., 2005; Reynolds & Dickter, 2010; Tippins, 2009).

Despite the just noted benefits, critics (e.g., Harris, Van Hoye, & Lievens, 2003; Kehoe et al., 2005; Stone, Stone Romero, & Lukaszewski, 2003) argue that their use may lead to a number of unintended, dysfunctional consequences. For instance, because e selection systems focus primarily on efficiency and cost containment, they may divert attention from the goal of hiring the most qualified applicants (Kehoe et al., 2005; Pearlman & Barney, 2000). In addition, e selection procedures may (a) be more subject to cheating than traditional procedures and (b) have an adverse impact on members of protected groups (e.g., Reynolds & Dickter, 2010; Stone et al., 2003). Moreover, e selection has the potential to invade personal privacy (Harris et al., 2003; Stone et al., 2003), and negatively affect applicants' attraction to organizations (e.g. Bauer, Truxillo, Paronto, Weekley, & Campion, 2004).

Given the widespread use of e selection systems and the potential advantages and disadvantages associated with them, the primary purposes of the present article are to (a) provide a review of the factors that affect their effectiveness and acceptance, and (b) offer directions for e selection research and practice. In this article e selection system effectiveness refers to the extent to which it enables individuals and organizations to achieve their short term and long term goals.

It merits emphasis that this article focuses on micro oriented approaches to selection. As such, it does not consider issues associated with workforce planning or strategic HRM. However, another article in this special issue focuses on these topics (i.e., Marler & Fisher, this 2012). In addition, this article stresses a person job (P J) fit framework, emphasizing the goal of ensuring that employees can make immediate contributions to productivity with minimal training. It does not consider the person organization (P O) fit perspective, which focuses on the congruence between the values of applicants and organizations (Chatman, 1989). Although there may be advantages of the P O fit model (e.g., increased job satisfaction and employee retention), Pearlman and Barney (2000) argue that the P O fit approach to selection is difficult to document and defend legally. In addition, they maintain that the validity of inferences made from P O fit models has not been tested under the Uniform Guidelines on Employee Selection (EEOC, 1978).

In the following sections, we examine the effectiveness and acceptance of e selection systems at each step of the selection process including (a) job analysis, (b) job application and initial screening, (c) testing and assessment, (d) interviewing, (e) decision making, and (f) validation (system evaluation). Furthermore, in the next section we consider a model that describes the factors that influence the outcomes of e selection.

2. A model of the acceptance and effectiveness of e-selection systems

Models of electronic HRM (eHRM) systems (e.g., Stone & Lukaszewski, 2009; Stone, Stone Romero, & Lukaszewski, 2006) contend that two factors determine their acceptance (i.e., the degree to which individuals react favorably to the system) and system effectiveness: (a) the nature of eHRM system and (b) the attitudes and abilities of individuals who use them (e.g., applicants). For example, organizations develop e selection systems to hire highly talented employees who can help them meet their short run (e.g., productivity) and long term goals (e.g., growth, survival). In addition, the values, goals, and abilities of applicants affect system acceptance and use. Ideally, e selection systems should be designed to be congruent with the values and abilities of applicants. However, the design of such systems and the procedures used to implement them may not always result in a match. As a consequence, the systems may evoke resistance in applicants, reducing their motivation to apply for jobs. Thus, we propose that there will be a positive relation between (a) the degree to which applicants believe that they have the ability to use e selection systems and gain access to jobs and/or job related outcomes (e.g., promotions) and (b) their propensity to accept and use the systems (Stone et al., 2006).

E selection systems also should be designed to meet the needs of applicants, HR staff, and supervisors and other stakeholders (e.g., Kehoe et al., 2005; Pearlman & Barney, 2000). One reason for this is that poorly designed, inflexible, or time consuming systems can have a negative impact on the degree to which applicants are attracted to organizations and their job acceptance rates. However, the nature of the labor market may affect the use of these systems by applicants. In a tight labor market applicants may have to use them. However, if their use is perceived to be extremely tedious the applicants may form negative beliefs about organizations, reducing their long term retention rates. Furthermore, applicant acceptance will be of particular concern when applicants are in high demand (e.g., nursing jobs) or have unique skills and abilities (e.g., software engineer).

The above noted models of eHRM (Stone & Lukaszewski, 2009; Stone et al., 2006) suggest that there is a positive relation between (a) the use and acceptance of e selection systems and (b) their effectiveness. For instance, effective e selection systems will (a) promote the hiring of highly qualified employees, and increase their productivity and (b) provide applicants with access to desirable jobs and/or promotion opportunities. In the following sections we illustrate how e selection system characteristics and individual factors jointly influence effectiveness and applicant acceptance. We consider these issues at each stage of the selection process.

3. Overview of the selection process

As is shown in Fig. 1, the selection process typically includes six interrelated steps, the first of which is to conduct a job analysis to determine task requirements and job specifications (i.e., KSAOs needed by job incumbents). The KSAOs that are identified at this stage can be used to both determine the predictors that are used in the selection process and formulate selection plans.

Once predictors are chosen, the HR specialist must decide on the optimal sequencing of events in the selection process (e.g., interviewing before or after testing), and determine how predictor information will be combined to make selection decisions. For instance, as is explained in a subsequent subsection, different weights can be used for each predictor (e.g., education, test scores, interview scores) and a regression based compensatory model can be used for making selection decisions.

Typically, in the second step of the selection process, an applicant is asked to complete an application blank. An inspection of it allows the HR specialist to determine if the individual has minimal qualifications (KSAOs) for a job.

In the third step of the process, an in depth assessment of the applicant's KSAOs is performed using data from one or more tests (e.g., cognitive ability tests, work samples) and inventories (e.g., personality inventories). Typically, the number and nature of tests and inventories used varies across jobs.

In the fourth step of the process, an interview is conducted to assess attributes (e.g., communication and interpersonal skills) that were not considered by the application blank, personality inventories, and tests. The interview also allows the applicant to ask questions about the job for which he or she has applied and other factors (e.g., benefits, vacations).

In the fifth stage of the process, the data gathered from all applicants are used to make hiring decisions. Typically these are based on the results of prior validation studies (explained below) conducted by the organization or other organizations (e.g., validity generalization research).

In the sixth and final step of the process, the organization uses data from a current validation study to examine the validity of inferences made from its selection system. This examination provides for an ongoing evaluation of the effectiveness of the system (e.g., the utility of the system; see, for example, Boudreau, 1991; Cascio & Aguinis, 2010).

It merits noting that under the Uniform Guidelines on Employee Selection (EEOC, 1978) e selection systems are subject to the same requirements as traditional systems. More specifically they must (a) use standardized procedures, (b) produce accurate scores, and (c) ensure that valid inferences are made on the basis of applicant data (EEOC, 1978).

In the sections that follow we consider how electronic or web based systems use influences each of the steps in the selection process. In addition, we describe the results of research on the criteria of effectiveness and applicant acceptance.

3.1. Step 1: electronic job analysis

Once an organization identifies its human resources needs, it must conduct a job analysis to identify task requirements and specify the KSAOs needed by a job incumbent. The results of the job analysis are also used to choose the types of predictors for each job or job family, and formulate selection plans (Gatewood, Feild, & Barrick, 2010). As is detailed below, the use of e selection systems may modify these steps in a number of ways.

3.1.1. Electronic job analysis methods

Electronic (e.g., web based) job analysis (EJA) typically begins with a review of the existing literature concerning a job. For example, an analyst can conduct the review by means of O'Net (2010), a web based source of job information that contains job descriptors, activities, and qualifications for incumbents in hundreds of occupations. The use of this EJA method provides very timely information about jobs, and makes it much easier and faster to collect basic job data than is the case with traditional job analysis methods.

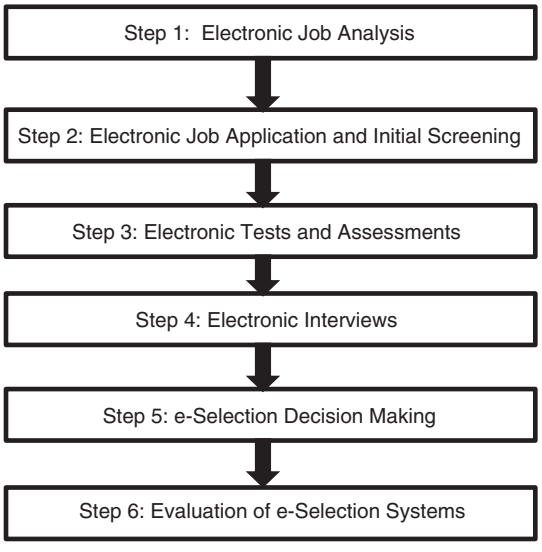

Fig. 1. The steps in the e-selection process.

Although O'Net is an extremely useful source of job information, Gatewood et al. (2010) caution that it should *not* be the sole basis for describing and defining jobs. One reason for this is that even though jobs may have identical titles, actual job activities and specifications may vary across organizations (Gatewood et al., 2010). Another reason is that it does not usually meet the legal standards for job analysis detailed in the *Uniform Guidelines on Employee Selection* (EEOC, 1978).

In the next phase of job analysis, analysts typically collect data about task requirements using direct observations, interviews, or questionnaires completed by subject matter experts (SMEs), including job incumbents and supervisors who have knowledge of the job.

