

Chapter 2

Simulations in the Selection Context: Considerations, Challenges, and Opportunities

Anthony S. Boyce, Christine E. Corbet and Seymour Adler

The use of simulations for assessing and selecting employees has a long and distinguished history in both government and commercial organizations, in the United States and globally. Over the past few decades, however, simulations have been increasingly used as “free-standing” elements of selection processes, outside their traditional role embedded in full-blown assessment centers. Today, simulations are used in selection processes in varying forms in conjunction with other assessment tools such as structured interviews, cognitive ability tests, and personality inventories. As with each component of a selection process, the simulation designer must consider the incremental value that the simulation adds to the process, relative to the other elements. There are many potential advantages for employing simulations for selection, but potential drawbacks exist as well.

In this chapter, we begin with a discussion of the advantages and disadvantages of using simulations. Next, we highlight some of the key considerations involved in the design and implementation of simulations, providing practical guidance and recommendations for areas in need of future research. We then examine the role of simulations in the candidate life-cycle from the perspective of both organizations and candidates. Finally, we conclude with a brief exploration of how changes in technology are likely to impact the nature of simulations and how candidates interact with them in the future.

A. S. Boyce (✉) · S. Adler
Aon Hewitt, New York, NY, USA
e-mail: anthony.boyce@aonhewitt.com

C. E. Corbet
Right Management, New York, NY, USA
e-mail: christine.corbet@right.com

S. Adler
e-mail: seymour.adler@aonhewitt.com

2.1 Advantages and Disadvantages of Simulation Use

2.1.1 *Validity*

Work samples, including simulations, have consistently demonstrated strong criterion-related validities (e.g., Schmidt and Hunter 1998). Indeed work samples typically are among the most valid tools for employee selection. Positive validation evidence has emerged across a wide range of settings and target jobs, from entry-level to management positions. Of course, the meta-analytic publications blend together in a single broad category labeled “work samples” or “simulations” a variety of specific procedures that differ a great deal in their design (as is true for meta-analyses of the validity of structured interviews, for example). Nonetheless, there are solid reasons for expecting simulations to be valid predictors of job performance.

To begin, as performance-based tests, simulations are less subject to the threats of faking and social desirability-based response distortion than what has been found to be true of personality inventories and interviews. In addition, during a simulation, as on the job, the participant *behaviorally* demonstrates within a representative situational context the underlying capacities—technical knowledge, prior learning, personality traits, and cognitive ability—that other selection tools only measure in a nonbehavioral format. In the classical formulation articulated by Wernimont and Campbell (1968) close to a half-century ago, simulations measure behavioral *samples*, not *signs*. Thus, if designed properly, the content of simulations mirrors the content of the target position. Indeed content-oriented strategies are often appropriately and successfully used to validate simulations. Furthermore, beyond actually being valid for selection decisions, simulations have another advantage—they *look* valid given their greater degree of fidelity and similarity to the target position.

2.1.2 *Credibility*

Over the past 20 years, research and practice in industrial-organizational (I-O) psychology has begun to recognize the importance of ensuring that elements of the assessment process appear credible and fair to candidates. Academic research, starting with Gilliland’s (1993) landmark study, has largely drawn on justice theory to describe the factors that affect candidate perceptions of the fairness of various assessment procedures. Practitioners similarly are concerned with the impact of how candidates are treated during the pre-employment process on the organization’s employment brand (Yu and Cable 2012). Indeed, in some businesses, especially mass-market retail, there is a growing realization that job candidates are also consumers. How people are treated as candidates can affect how prospective customers perceive the organization’s brand as a provider of goods or services and whether those perceptions are shared by candidates with their respective social networks.

While simulation fidelity can vary to a great extent, simulations as a whole have higher fidelity than all other assessment techniques (we will address the question of

how much fidelity is required in a simulation later in this chapter). Only during a simulation can job candidates be confronted with vividly representative real-life job challenges. They can be given the freedom to respond in ways—by speaking, writing, and making decisions—that reflect how they would actually respond in the target position. Research has demonstrated that perceived job relevance, ability to perform to the best of one's abilities, and the perceived value of potential feedback are all factors that affect the perceived credibility of assessment procedures and the perceived fairness of outcomes coming from those procedures. Not surprisingly, meta-analytic findings (e.g., Hausknecht et al. 2004) have found simulations to be consistently perceived as more favorable by candidates than all other selection techniques, with the exception of interviews.