An EJA changes this step in a number of ways. For example, instead of interviewing or mailing questionnaires to SMEs, analysts can use Internet or intranet systems to send questionnaires to SMEs in multiple locations. The SMEs can complete these questionnaires quickly, and their responses can be shared electronically. Then task requirements can be discussed using web based systems or videoconference methods (e.g., Skype which is a free voice and video system that allows for communication over the Internet; www.businessdictionary.com). Subsequently, the analysts can make judgments about the final set of task requirements. As a result of using the EJA strategy, data about task requirements can be gathered quickly, and SMEs can complete discussions with other panel members without having to travel to remote locations.

After the job analyst collects data about task requirements, the SME panel is convened to make inferences about the KSAOs needed for each job and its tasks. In an EJA SMEs use web based questionnaires to make such inferences, and share their individual judgments with other panel members. The SMEs can also be convened using a virtual panel method and can use web based or videoconference techniques to discuss and make final decisions about KSAOs. Again, a key advantage of this EJA approach is that geographically dispersed SME panels can "meet" and do their work using electronic technology (Ebrahim, Ahmed, & Taha, 2009). As a result, they can develop job specifications much faster than with traditional job analysis methods.

Note that in a traditional job analysis another panel of SMEs (e.g., HR specialists and Industrial and Organizational Psychologists) is convened to make judgments about the types of predictors that are to be used to assess KSAOs. However, in an EJA the SMEs can be assembled as a virtual panel (using Internet or intranet systems) to choose the predictors. The views of each panel member can easily and quickly be shared electronically with all other panel members. Then, the virtual panel can discuss the merits of each of the predictors, and identify those that are to be included in the predictor battery used for a job. The chosen predictors can then be used as a basis for making selection decisions for a job or job family.

It should be evident from the above that EJA streamlines the process of gathering data about task requirements and job specifications, thus expediting the overall development of selection procedures. Furthermore, data about the validity of different predictors can be built into the system so that SMEs can readily access information about such predictors. As a result, the use of EJA enables organizations to develop content valid selection systems in a more efficient and less costly manner than with traditional job analysis. Issues associated with the validity of various predictors are considered below in a subsection on validation.

3.1.2. Effectiveness of electronic job analyses

Even though many organizations are using EJA methods, relatively little research has focused on their effectiveness. One notable exception is the work of Reiter Palmon, Brown, Sandall, Buboltz, and Nimps (2006). They described an EJA conducted by the U.S. Navy, and considered issues related to its validity and effectiveness. Reiter Palmon et al. asked SMEs in a variety of locations to use the Internet to identify such factors as legacy task statements, job activities, and tasks. Then, they compared the outcomes of the EJA and traditional job analysis methods. Findings of their study revealed that the EJA method resulted in more comprehensive descriptions of the job than did the traditional method. They also found that the EJA method allowed SMEs from different locations to complete the job analysis in a shorter period of time than with the traditional method. Overall, the research showed that the EJA method had a number of advantages over the traditional method, including being less time consuming, easier to update, and more flexible than the traditional method. Although the results of the Reiter Palmon et al. study indicated that the EJA method may be effective for conducting job analysis, research is needed to determine if the same method is superior to the traditional method in terms of such criteria as the identification of predictors and the development of selection models.

3.1.3. Applicant acceptance of electronic job analysis

The research reviewed above focused on the relative effectiveness of the EJA method for conducting a job analysis. However, it did not consider the reactions of SMEs or job analysts (e.g., their acceptance of the method). This is surprising because the EJA method may transfer the work performed by job analysts to SMEs. As a result, we predict that SMEs will react negatively to the EJA method if they view it as increasing their workload. However, research is needed to assess the validity of this prediction.

3.1.4. Summary and directions for research on electronic job analysis

In summary, some research revealed that the EJA method may be less time consuming, and provide more comprehensive information about jobs than the traditional method (Peterson & Taylor, 2004; Reiter Palmon et al., 2006). However, we know of no research on the acceptance of EJA by job analysts or SMEs. As a result, research is needed on this issue. Therefore, we offer the following hypotheses to foster such research:

H1. The use of the EJA method will provide more comprehensive and timely information about task requirements, job specifica tions, and the value of predictors than the traditional method.

H2. Acceptance of the EJA method will increase to the degree that SMEs, job analysts, and HR specialists perceive that its use leads to positive consequences (e.g., ability to perform job analyses rapidly, decrease the work associated with a job analysis).

3.2. Step 2: electronic job application and initial screening

Typically, organizations ask applicants to complete an application blank and/or submit a resume. These provide information about such applicant variables as work experience, training, education, and licenses. Today, many organizations require applicants to either complete application blanks online or upload resumes to company websites. In addition, some organizations use Interactive Voice Response (IVR) systems to collect data about applicants that can be used for the purpose of initial applicant screening. In the following sections we consider IVR systems and application systems separately because they use very different types of technology. Given the widespread use of both types of technology we consider factors associated with their effectiveness and acceptance below.

3.2.1. Effectiveness of web based application systems

Although web based application systems are being used increasingly, relatively little research has examined their effectiveness (Stone et al., 2003). In addition, most of the research on such systems has been reported under the heading of e recruiting because recruiting and initial applicant screening are often intertwined (e.g., Dineen, Ash, & Noe, 2002; Dineen & Noe, 2009; Stone et al., 2003). Although a thorough review of the literature on e recruiting is beyond the scope of this article, below we review selected research on the effectiveness of this strategy in the initial screening process. The review considers source factors, content factors, administrative factors, and individual factors.

3.2.2. Source factors

One way of assessing the effectiveness of web based application systems is to examine the quality of applicants generated by them. Researchers (Chapman & Webster, 2003; Galanaki, 2002) argued that organizations use these systems because they are likely to reach more talented applicants than traditional systems. In this regard, research by Chapman and Webster (2003) revealed that relative to traditional recruitment methods, electronic systems generate a higher *quantity* of applicants, but they are not necessarily of higher *quality*. As a result, such systems may not always lead to the hiring of higher quality applicants.

Research by McManus and Ferguson (2003) showed that electronic application systems are more likely to generate some types of applicants than others. For instance, they are likely to attract applicants who are better educated, more computer literate, and more achievement oriented than those attracted by traditional recruiting systems. As a consequence, electronic systems may be more valuable in terms of recruiting individuals for high scope jobs (e.g., professionals, managers, and scientists) than for low scope jobs (e.g., assemblers, machine operators, and maintenance workers). Interestingly the McManus and Ferguson study also showed that web based application systems are more likely to generate applicants with unfavorable backgrounds (e.g., people who hop from job to job) than are traditional systems.

Overall, research shows that web based application systems have both advantages and disadvantages as a means of recruiting applicants. Thus, research is needed to identify the optimal methods that can be used for recruiting people for various types of jobs.

3.2.3. Content factors

Content factors can affect the effectiveness of web based application systems. They have to do with the job relatedness and/or legality of questions in an application. For instance, research by Wallace, Tye, and Vodanovich (2000) examined the legality and job relatedness of questions on web based application blanks used in 41 states. They found that 97.5% of such blanks contained at least one illegal or non job related item. For example, 12% of applications contained questions about an applicant's disability. Questions of this nature are strictly prohibited under the Americans with Disabilities Act (1990). In addition, the applications had questions about a number of variables were not directly job related: In particular, 51.2% contained questions about age, 31.7% had items that asked about sex, and 34.1% asked about race. Although these questions are not literally illegal, legal professionals contend that organizations application blanks should not include them because they can be used to support a prima facie case of unfair discrimination under extant Civil Rights laws (Bennett Alexander & Hartman, 2009).

Web based application systems also can be used to gather demographic data from applicants that are needed for government reporting (e.g., Affirmative Action Plans). Organizations are required to keep these data separate from other data collected in the application process. Unfortunately, many organizations don't disaggregate demographic data from other types of data that are stored in their electronic systems. This may lead applicants to perceive that data that are unrelated to job qualifications (e.g., sex, race, age, and disability) will be used to make hiring decisions. Overall, therefore, one limitation of web based application systems is that the questions included in them may not be job related or meet legal standards. However, the same problem may present itself with traditional application systems.

3.2.4. Administrative factors

A number of administrative factors may influence the effectiveness of web based application systems. Among these are the degree to which the systems (a) use “key words” in applicant screening, (b) serve as basis for the use of weighted application blanks, and (c) are flexible, easy to use, and efficient.

Many web based application systems use key words to screen applicants, and determine if they meet the basic job requirements (e.g., in terms of education, experience, licenses). Screening on the basis of key words decreases the administrative time and costs associated with reviewing applications and sending decision letters to applicants. Despite the widespread use of key words for applicant screening, Mohamed, Orife, and Wibowo (2002) argue that the criteria used in key word systems are not always based on job analyses. As a result, the key words may not be job related or predictive of job performance. In addition, they note that resume' writing skills, and choice of words may bias the screening process because applicants who use words listed in the job description for a target job have a better chance of being hired than those that do not. Therefore, one of the weaknesses of these systems is that organizations may select applicants who happen to use the right words on their applications as opposed to those who are most qualified for jobs (e.g., Stone et al., 2003). Unfortunately, there is very little empirical research on the effectiveness of key word screening systems.

Another factor that may affect the effectiveness of web based application systems is the degree to which items in the application serve as a basis for the use of weighted application blanks (WABs). The WAB technique assigns weights to items based on their predictive power, and the application blank is scored like a test (Cascio & Aguinis, 2010). Cutoff scores can be established for items (e.g., education) or total scores computed for the overall application. A key advantage of web based application systems is that they can facilitate the development of WABs. Thus, they have the potential to improve the selection process. Note, however, the WAB method also can be used with traditional applications. Thus, research is needed to examine the *relative* effectiveness of web based and traditional application systems.

Other administrative factors may influence the effectiveness of web based application systems (e.g., ease of use, flexibility, navigability). These are considered below in the section on system acceptance.

3.2.5. Individual factors

A number of individual factors may affect the effectiveness of web based application systems (McManus & Ferguson, 2003; Stone, Lukaszewski, & Isenhour, 2005). For example, research by McManus and Ferguson (2003) showed that computer related experience, skill, and anxiety were negatively related to the ability of applicants to use web based application systems. Thus, system effectiveness will suffer to the degree that otherwise qualified individuals are dissuaded from using such systems.

Research also shows there computer skills and access to computers vary across individuals who differ in terms of such factors as sex, age, ethnic, and socioeconomic status (e.g., McManus & Ferguson, 2003; Wallace & Clariana, 2005). As a result, applicants who lack computer skills and/or access to computers may not be able to easily use web based application systems. Therefore, the use of such systems may have an adverse impact on some job applicants. Given the importance of equal opportunity issues, we consider them below in a subsection on adverse impact.

3.2.6. Applicant acceptance of web based application systems

Although there has been relatively little research on the effectiveness of web based application systems, there has been some research on their acceptance by applicants (e.g., Stone et al., 2005). Much of it has been reported in articles dealing with e recruiting. A review of this research reveals that website characteristics (e.g., ease of use, perceived fairness), and individual characteristics (e.g., computer experience, sex, gender) are related to applicant acceptance. For example, results of studies show that website characteristics are related to applicant acceptance (e.g., Cober, Brown, Levy, Keeping, & Cober, 2003; Sinar, Paquet, & Reynolds, 2003; Williamson, Lepak, & King, 2003). In particular, the ease of use, efficiency, and "friendliness" of web based systems influenced applicant acceptance and their willingness to use them to apply for jobs (e.g., Cober et al.; Sinar et al., Williamson et al., 2003): Applicants were more motivated to apply for jobs when websites were easy to navigate, and efficient than when they were not (e.g., Sinar et al.; Williamson et al., 2003). Even though there has been some research on website characteristics, we believe that such factors as system flexibility and cognitive demands placed on applicants will affect applicant acceptance. Therefore, research is needed to examine the effects of these factors on this criterion.

Results of research by Bauer et al. (2006) found that the perceived fairness of web based application system was related to perceptions that they invaded privacy. In addition, the study showed that the perceived fairness of a system was positively related to attraction to the organization and job application intentions. Note that both such variables can be viewed as indices of applicant acceptance.

The just described study by Bauer et al. (2006) also revealed that the computer experience of applicants moderated the relation between perceived fairness and job application intentions: When individuals had high levels of experience perceptions of system fairness were positively related (albeit weakly) to application intentions. However, when applicants had low levels of experience there was a strong negative correlation between their perceptions of system unfairness and job application intentions. Thus, computer experience and perceptions of unfairness may play key roles in applicant acceptance of web based application systems. We also believe that applicants will be less likely to perceive web based application systems as fair or accept them when items in web based applications are (a) perceived to have low levels of job relatedness or (b) viewed as having the potential stigmatize them. Research is needed to test these predictions.

Research shows that other individual characteristics may affect applicants' reactions to web based application systems. For example, a study by Sinar et al. (2003) found that inexperienced job applicants are more likely to be influenced by the attributes of an organization's website than are those with considerable work experience. In addition research by McManus and Ferguson (2003) found that there are age, sex, and racial differences in the use and acceptance of web based application systems. These issues are considered further below in a subsection on adverse impact.

3.2.7. Summary and directions for research on web based application systems

Relatively little research examined the effectiveness and acceptance of web based application systems. However, the results of it revealed that the effectiveness and acceptance of these systems may depend on several factors (i.e., content, administrative, and individual). Even though there has been some research on these factors, much more is needed. Therefore, we offer the following hypotheses to guide it:

H3. The greater the degree to which either key word screening systems and/or questions on web based application systems are based on a job analysis the greater will be their criterion related validity (e.g., for the criterion of job performance).

H4. Applicant acceptance of web based application systems and their motivation to apply for jobs will be negatively related to views that they are inflexible and/or difficult to use.

H5. Applicant acceptance of web based application systems and motivation to apply for jobs will be negatively related to beliefs that questions in them lack job relatedness and/or have the potential to stigmatize them.

3.2.8. Effectiveness of interactive voice response (IVR) application systems

IVR systems are being used increasingly to collect applicant data at the initial screening stage of the selection process. These systems enable organizations to administer application blanks or other types of selection inventories using audio devices or telephones. Applicants respond to pre recorded application blank questions that are read with a human or synthetic voice (Corkrey & Parkinson, 2002). They respond to the questions verbally or use numbers on a telephone keypad, and the system stores their answers on a computer. Applicants can access IVR systems through toll free numbers provided on traditional recruiting ads or web based recruiting systems. Similar types of systems are widely used for sales, marketing research, telebanking, and political polling (e.g., Church, 2001; Tourangeau, Steiger, & Wilson, 2001) because they decrease the administrative burden associated with collecting large amounts of data in a short period of time. They also offer applicants the opportunity to access the web based system and apply for jobs at any time of the day or night (Greenberg, 1999).

Despite the increased use of IVRs in the selection process, there has been relatively little research on their effectiveness or acceptance by applicants (e.g., Bauer et al., 2006; Yang, Callegaro, Bhola, & Dillman, 2011). However, there has been some research on the comparability of respondents' answers to survey questions using IVR, web based, and paper and pencil forms (e.g., Dillman, 2000). For example, the results of these studies show that people use more extreme responses when using IVR than web based or mailed survey methods (e.g., Dillman, 2000).

Researchers also have identified several psychological factors that may be responsible for differences in responses to data collection procedures (e.g., Dillman, Sangster, Tarnai, & Rockwood, 1996; Schwarz, Strack, Hippler, & Bishop, 1991). For example, Schwarz et al. (1991) reported that these differences are attributable to (a) visual versus auditory presentation of questions and responses, (b) sequential versus simultaneous presentation of questions, (c) time pressure, (d) explanations from interviewers, (e) perceived confidentiality, and (f) control over the pace of responding. Thus, when questionnaires or application blanks are presented using paper or web based methods respondents can read and respond at their own speed, read ahead, or review their previous answers. However, IVR systems do not allow for this. In addition, they do not provide respondents with a visual presentation of interview questions or response options. Thus, applicants may have difficulty remembering the options and have a tendency to respond using scale end points (because they cannot recall the mid points).

Research by Yang et al. (2011) examined differences in responses to IVR and web based methods in a personnel selection context. Results of their study revealed that applicants provided more extreme responses to selection inventories when the questions were presented using an IVR than a web based method.

Other researchers (e.g., Krosnick, 1999; Krosnick, Narayan, & Smith, 1996) argue that respondents with high motivation levels pay much more attention to providing the best answer to questions (e.g., optimizing) than those with low levels of motivation. The latter try to answer questions with as little effort as possible. Thus, motivation may play an important role in applicant responses.

Research by Hattrup, O'Connell, and Yager (2006) compared the types of data reported by applicants using IVR or web based application systems. They used data from 54,218 applicants for automobile manufacturing jobs, and found that individuals who used an IVR application system reported having more previous jobs than those who used a web based system. The applicants also reported more previous absences when using an IVR than a web based system. However, there were no differences in previous terminations reported using these two types of application systems. These results suggest that job applicants may provide more extreme responses when using an IVR than a web based application system.

3.2.9. Applicant acceptance of IVR application systems

Although IVRs are being used increasingly, there has been no research on their acceptance by applicants. However, there are studies of their acceptance in the interview process (e.g., Bauer et al., 2006). Interestingly, the research has produced inconsistent findings. For instance, a review by Corkrey and Parkinson (2002) revealed that some studies showed that individuals are more likely to prefer face to face than IVR methods (e.g., Bauer et al., 2004; Kobak et al., 1997). However, results of other studies indicated that individuals felt that IVR questions resulted in less embarrassment than questions on web based systems (Kobak, Greist, Jefferson, Mundt, & Katzelnick, 1999; Kobak et al., 1997). Still other research showed that users were satisfied with IVRs. However, the studies did not compare them to other data collection methods (Corkrey & Parkinson, 2002). Overall, the evidence

suggests that IVRs may be an acceptable method of collecting job application data. However, research is needed to determine the variables responsible for the mixed findings on applicant acceptance.