2.1.3 *Flexibility*

In many ways, an organization looking to add a simulation to the selection process has a larger range of design and delivery choices than it would have with alternative assessment methods. For instance, traditional psychometric tools measuring cognitive ability, job knowledge, or personality can be administered in paper form or on a computer. Length typically ranges from 15–90 minutes, rarely shorter and rarely longer in operational selection situations. In contrast, as the chapters in this volume amply illustrate, simulations take on many forms. They can last 10 minutes or 10 hours and can have candidates interact with a single role-player or with a team of role-players. They can be technology-enabled or rely on print materials. They can require the candidate to behave naturally (e.g., creating and delivering a sales presentation to a live audience) or in highly structured ways (e.g., selecting a behavior from a list of alternative responses). Candidate behavior can be recorded or not. Correspondingly, if recorded, assessment of candidate performance can occur immediately following participation in the simulation or at a later point in time.

The many simulations described in this book illustrate the range of complexity that simulations today take on. Some are stand alone, relatively brief exercises (as short as 2–3 minutes), while others are day-long simulations with multiple components and multiple interactions. Even the more complex simulations vary in the timeframe they *represent*; some are day-in-the-life experiences and others may have a year's worth of events unfold over the course of a day. Moreover, simulation exercises can be delivered face-to-face, over the telephone, through personal computers, over the web with or without media-rich enhancements, and with or without live visual or auditory interaction with role-players. Simulations can be simultaneously administered to individual candidates or to groups of candidates, and if to groups, individuals in a group can be allowed to interact with each other or not. This range of sizes and shapes affords the designer a great deal of flexibility when inserting a simulation into a selection process.

Finally, simulations—certainly, if they are custom-designed for a particular application—can accommodate the assessment of a very wide range of constructs.

Simulations can be designed to assess leadership or customer service skills. They can tap decision-making under stress or the ability to adapt to change. Simulations can measure the depth of a candidate's technical knowledge and the ability to apply that knowledge in job-relevant situations. This flexibility means that in designing a selection process, the practitioner can identify those critical job requirements not well assessed by other elements of the process and devise a simulation to specifically focus on those gaps.

2.1.4 *The Downside*

Historically, the key negative to implementing simulations has been the relatively high cost of administering them. An associated negative for adopting simulations has been the need to bring candidates to a facility and have trained, skilled assessors evaluate the candidates' performance on the simulation. In some cases, the simulation further required a special apparatus, for example, for ergonomic measurement in simulations used for firefighters or cable technicians.

At this point in time, the development of a customized simulation is still relatively expensive and time-consuming, even, or especially, if technology is part of the design. It is not unusual for the design of a simulation, particularly if it is technology-enabled, to take 4–6 months from inception to deployment. Urgent selection challenges may require quicker answers. We should point out, though, that the cost of designing and validating a simulation may not be materially different from the cost of designing and validating more traditional measures of aptitude, personality, or job knowledge.

Offsetting the cost of investing in a technology-enabled solution is often the more efficient delivery of simulation content on an ongoing basis. Thus, for example, creating a system that analyzes and scores written verbal content (e.g., inbox e-mail responses) can virtually eliminate professional labor costs associated later with scoring. Costs need to be carefully analyzed in terms of the specialized skills and associated labor rates required at the design and delivery stages. In particular, the calculation of projected returns has to take into account the number of people who will be administered the simulation—the amortization base—and the financial and less tangible risks associated with a bad hire or a bad candidate experience.

2.2 Design and Implementation Considerations

Implementing job simulations can be a relatively simple endeavor if an existing off-the-shelf (OTS) solution is chosen, or it can be a complex process that spans many months and requires substantial input from relevant stakeholders and subject matter experts (SMEs). Where a particular job simulation falls along this continuum is influenced by many situational constraints, including budget for development

and ongoing administration; people factors related to stakeholders and the candidate pool; the breadth and depth of the knowledge, skills, abilities and other characteristics (KSAOs) targeted; and the degree to which technology is leveraged to aid in delivery and scoring. Each of these considerations places constraints upon key features (e.g., fidelity, medium, and scoring method) of the job simulation itself as well as the development and implementation processes. In turn, these features impact the outcomes of the simulation (e.g., validity, candidate reactions, and generalizability). While the interrelationships between these factors are somewhat complex, we have broken our discussion into seven key areas so that interested readers can target their review to some or all of the components. These areas are: fidelity, KSAOs, selecting an OTS simulation tool, approach to scoring, proctored versus unproctored, use of technology, and managing the interests of simulation stakeholders.