3.2.10. Summary and directions for research on IVR application systems

In summary, there has been very little research on the effectiveness and applicant acceptance of IVR application systems. However, the existing research shows that individuals may (a) provide more extreme responses, and (b) report more undesirable behaviors when using IVR application systems than when using web based application systems. In addition, research on applicant acceptance of IVR systems has produced mixed findings. Thus, more research is needed on IVR application systems, and we offer the following predictions to guide it:

H6. The use of IVR application systems will result in less accurate background information than the use of either web based or traditional application systems.

H7. Applicants will react more negatively to systems and be less attracted to organizations when IVR application systems are used than when either web based or traditional application systems are used.

3.3. Step 3: electronic testing and assessment

Organizations may use a number of employment tests and/or personality inventories to assess applicants' KSAOs. In recent years there has been an increased use of the Internet or computers to administer tests and inventories.

Internet based tests are particularly attractive to organizations because they require fewer resources (e.g., proctors, test facilities), and applicants can complete tests and/or inventories at times that are convenient for them (Makransky & Glas, 2011). However, one of the major limitations of electronic tests is that they are often unproctored and therefore are subject to cheating. In order to deal with cheating problems organizations can use confirmatory tests, i.e., follow up tests given under supervised conditions. However, the fact that confirmatory tests are needed serves to reduce the utility of web based tests. Given the increased use of computerized testing in the selection process, we consider the effectiveness and applicant acceptance of this testing method below.

Two basic assumptions of selection are that (a) job applicants vary in terms of their job relevant KSAOs (Gatewood et al., 2010) and (b) the KSAOs can be assessed using tests, personality inventories, and other measures. *Tests* are typically defined as standardized measures of aptitude and ability that have right and wrong answers. *Personality inventories* measure such variables' interests, attitudes and values, and do not have right and wrong answers (Guion, 1965). The overall purpose of using both tests and inventories is to distinguish between applicants who differ in terms of the variables that have a bearing on such outcomes as job performance, job satisfaction, and retention.

Among the major concerns with computerized (e.g., web based) testing are the degree to which the test medium (a) affects the comparability of applicants' scores and/or (b) influences psychometric properties of tests (i.e., reliability and validity; Anastasi & Urbina, 1997; Mead & Drasgow, 1993). In this regard, Anastasi and Urbina (1997) argue that most tests were developed for use with paper and pencil formats (paper tests hereinafter). Thus, the use of web based tests requires that their psychometric properties be investigated before they can be interpreted validly. Thus, for example, it is critical to check for score comparability between paper and computerized tests when individuals have little experience with computers or web based testing (e.g., older or minority applicants). Not surprisingly, therefore, much of the research on testing in e selection has focused on the issue of measurement equivalence.

There are a number of definitions of measurement equivalence (e.g., Bobko & Kehoe, 1983; Drasgow, 1984) and an in depth consideration of all of them is beyond the scope of this article. Therefore, herein we define *measurement equivalence* in terms of three criteria considered by Drasgow (1984) and Mead and Drasgow (1993). First, measures are equivalent if (a) the correlation between their scores (e.g., paper and the computerized tests) is close to one (Mead & Drasgow, 1993), (b) the scores for the two test forms have comparable means and standard deviations (Mead & Drasgow, 1993), and (c) the scores for the two types of tests have equivalent degrees of correlation with external variables (e.g., job performance, turnover). An additional consideration is the degree to which scores from the tests have equivalent correlations with external variables *across* relevant subpopulations (e.g., older versus younger applicants). Thus, a major consideration in equivalence assessment is on the equality of correlations with external variables (Drasgow, 1984). In view of these considerations, and we offer a brief review of research on measurement equivalence for tests and personality inventories.

3.3.1. Electronically administered tests and personality inventories

There has been limited research on the equivalence of computerized and paper forms of tests of cognitive ability and situational judgment. Although electronically administered tests may use different technologies (e.g., testing using web based systems or stand alone computers), for the sake of simplicity we use the term computerized test to refer to both types of test administration.

Prior to discussing research on the effectiveness of computerized tests we consider different categories of tests (Anastasi & Urbina, 1997; Nunnally, 1978). A *power* test has a common set of items (that differ in terms of difficulty level) that are presented to all examinees and a time limit that is sufficiently long to allow almost all test takers to attempt all items. A *speeded test* contains items that are typically of low difficulty, but must be completed in a short period of time (i.e., one that does not allow the typical

test taker to respond to all items), so test scores are based largely on the rate at which individuals process information. In contrast, although a *timed power test* has a restrictive time limit, it allows most individuals to respond to all test items. A *computer adaptive test* (CAT) is a form of computerized test that adapts test questions to the examinee's ability level (Anastasi & Urbina, 1997). Initially, all test takers complete a common set of items. Then questions are presented to test takers on the basis of the correctness of their previous responses: if the person passes an item of intermediate difficulty then he or she is presented with a more difficult item. However, if the person provides an incorrect response to an item he or she is presented with one of lower difficulty.

A *situational judgment test* (SJT) assesses individuals' judgments about situations encountered in work situations (McDaniel, Morgeson, Finnegan, Campion, & Braverman, 2001). Examinees are presented with a set of hypothetical work scenarios and asked to choose the most appropriate response. These types of tests use predetermined scoring schemes that are tailored to specific jobs. Finally, a *personality inventory* assesses individual differences in patterns of thinking, feeling and behaving (www.apa.org).

3.3.2. Effectiveness of computerized ability tests

In selection contexts, applicants are typically required to take tests that deal with one or more facets of cognitive ability. Although there are a numerous definitions of cognitive ability tests, for the purposes of this article we view it in terms of intellectual functioning (Schmidt & Hunter, 1981). Measures of this construct are widely used predictors of job performance, and organizations are now using computerized methods to administer them.

Most of the research on computerized cognitive ability testing has considered the measurement equivalence of computerized and paper test forms. Overall, the results of this research are mixed (e.g., Mead & Drasgow, 1993; Ployhart, Weekley, Holtz, & Kemp, 2003; Potosky & Bobko, 2004). For instance, a meta analysis by Mead and Drasgow (1993) found that computerized timed power tests (e.g., the Army General Classification Tests [ASVAB]) were only slightly harder, on average than paper test forms. In addition, the restricted correlation between the two modes of administration for timed power tests was quite high ($r = .95$). However, their research showed that the two forms were less equivalent for speeded than for timed power tests. Thus, it appears that scores on speeded tests may be affected by administration mode, and decision makers should use caution when comparing applicants' scores on paper and computerized versions of speeded tests.

Research by Potosky and Bobko (2004) assessed the equivalence of computerized and paper versions of a Test of Learning Ability (i.e., TLA). Results of their study revealed a moderate correlation ($r = .60$) between the two versions. In addition, mean scores on the computerized version were significantly lower than those on the paper version. Furthermore, there were several differences in cross mode correlations for various subscales of the cognitive ability test. For instance, the cross mode correlations were .74 for the math subscale, .58 for the verbal subscale, and .44 for the spatial relations subscale. In view of these findings, the authors argued that the cross mode correlations for the cognitive ability test were too low to conclude that the computerized and paper versions of the test were equivalent. In short, the computerized TLA measure appears suffer from construct validity problems.

A study by Coyne, Warszta, Beadle, and Sheehan (2005) compared the equivalence of an online unsupervised ability test battery (i.e., the ICES) to a supervised paper version of it. The ICES test assessed four abilities (i.e., verbal, numerical, spatial and general ability). Results of the study showed that, on average, examinees scored lower on the unsupervised computerized ability test than the supervised paper version. Similarly, the coefficients of equivalence and stability for the four subscales ranged from .47 to .68, suggesting that there are differences in the psychometric properties of the two versions of the test. In short, the computerized and paper versions of the tests were not equivalent. However the difference in test supervision may have affected scores on these test forms. These issues are considered in greater detail below.

In summary, research on the equivalence of computerized and paper and pencil cognitive ability tests has produced inconsistent results. Consequently, much more research is needed to determine the factors that influence the equivalence of computerized and paper versions of cognitive ability tests.

3.3.3. Effectiveness of electronic situational judgment tests

Some research has considered the measurement equivalence of computerized and paper versions of situational judgment tests (SJTs) (e.g., Ployhart et al., 2003; Potosky & Bobko, 2004). For example, results of a study by Ployhart et al. revealed that relative to the paper version of the test the computerized SJTs (a) had lower mean scores, (b) showed more variability, (c) had more normal distributions, (d) had higher internal consistency reliability estimates, and (e) had higher relations with other measures. These findings suggest that there may be some advantages of computerized SJTs. However, they may also have some limitations. For instance, to the degree that scores on such tests are highly correlated with other predictors, the incremental validity of computerized SJTs (i.e., degree to which they explain unique variance in job performance) may suffer. However, the same is true of paper SJTs.

Research by Potosky and Bobko (2004) examined the equivalence of computerized and paper SJTs. The results of their study revealed that neither the means scores nor the standard deviations for the computerized SJT differed from the paper version. Similarly, an untimed SJT produced a moderately high ($r = .84$) cross mode correlation, suggesting that the tests are equivalent across modes of administration.

Taken together, the findings of studies by Ployhart et al. (2003) and Potosky and Bobko (2004) do not provide clear support for the equivalence of computerized and paper SJTs. Thus, research is needed to determine the factors that influence their equivalence.