2.2.1 *Fidelity*

One of the most salient features of a job simulation is *fidelity*, the degree to which the simulation authentically reflects the targeted job in terms of both stimuli and responses (Motowidlo et al. 1990). Although these two components of fidelity are related, each can be considered to vary along a continuum. Assessment centers and work samples generally reside at the high end of stimuli fidelity in that they include actual (or close approximations of) job materials, equipment, and people to enhance the realism of the assessment and more closely replicate features of the target job. Computer-based simulations often fall into the middle range of stimuli fidelity, replacing actual job materials and equipment with less realistic or more general mock-ups and substituting video, avatar, or audio representations for live people. The low end of stimuli fidelity is anchored by traditional situational judgment tests (SJTs) where the stimuli are limited to text-based descriptions of the task situation. Likewise, the degree to which a simulation affords candidates the opportunity to perform the range of behaviors that would be available to them on the job (i.e., response fidelity) varies greatly and impacts overall fidelity. For example, work samples and role-plays can allow candidates to actually perform the relevant behaviors as they would on the job, whereas computer- or paper-based simulations often limit candidate responses to a set of multiple-choice options.

Among the chief advantages of high fidelity simulations is that they generally exhibit high face validity. Due to the obvious overlap between the simulation and the job, candidates and stakeholders (e.g., recruiters and hiring managers) can easily see how performance on the simulation relates to expected performance on the job. High face validity has been shown to enhance candidate reactions (Hausknecht et al. 2004), may reduce legal challenges (Terpstra et al. 1999), and is likely to enhance stakeholder buy-in and support for a simulation. Fidelity also impacts the degree to which the simulation can serve the function of a realistic job preview (RJP), providing candidates with high quality information on which to self-evaluate whether the job fits with their interests, skills, and preferences (Downs et al. 1978).

In theory, the higher degree of overlap between the simulation and the job present in high fidelity simulations should also result in greater criterion-related validity (McDaniel et al. 2006). However, meta-analytic research examining the validity of simulations ranging from low fidelity (e.g., SJTs) to high fidelity (e.g., assessment centers and work samples) indicates roughly equal validity, in the range of 0.33–0.37 (SJTs: McDaniel et al. 2001; assessment centers: Gaugler et al. 1987; Schmidt and Hunter 1998; work samples: Roth et al. 2005), with one outlying estimate of the validity of work samples being as high as 0.54 (Schmidt and Hunter 1998). Unfortunately, there has been limited research directly comparing low and high fidelity simulations in the same study (see Lievens and Patterson 2011 for an exception where approximately equal validity was observed for an SJT and an assessment center).

Comparative research varying stimuli and response fidelity is also quite limited. Most of the validity research varying stimuli fidelity has focused on video-based versus text-based stimuli for SJTs (e.g., Chan and Schmitt 1997; Lievens and Sackett 2006), and a recent meta-analysis suggests that video-based stimuli exhibit superior criterion-related validity over text-based stimuli (Christian et al. 2010). However, research examining the intermediate ranges of stimuli fidelity allowed for by computer-based simulations using avatars, virtual worlds, and response-dependent stimuli presentation (i.e., branching), is largely lacking.

Research explicitly examining ranges of response fidelity is even more limited. In one of the few such studies, Funke and Schuler (1998) found that the validity of SJTs increased as response fidelity increased, with oral constructed responses (similar to a situational interview) exhibiting greater validity than written constructed responses which had greater validity than multiple-choice responses. Technological advances, such as webcams for recording oral responses to be scored later and computer-based scoring of constructed written responses (Rudner et al. 2006), are making it more economically and administratively feasible for simulations to include intermediate ranges of response fidelity. The current research literature does not provide sufficient guidance in helping the practitioner determine how much fidelity, what kind of fidelity, and under what conditions fidelity results in enhanced criterion validity. Thus, it is our recommendation that other considerations (e.g., stakeholder interests, costs, and simulation purpose) drive fidelity decisions, for the time being.