3.3.4. Effectiveness of electronic personality inventories

A number of studies examined the equivalence of scores on computerized and paper personality inventories (e.g., Buchanan & Smith, 1999; Chuah, Drasgow, & Roberts, 2006; Meade, Michels, & Lautenschlager, 2007; Oswald, Carr, & Schmidt, 2001; Ployhart et al., 2003; Salgado & Moscoso, 2003). However, the results of this research are inconsistent. Some studies show that computerized and paper personality inventories have equivalent results (e.g., Buchanan & Smith, 1999; Ployhart et al., 2003). For example, Buchanan and Smith (1999) compared scores on a paper and web based version of a self monitoring scale. The results of their study revealed that (a) the internal consistency reliability estimate for the web based version was larger than that for the paper version (.75 and .73, respectively) and (b) the web based version had a slightly lower mean, and a slightly greater standard deviation than the paper version. It merits adding that the reliability difference is trivial and would have virtually no effect on validity estimates.

Ployhart et al. (2003) examined the equivalence of computerized and paper measures of conscientiousness, agreeableness, and emotional stability. The results of their study indicated that the mean scores of applicants on all three variables were higher for the paper than the computerized measures. Likewise, the variances for conscientiousness and emotional stability were greater for the computerized than the paper measures. However, the internal consistency reliability estimates were greater for the computerized than the paper measures.

Research by Meade et al. (2007) assessed the comparability of applicants' scores on an Internet based and paper version of the Occupational Personality Questionnaire (OPQ 32, SHL) (2011). The results of their study were somewhat inconsistent, but found that scores on the Outgoing and Optimism subscales were *not* equivalent. The authors also assessed whether the choice of test format was related to equivalence and found that when individuals were forced to complete measures in a non preferred format, their scores were not comparable for the Affiliative and Variety Seeking subscales. As a result, the ability to choose test format may influence the equivalence of scores on Internet based and paper inventories.

Despite the research reviewed above, results of other studies revealed that scores on paper and computerized personality inventories are equivalent (Chuah et al., 2006; Cronk & West, 2002; Meade et al., 2007; Oswald et al., 2001; Salgado & Moscoso, 2003). For instance, Oswald et al. (2001) examined the effects of the test medium and supervision on scores for scales of the Big Five personality inventory. The results of their study indicated that when examinees were supervised, mean scores were slightly larger and standard deviations were smaller for the web based than the paper condition. However, in the unsupervised condition, the means and standard deviations were very similar for both test modes.

A study by Cronk and West (2002) assessed score differences between two versions of a Visions of Morality scale (Internet based, paper) completed in class or at home. They found no differences in scores on Internet or paper tests administered at home or in class. However, they found that of the four administration modes the take home Internet based version had the lowest response rate.

Salgado and Moscoso (2003) assessed the equivalence of Internet based and paper versions of the IP/5F, a Spanish version of the Five Factor personality inventory. Results of their study revealed that the two versions were equivalent in terms of (a) internal consistency, (b) mean scores, (c) standard deviations, and (d) coefficients of equivalence and stability. Similarly, Chuah et al. (2006) compared the results of a traditional paper version of Goldberg's Big Five measure with an Internet based and a proctored computer lab version. The study's findings revealed that there were no differences in measurement properties of the scale across the three administration modes. Likewise, the study by Meade et al. (2007) found that scores on the conscientiousness subscale were equivalent across test modes.

Finally, a study by Jones, Brasher, and Huff (2002) assessed the comparability of an IVR (audiotape) and paper version of an integrity test, i.e., the Applicant Potential Inventory (API). They used three administration modes: (a) an IVR, (b) paper, and (c) paper plus IVR. Results of their study showed that there were no differences in reliability estimates for the three test versions. It merits adding that the study had very low per condition small sample sizes. Thus, because of low statistical power their findings appear to lack statistical conclusion validity (Shadish, Cook, & Campbell, 2002).

Overall, additional research is needed to assess the equivalence of computerized and paper administrations of various types of personality measures. Statistical conclusion validity is a potential problem in all studies that report null results (i.e., no between condition differences in criteria; Shadish et al., 2002).

3.3.5. Proctored versus un proctored testing

Even though web based tests may increase the efficiency and lower the costs of testing, the use of such tests poses some unique challenges for organizations. For example, one of the critical issues with web based tests is that they are often administered without supervision or proctoring (Tippins, 2009), and this may give applicants the opportunity to cheat (e.g., have others complete tests for them). We know of no evidence on the extent to which this is actually a problem, but research in educational settings indicates that 76% of college students admit to cheating on exams (Drasgow, Nye, Guo, & Tay, 2009). In spite of these findings, results of one study found that applicants did not cheat on proctored or unproctored *speeded* tests (Nye, Do, Drasgow, & Fine, 2008). Thus, cheating may be more of a problem on conventional than speeded tests, and the use of speeded tests may be one way of enhancing the validity of inferences made from scores on web based tests.

In view of the concerns about cheating on unproctored employment tests, the International Guidelines on Computer based or Internet Delivered Testing (2005) recommend the administration of follow up or confirmatory tests in controlled settings. However, the use of such tests may be costly and may serve to reduce many of the advantages of web based tests (Makransky & Glas, 2011).

It should be evident from the above that there is considerable controversy surrounding the use of unproctored web based employment tests. In this regard, some researchers maintain that cheating may be a serious limitation that reduces the validity of inferences from such tests (Tippins, 2009). As a result, many organizations use verification testing, warnings about cheating, or computer adaptive tests to deter or counteract cheating (Drasgow et al., 2009; Tippins, 2009).

To date, only a few studies have examined the effectiveness of using proctored versus unproctored web based tests in selection (Makransky & Glas, 2011; Templer & Lange, 2008). For instance, research by Templer and Lange (2008) found that testing conditions (proctored versus unproctored) affect test results. In addition, the results of the study by Makransky and Glas (2011) showed that cheating can have a negative impact on the validity of unproctored tests, but using a sequential confirmation test can decrease this problem. Thus, organizations can use confirmatory tests or speeded tests to (a) deter cheating, and (b) ensure that valid inferences are being made on the basis of scores on web based tests.

3.3.6. Applicant acceptance of electronic tests and personality inventories

Given the increasing use of web based tests by large organizations, a number of studies have examined applicants' reactions to them (e.g., Harris et al., 2003; Richman Hirsch, Olson Buchanan, & Drasgow, 2000; Salgado & Moscoso, 2003). Interestingly, the results of this research are inconsistent. For instance, some research revealed that applicants react more positively to computerized or multimedia formats than a paper format (Potosky & Bobko, 2004; Richman Hirsch et al., 2000; Salgado & Moscoso, 2003). For example, the study by Richman Hirsch et al. assessed managers' reactions to three versions of a conflict resolution inventory (paper, written form via computer, and multimedia administration by computer, including videos). Their study found that participants perceived multimedia inventories as more (a) face valid, (b) content valid, and (c) predictive of job performance than paper or computer only versions (Richman Hirsch et al., 2000). However, it deserves stressing that applicant perceptions may have little or no relation to the actual psychometric properties of measures (e.g., criterion related validity coefficients).

Research by Salgado and Moscoso (2003) found that examinees preferred an Internet based personality inventory over a paper version because it was viewed as less intimidating. Likewise, Potosky and Bobko (2004) reported that, on average, participants in their study enjoyed an Internet based cognitive ability test more than a paper test. It should be noted that many of the participants in these studies were young, and probably quite adept at computer use. As a result, they may not be representative of the wide range of individuals who apply for many jobs, especially those of low scope.

In contrast to the findings of Potosky and Bobko (2004), research by Harris et al. (2003) revealed that applicants reacted more *negatively* to web based tests than paper tests when they felt that the web based test would put them at a disadvantage in terms of technical problems (e.g., computer crashes). The authors suggested that applicants would react more negatively to web based than paper tests when the taking a test on the Internet would lead to invasions of privacy. (A more detailed discussion of privacy issues is considered in a subsequent subsection.)

Still other research revealed that test mode has no impact on individuals' reactions to tests (e.g., Meade et al., 2007; Wiechmann & Ryan, 2003). The findings of yet other studies (e.g., Oostrom, Born, Serlie, & Van Der Molen, 2010; Potosky & Bobko, 2004; Sylva & Mol, 2009; Wiechmann & Ryan, 2003) showed that reactions to computerized tests depend on a host of other factors (e.g., computer anxiety, computer self efficacy, test taking experience or self efficacy). Several of these factors are considered below in a subsection that focuses on adverse impact.

3.3.7. Summary and directions for research on electronic tests and personality inventories

In summary, there has been relatively little research on the equivalence and applicant acceptance of some types of computerized (e.g., web based) and paper tests (e.g., cognitive ability, SJTs). In contrast, the findings of a number of studies showed differences in the effectiveness and applicant acceptance of computerized and paper personality inventories, but the results of these studies are far from conclusive. We believe that one reason for these mixed findings is that computerized cognitive ability tests may be much more demanding than paper tests because applicants must attend to two tasks simultaneously (i.e., manage the computer system and complete the test). As a result, it is not clear if scores on these tests are a function of applicants' cognitive abilities or their familiarity with the use of computers. Therefore, research is needed to examine the degree to which multiple task demands influence scores on computerized tests.

Interestingly, some researchers maintain that methodological factors have influenced the results of research on the measurement equivalence of tests and inventories. For example, Reynolds and Dickter (2010) argue that many of the studies on measurement equivalence used quasi experimental (as opposed to randomized experimental) designs. As a consequence, differences between groups may be due to the lack of random assignment of participants to conditions rather than a lack of test equivalence. As a result, randomized experimental research is critical for determining the degree to which measures of different types are equivalent (Stone Romero, 2008, 2009, 2010).

It deserves adding that most of the research on the measurement equivalence of computerized and paper tests and inventories has considered the criteria of (a) correlations between test forms, and (b) the comparability of means and standard deviations (Mead & Drasgow, 1993). Unfortunately, it has not assessed the degree to which the patterns of relations with external variables are equivalent. Likewise, only a few studies have examined the equivalence of relations across various subgroups (e.g., older versus younger applicants, ethnic minority versus majority). Therefore, research is needed to assess the (a) criterion related validity of inferences made from computerized and paper tests and inventories, and (b) degree to which patterns of relations with job performance and other criteria are equivalent across subgroups formed on the basis of sex, age, ethnicity, and proficiency in computer use. As a result, we offer the following predictions to guide research:

H8. Computer ability and computer self efficacy will be positively related to the validity of inferences made from computerized versions of cognitive ability tests and personality inventories.

H9. Applicant acceptance of computerized versions of cognitive ability tests and personality inventories will be negatively related to beliefs that they impose a greater degree of cognitive load than paper cognitive ability tests and inventories.

3.4. Step 4: electronic interviews

In the fourth stage of the selection process organizational representatives (e.g., HR specialists, supervisors) typically conduct face to face interviews with candidates. The interviews allow for the collection of information about such variables as the communication and interpersonal skills of applicants. In addition, they allow applicants to ask questions about the job and the organization. However, face to face interviews are time consuming and costly. As a result, organizations are now using electronic technology (e.g., videoconferencing, telephones) to conduct interviews (Chapman & Rowe, 2002). Although there may be a number of advantages of the use of this technology, the results of research reveal that the type of technology used (e.g., videoconferencing) may affect the effectiveness and applicant acceptance of electronic interview systems (e.g., Bauer et al., 2004; Chapman & Rowe, 2002; Chapman, Uggerslev, & Webster, 2003; Straus, Miles, & Levesque, 2001). Therefore, in the following section we review research on electronic interviews. Before considering this research, it is important to note that a number of companies are marketing IVR systems for interviews (Thornburg, 1998; Young, 2003). However, no data on the extent to which IVRs are actually used for this purpose. In addition, there is no research on the effectiveness of using IVRs in actual selection systems in organizations. Nevertheless, as noted below, there is research on the relative effectiveness of IVRs in simulated interview contexts.

3.4.1. Effectiveness of electronic interviews

Some research has assessed the effectiveness of electronic interview methods. For example, several studies examined the extent to which varying types of interview formats (e.g., face to face, telephone, and videoconferencing) affect ratings of job applicants (e.g., Silvester, Anderson, Haddleton, Cunningham Snell, & Gibb, 2000; Straus et al., 2001). However, the results of this research are mixed. In some cases they indicate that applicants are rated lower when the interview is conducted by telephone than by face to face methods (Silvester et al., 2000). However, the results of other research show opposite results. For example, the findings of a study by Straus et al. (2001) show that that (a) applicants are rated *higher* in terms of ability and likeability using telephone than face to face methods, (b) there are no differences in ratings of applicants between videoconferencing and face to face methods, and (c) telephone interviews decrease some of the biases that are present in face to face interviews. More specifically, unattractive applicants receive lower ability ratings when the interview is conducted with face to face than telephone methods (Straus et al., 2001). In contrast, when applicants are attractive, there are no differences in ratings between these two methods. Thus, one advantage of telephone interviews is that interviewers may focus on an applicants' job qualifications rather than variables that may have no bearing on performance for many jobs (e.g., appearance, race, and disability).

3.4.2. Applicant acceptance of electronic interviews

Research also has examined applicants' reactions to varying types of interview methods (e.g., Bauer et al., 2004; Chapman & Rowe, 2002; Chapman et al., 2003). Results of several studies (e.g., Bauer et al., 2004; Chapman et al., 2003) revealed that applicants react more positively to face to face, than telephone, videoconference, or IVR methods. For example, research by Bauer et al. found that face to face interviews are viewed as fairer than IVR interviews. In addition, they found that individuals viewed the company's image more favorably when the interview was conducted face to face than with an IVR. Similarly, results of a study by Chapman et al. showed that face to face interviews are perceived as more fair and applicants were more likely to accept a job offer from a company that used such interviews than either telephone or videoconferencing interview methods. One explanation of these findings is that face to face interviews give applicants more of an opportunity to manage positive impressions than do telephone or videoconference interviews (Stone Romero, Stone, & Hyatt, 2003). Another is that face to face interviews send a signal that the organization cares about applicants, whereas electronic interviews suggest that the organization is concerned with efficiency and cost containment.

Interestingly, the results of other studies show that reactions to interview methods may vary as a function of such factors as interview structure, applicant gender, and personality (e.g., Chapman & Rowe, 2002; Chapman et al., 2003). For instance, the Chapman and Rowe study found that interview medium interacted with the structure of the interview to affect applicant reactions: when an interview is low in terms of structure, applicants are more attracted to the organization when the interview is conducted with a face to face than a videoconference method. In contrast, when an interview is high in structure, applicants are more attracted to the organization when the interview is conducted with a videoconference than a face to face method.

The study by Chapman et al. (2003) found that the self monitoring level of individuals moderated the relation between interview method and perceptions of fairness. More specifically, applicants high in self monitoring are more likely to perceive face to face interviews as fair than those low in self monitoring. However, those low in self monitoring are less likely to perceive telephone interviews as fair than those high in self monitoring. Thus, personality may influence applicant acceptance of interviews methods. This may be a real problem because organizations have no way of determining the method that will be most

liked by a specific applicant. Even if they did, legal considerations may not want allow them to tailor methods to specific applicants.

3.4.3. Summary and directions for research on electronic interviews

In spite of the growing use of electronic interviews relatively little research has addressed their effectiveness or applicant acceptance. Most of this research examined the impact of different types of interview methods (e.g., face to face, IVR, telephone, videoconference) on ratings of applicants. However, the existing research does not fully explain why some electronic methods may be more effective or acceptable than others. As a result, additional research is needed to examine the factors that affect the effectiveness and applicant acceptance of electronic interview methods. For instance, along with others (Chapman et al., 2003) we believe that the degree of "media richness" (Daft & Lengel, 1984) may influence the effectiveness and applicant acceptance of electronic interviews. Thus, we predict that when electronic interviews use rich media (e.g., videoconferencing) they are more likely to be effective and acceptable to applicants than when they do not. However, we know of no empirical research on this issue. Thus, we offer the following hypotheses to guide it:

H10. Interview medium richness will be positively related to the validity (e.g., criterion related) of inferences stemming from interviews.

H11. Interview medium richness will be positively related to applicant acceptance.

3.4.4. A final note on electronic measurement methods

Organizations often use data from types of measures other than those considered in this paper (e.g., background checks, drug tests). A review of all such methods is beyond the scope of this article. Nevertheless, electronic methods may help with many of them. For example, organizations can use electronic methods for conducting background checks (e.g., checking multiple sources of online information). This strategy may be quite useful for several purposes (e.g., averting negligent hiring problems).

3.5. Step 5: e selection decision making

Organizations use data on a number of predictors (e.g., test scores, job experience information, and job sample tests) to make hiring decisions. This is a critical step in the selection process because the primary goal of selection is to make decisions that will lead to the maximization of job performance and other important criteria (Guion, 1965). As a result, any evaluation of the adequacy of a selection system must consider the degree to which it enables organizations to hire the most qualified applicants. Achieving this goal is contingent on the use of effective selection decision making strategies (decision strategies hereinafter).

3.5.1. Decision strategies

Organizations may use any one of a number of strategies to make selection decisions. One entails (a) combining predictor scores into a composite, (b) ranking the applicants in terms of the composite, and (c) selecting one or more applicants on the basis of the composite scores. Others include using multiple hurdles, or multiple cutoff strategies. As noted below, whatever strategy is used, e selection techniques may facilitate decision making.

It deserves adding that in developing composite scores to use in predicting job performance (or other criteria) organizations may determine weights for each predictor using multiple regression. Optimal regression weights are determined using scores on various predictors and criteria that the organization has about its current employees (i.e., historical data), and once the weights have been determined they are used in making regression based predictions about the performance of current or future applicants.

Unfortunately, the regression approach may not be appropriate for all types of jobs at early stages in decision making. In such instances a multiple hurdles approach may be used. For example, in hiring a pilot a company may require evidence that he or she has appropriate certifications (e.g., commercial, instrument, multi engine, Class II Medical). Note that in a multiple hurdle system high scores on one predictor cannot compensate for low scores on another. For example, a perfect score on an FAA written examination cannot compensate for a failure to pass a practical test for a particular certification (e.g., instrument).

As is suggested by the above, organizations can use different selection strategies sequentially. More specifically, a multiple hurdles strategy can be used at early stages of the decision making process. Then the multiple regression based strategy can be used to predict the performance of all applicants who meet or exceed the cutoff values in the multiple hurdle system (Heneman, Judge, & Kammeyer Mueller, 2011).

3.5.2. Effectiveness of e selection decision making

E selection can facilitate selection decisions by enabling a selection system to use one or more decision making strategies (e.g., multiple hurdles, multiple cutoffs). As noted above, information about each of the predictors can be gathered at different points in time in the selection process (e.g., job experience information can be gleaned from an application blank, whereas scores on tests can be obtained after the initial screening of these blanks). Thus, e selection can enhance the workflow associated with the selection process. At any given stage in the process a decision maker can access an applicant's standing with respect to data on previously assessed predictors.

Note that HR specialists can use decision support systems to model the impact of different decision strategies on the utility and validity of inferences made from selection systems. For instance, they can examine the consequences of (a) using varying cutoff scores for different predictors or (b) the utility of using regression based models. A detailed description of decision support systems is provided in the article by Dulebohn and Johnson in this issue of the journal.

We know of no research on the effectiveness of using e selection based decision support systems, but believe that it is much needed. As a result, we provide the following hypothesis to guide it:

H12. The use of e selection based decision support systems will help organizations make more valid inferences about applicants than traditional selection systems.

3.5.3. Applicant acceptance of e selection systems for decision making

The use of different selection decision strategies is often time consuming and costly to implement. As a result, electronic systems should make these tasks easier and less time consuming for staff members and decision makers (e.g., HR specialists, managers) than traditional decision strategies. Therefore, we predict that decision makers will react more positively to e selection systems than traditional systems because the former systems decrease their workload. To our knowledge, no research has examined decision makers' reactions to the use of e selection systems. Therefore, we make the following prediction:

H13. Organizational members will react more positively when electronic selection systems are used to make selection decisions than when traditional systems are used.

3.6. Step 6: evaluation of e selection system effectiveness

In the last step of the selection process, organizations can use data in e selection systems to evaluate system effectiveness, assess the validity of predictors, and conduct adverse impact analyses. For instance, organizations can use e selection systems to generate criterion (outcome) measures to evaluate and improve overall system effectiveness. In addition, they can use these systems to assess the validity of inferences made from selection predictors. Finally, they can use these systems to generate adverse impact analyses, and aid in the preparation of other required government reports (e.g., Affirmative Action Utilization Analysis, EEO 1 Reports). Each of these issues is discussed below.

3.6.1. E selection system effectiveness criteria

One of the major advantages of e selection systems is that they enable organizations to easily collect and analyze data needed to evaluate system effectiveness. For instance, these systems can be configured to generate reports on the degree to which e selection enables organizations to meet their selection related goals. In particular, they can determine if e selection systems increase (a) the number of quality hires, (b) the percentages of employees who meet or exceed performance standards, (c) employee retention rates, (d) unit or organizational performance, and (e) workforce diversity (e.g., Kehoe et al., 2005). In addition, they can examine applicant yield rates, reduction in hiring time, or costs per hire which may improve an organization's financial performance. Furthermore, the information in e selection systems can be integrated with data from financial, human resource, or customer data systems to analyze employee success rates. Then, data from these metrics can be used to improve the selection system. A more detailed discussion of HR metrics is considered in the article by Dulebohn and Johnson (2012). One of the outcome measures used to evaluate system effectiveness is the criterion related validity (e.g.,) of predictors. This issue is considered in the next section.

3.6.2. Validation studies

Organizations can use e selection systems to gather and analyze data for validation studies. These studies help organizations determine if they are making correct inferences about applicant success, and enable them to meet legal requirements (EEOC, 1978). For instance, the Uniform Guidelines on Employee Selection (EEOC, 1978) require that organizations show that the selection predictors and the inferences made from them are valid.

Organizations can use data from e selection systems to conduct construct validity (e.g., criterion related validity, content validity) studies. *Construct validity* is defined as the degree to which there is correspondence between the scores derived from a measure and the hypothetical scores on the underlying construct (Nunnally, 1978; Shadish et al., 2002). Note that construct validity cannot be assessed directly. Rather, evidence about this type of validity is obtained by conducting studies on criterion related validity and content validity.

Criterion related validity studies are used to show that the predictors used in selecting employees are related to relevant criteria (e.g., job performance; EEOC, 1978). *Content validity* is demonstrated by showing, for example, that the items in a measure of job related knowledge are a representative sample of job behaviors (EEOC, 1978). Both criterion related validity and content validity evidence can be vital in supporting the use of a predictor should its legality be questioned. In addition, both types of evidence support inferences about construct validity.

It merits noting that construct validity evidence cannot be based on the results of a single study. Instead, it must be based on the results of sets of studies that deal with both criterion related validity and content validity. E selection can facilitate construct validity studies by collecting and integrating data from both types of studies.

3.6.3. Adverse impact issues

Legal and ethical guidelines require that selection procedures not have an adverse impact on members of various subgroups (e.g., subgroups based on race, sex, or ethnicity). *Adverse impact* refers to the degree to which a selection procedure has a disproportionately negative impact on members of such subgroups (EEOC, 1978). If the use of specific predictors or the overall selection process has an adverse impact on members of such subgroups it is considered unfairly discriminatory unless the organization can demonstrate that the predictors are valid (EEOC, 1978). Therefore, it is vital that organizations conduct analyses to determine if their selection systems have an adverse impact on subgroup members.

Not surprisingly, adverse impact analyses are often very tedious and time consuming, especially for large organizations. However, e selection systems can streamline their completion. For instance, these systems can collect, store, analyze and provide reports about the adverse impact that the selection process (or predictors) has on subgroup members. Then, data from these reports can be used to improve the overall selection process (e.g., by identifying alternative selection strategies that can be used to alleviate this problem).

In most cases, legal guidelines require that organizations examine the adverse impact of the total selection process, but in some cases organizations are required to evaluate the adverse impact of each predictor for each subgroup (e.g., African Americans, Hispanic Americans, and Native Americans; EEOC, 1978). Therefore, e selection systems can greatly facilitate the process of generating the data used for such analyses. Given the importance of adverse impact in the selection process, we consider this issue in more detail below.

3.6.4. Effects of using e selection systems on adverse impact and workforce diversity

Throughout this article we argue that the "blind" use e selection systems may result in adverse impact for members of some subgroup. For example, these systems require that applicants have computer access and computer related skills. However, studies (e.g., Pew Internet and American Life Project, 2010) reveal that members of age, sex, and racial subgroups are less likely to have such skills than majority group members. Thus, the sole reliance on e selection systems by organizations may adversely affect the employment opportunities of various subgroup members. In addition, the use of such systems may inadvertently limit the diversity of the workforce. Each of these issues is considered below.

Researchers have argued that women, older applicants, and members of several ethnic groups may be adversely affected by the use of e selection systems (McManus & Ferguson, 2003; Stone et al., 2005). One reason for this is that research shows that there are age, race, and socioeconomic differences in access to the Internet. For instance, results of a recent survey (Pew Internet and American Life Project, 2010) show that 63% of Anglo Americans, 52% of African Americans, and 47% of Hispanic Americans have Internet access. As a result, members of these subgroups are less likely to have the computer related skills and abilities needed to use e selection systems. Likewise, research results indicate that there are age based differences in the use of the Internet for job searches. For example, the results of survey research (Pew Internet and American Life Project, 2010) reveal that whereas 36% of individuals over the age of 55 use the Internet to search for jobs, 65% of those in the 18 34 age range use it for this purpose. In addition, the results of research show that there are sex and race based differences in computer anxiety, which may negatively affect the ability of some individuals to use e selection systems. For instance, results of a study by Wallace and Clariana (2005) reveal that women, older applicants, and African Americans have more difficulty using e selection systems than members of other groups. Thus, the "blind" use of e selection systems by organizations may result in adverse impact for members of some subgroups, and it may be especially problematic in the case of jobs in which women and minorities are unrepresented (McManus & Ferguson, 2003).

In support of the above noted arguments, the results of research on computerized testing by Potosky and Bobko (2004) show that although younger individuals perform better on web based tests than older individuals, there are no such age based differences in performance on paper tests. The findings of their study also reveal that age is negatively related to Internet self efficacy; that is, older study participants are less confident and less familiar with Internet based tests than younger ones. In addition, their research indicates that computer understanding and experience are positively related to performance on web based, but not paper tests.

Studies in education also have shown that there are gender, race, and age differences in performance on computerized tests (Parshall & Kromrey, 1993). In particular, the studies reveal that women score lower on computerized versions of quantitative tests than paper versions. In addition, minority men score lower on computerized verbal tests than paper tests. Furthermore, compared to younger African Americans, older Americans score lower on computerized than paper tests. These findings suggest that web based employment tests have the potential to result in an adverse impact for elderly applicants, women, and minorities. However, research is needed to directly assess these effects in selection (as opposed to education) contexts.

The "blind" and exclusive use of e selection systems by organizations may serve to limit workforce diversity. For instance, the results of a study by McManus and Ferguson (2003) reveal that applicants who use web based application systems are younger than applicants who use traditional systems. In addition, the users of web based systems are more likely to be Anglo American than African American. However, results of the same study also show that African Americans are more likely to use web based application systems than networking systems (e.g., job fairs). Thus, even though web based application systems may reduce the number of older individuals who apply for jobs, they may increase job applications by African Americans. Even though there has been some research on the issue, much more research is needed to assess the impact of e selection on the demographic makeup of organizations.

3.6.5. Summary of adverse impact issues and directions for research

We know of no direct research on the adverse impact of e selection systems. However, the results of several studies suggest that the lack of computer skills may negatively affect an applicant's scores on computerized tests.

There is very little research on the effects of e selection systems on workforce diversity. Thus, much more research is needed on these issues. However, we believe that the "blind" and exclusive use of e selection systems by organizations may serve to limit the demographic diversity of job both job applicants and incumbents. Thus, organizations can take a number of steps to ensure that all applicants have an opportunity to apply for jobs and complete various tests and assessments. For instance, organizations might give applicants a choice of using a web based or a paper test rather than requiring them to use the former type of test. In support of this argument, research shows that giving applicants a choice of testing modes leads to positive changes in their scores on personality measures (Meade et al., 2007). In addition, choice influences applicant satisfaction with testing procedures (Lukaszewski, Stone, & Stone Romero, 2008).

Overall, we believe that organizations should use several application methods (e.g., paper applications, kiosks, or IVR systems) rather than only relying on those that are web based. Likewise, they should allow staff members to enter data on web based systems for applicants who lack computer skills in cases where such skills are not needed on the job. Although these alternatives appear feasible, research is needed to determine if they (a) enhance the diversity of the workforce, and (b) influence the costs of processing applications.

In view of the need for organizations to consider adverse impact, we offer the following predictions to guide future research:

H14. The use of web based employment tests will have more of an adverse impact on members of some subgroups than paper tests.

H15. There will be less adverse impact on subgroup members when an organization gives applicants a choice of test formats than when they do not.

H16. The use of multiple application methods will result in greater workforce diversity than the use of only the web based method.

Another concern about the use of the e selection systems is their potential to invade the privacy of applicants (applicant privacy hereinafter). Therefore, we address this issue below.

3.7. Potential for e selection systems to invade the privacy of applicants

There are growing concerns about the potential for e selection systems to invade applicant privacy. For instance, the findings of a number of studies (e.g., Harris, 2006; Linowes, 1989; Piller, 1993; Stone & Stone, 1990; Stone et al., 2003) reveal that individuals are concerned about the potential for e selection systems to invade privacy because of such problems as (a) the failure of organizations to provide for data security, (b) the unauthorized release of personal data by organizations, and (c) the use of invalid data in the selection process. Each of these issues is considered below.

3.7.1. Data security problems and invasion of privacy

Applicants are often concerned with the use of e selection systems, especially web based systems, because they give users access to a wide array of personal information about data subjects (e.g., job applicants and job incumbents), including their social security numbers, test scores, and physical and mental health information (Stone et al., 2003). As a result, data subjects may perceive that if these data are accessed by others, they may experience one or more negative outcomes (e.g., stigmatization, denial of jobs or promotions, discharge, and layoff). Interestingly, results of some research suggest that this concern may be well founded. For example, the findings of one study (Privacy Rights Clearinghouse, 2010) indicate that over 500 million organizational records have been breached since 2005. Although these breaches involved a wide variety of types of data, there has been a rise in theft of employment data. For instance, in 2010, a hard drive was stolen from the AMR Corporation, the parent company of American Airlines. It had information about current and former employees, including their names, social security numbers, health records, and bank account data.

As a result of data security problems there is a growing concern about identity theft with e selection systems. In view of it a number of states (e.g., CA, CT, RI, TX, MA, and NV) have passed data security laws that require organizations to adopt reasonable security procedures to prevent unauthorized access to employee data.

Several recent studies have examined the extent to which eHRM systems are perceived as unfair or invasive of privacy (e.g., Bauer et al., 2006; Eddy, Stone, & Stone Romero, 1999; Lukaszewski & Stone, 2003; Stone, Lukaszewski, & Stone Romero, 2001). The results of the study by Eddy et al. (1999) show that individuals are more likely to perceive that an eHRM system is invasive of privacy and unfair when they are unable (as opposed to able) to control the release of information outside an organization. Similarly, the findings of a study by Stone et al. (2001) indicate that an eHRM is considered more invasive of privacy when employment data are disclosed to supervisors than to HR staff members. Furthermore, research by Lukaszewski et al. (2008) reveals that employees are more likely to perceive their privacy is invaded when medical data are (as opposed to are not) collected and stored in an eHRM system. It merits noting that the Health Insurance Portability and Accountability Act (HIPAA) requires that health data not be used in making employment decisions. In spite of this, some organizations store data about the findings of physical examinations or drug tests in their eHRM systems.

3.7.2. Unauthorized data disclosure problems

Data subjects are also concerned about the use of e selection systems because they may result in the unauthorized disclosure of information to individuals within and outside of the organizations that initially stored it. In support of this argument, research

(Linowes, 2000) shows that 70% of employers regularly disclose employment data to creditors, 47% give information to landlords, and 19% disclose employee data to charitable organizations. In addition, some reports indicate that organizations regularly sell data collected on recruiting websites. Furthermore, 60% of employers do not inform applicants or employees when they disclose information within our outside the organization (Society for Human Resources Management and West Group, 2000). Thus, the use of e selection systems may lead to releases of information about data subjects. Regrettably, there are few legal restrictions on this practice in private sector firms. As a result, data subjects may be justifiably concerned about unwanted releases of information stored e selection system files.

3.7.3. Data accuracy problems

Data subjects also report that they are concerned about the use of e selection systems because they often contain inaccurate data. Unfortunately, they are often unaware that data in such systems are inaccurate, and many organizations do not provide them the opportunity to correct inaccurate information. For example, the results of studies (e.g., Society for Human Resources Management and West Group, 2000) show that although data from background checks, credit checks, or social media are often inaccurate, they often end up appearing in the permanent records of e selection systems. Inaccurate data are especially problematic because they may stigmatize individuals unfairly and lead to a number of negative outcomes (e.g., job loss, denial of promotion). For instance, an executive at Hilton Hotels was terminated shortly after he was hired because of incorrect background check data (Socorro vs. IMI Data Search and Hilton Hotels). Although he won a lawsuit against the former employer, he had trouble getting jobs for many years because the inaccurate information was disseminated to a number of databases. The findings of other studies (e.g., Stone et al., 2003) indicate that mistakes in a person's name, identity theft, and arrest records without case dispositions also may result in the loss of employment opportunities.

The use of inaccurate data in e selection systems may have a negative impact on both organizations and individuals. For example, when data in these systems are inaccurate organizations may make erroneous inferences about the likely success of applicants, and fail to hire highly qualified individuals, denying them opportunities for gratifying careers. As a result, some applicants are likely to perceive that e selection systems are unfair and/or invasive of privacy. In support of this argument, research by Stone et al. (2001) found that individuals are more likely to perceive their privacy had been invaded when they are unable (as opposed to able) to check the accuracy of data in eHRM systems.

3.7.4. Summary of privacy issues and directions for research

As noted above, data subjects may perceive that e selection systems are invasive of privacy because data in them are inaccurate or may be disclosed to others without their permission. As such, they are more likely to perceive that these systems are unfair and invasive of privacy than traditional systems. We believe that these problems can be averted by the development of clear and appropriate privacy policies by organizations. For example, they should (a) establish policies that allow individuals to check the accuracy of data in e systems, (b) release data about employees or applicants to others if and only if the data subjects consent to it, and (c) develop and use sound data security systems.

In view of the just noted concerns about privacy, we offer the following hypotheses to guide future research:

H17. Concerns about invasion of privacy in e selection systems can be reduced by (a) having effective system security safeguards, (b) allowing individuals to check the accuracy of data in e systems systems, and (c) requiring organizations to obtain the consent of data subjects prior to disclosing their data to others.

4. Conclusion

Organizations are using e systems increasingly to facilitate selection because they have the potential to result in such benefits as increased selection efficiency and decreased selection system costs. Despite the widespread use of such systems, relatively little research has examined the determinants of their effectiveness and applicant acceptance. Thus, one of the major objectives of this article was to consider potential determinants of these criteria. We considered them at each stage of the selection process (e.g., job analysis, job application, testing and assessment, interviewing, selection decision, and system evaluation). In addition, we specified some of the unintended consequences of using e selection systems (e.g., adverse impact and invasion of privacy).

The review indicates that e selection systems have the potential to help organizations and individuals meet their short term and long term goals. However, additional research is needed to assess the extent to which system, procedural, and individual factors influence (i.e., cause) the achievement of these objectives. Especially critical in this regard is research that allows for causal inferences about the factors that determine system effectiveness and applicant acceptance (Shadish et al., 2002; Stone Romero, 2008, 2009, 2010). In the interest of furthering research on these criteria we offered numerous testable hypotheses.

We hope that our review helps organizations to design and implement e selection systems that consider both the needs of both organizations and individuals. To the degree that this is done organizations will be able to improve their selection practices and achieve such goals as improved productivity and decreased costs. In addition, applicants will have improved chances of gaining access to jobs for which they are well qualified, allowing them to have rewarding careers.

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