Aside from a lack of clear evidence that high fidelity simulations have correspondingly high validity, higher fidelity simulations may also bring with them some key disadvantages. For example, they can require greater investments both to develop and administer (e.g., Motowidlo et al. 1990; Patterson et al. 2009), although this depends to an extent upon the specific type and degree of fidelity sought. A high fidelity simulation for retail employees conducted in a store, with trained role-players, and requiring the use of actual computer systems to perform job tasks (e.g., looking up product information and placing an order on a company website), may cost less to initially develop but significantly more to administer than a mid-fidelity computer-based simulation involving video-based stimuli, a simulated company website that tracks user inputs, and multiple-choice responses. Of course, a text-based SJT would result in the lowest development and administrative costs. Given their greater degree of overlap with the target job, high fidelity simulations are also less generalizable across jobs than their low fidelity counterparts. To the extent that a simulation is

focused on a narrow set of technical skills required for only one job or a subset of jobs, generalizability may be less of a concern. However, for simulations focused on broader skill sets (e.g., teamwork or managerial skills), some sacrifice in the fidelity of the stimuli (e.g., using a generic organizational context rather than a marketing, finance, or other department-specific context) may be justified to enhance generalizability across jobs, units, and departments.

2.2.2 Knowledge, Skills, Abilities, and Other Characteristics

As noted previously, the flexibility of simulations allows assessment of an immense range of KSAOs. Simulations can be designed to assess very technical (e.g., welding, financial analysis, and specific job knowledge) or more general and broadly applicable KSAOs (e.g., written communication, problem solving, and teamwork). As with any selection tool, the choice of exactly which KSAOs to target should be based on job analytic data. However, in the context of simulations, the measurement of particular KSAOs may both impact and be impacted by several other factors, including the amount and type of job information necessary for development and the fidelity requirements of the simulation. In addition, traditional test development concerns like validity and subgroup differences (e.g., Black–White score differences) may contain an additional layer of complexity when examined within the simulation context. Each of these issues is described later.

The KSAOs targeted in a particular simulation can influence both its fidelity and the type of job information required for development. Simulations focused on the assessment of highly specific or technical skills may require higher fidelity to the extent that the behaviors evincing these skills can only be produced and evaluated in a high fidelity environment. For example, to determine a candidate's ability to perform a complex welding task, the candidate must be given the opportunity to use the appropriate equipment and demonstrate completion of the appropriate welds. For highly job-specific and technical skills such as these, a high fidelity simulation is warranted. At the other end of the continuum, however, candidates for a management position may have their teamwork skills assessed in multiple ways including role-plays, SJTs, or situational interviews. In this instance, because the skills being measured are more broadly generalizable, lower fidelity simulations are an option. While the focus on technical KSAOs and the degree of fidelity required is not wholly confounded, in general, a focus on more technical KSAOs and/or higher fidelity will require more thorough job and task analysis to generate the detailed task data necessary for simulation development. When focusing on more general KSAOs, a competency-based or critical incident approach may be appropriate. More detailed discussions of the types and amount of information required for the development of simulations targeting different KSAOs can be found in Felker et al. (2007) and Whetzel et al. (2012).

Although job simulations have often been stated to have high criterion-related validity and relatively small subgroup differences (e.g., Cascio and Aguinis 2005; Hoffman and Thornton 1997; Schmitt et al. 1996), recent research focusing explicitly

on the constructs being measured by job simulations is beginning to paint a more nuanced picture. For example, Roth et al. (2008) conducted a meta-analysis and found that simulations saturated with cognitive ability (e.g., those assessing job knowledge or having high information processing requirements, like many inbox simulations) have much larger Black–White differences than those saturated with social skills (e.g., role-plays or presentations), giving us some insight that both the constructs being assessed and the method by which we are assessing them are jointly contributing to the outcomes of the assessment. Whetzel et al. (2008) observed similar results in the context of a meta-analysis examining subgroup differences as a function of the cognitive loading of SJTs. This is not to say that blanket efforts should be made to reduce the level of cognitive loading in simulations, as doing so has the potential to mitigate subgroup differences while also reducing validity (Ployhart and Holtz 2008). However, practitioners and organizations may be advised to consider modifying simulations slightly to achieve the best of both worlds. Whetzel et al. (2012) provide some suggestions here, including asking assessment center participants to describe their responses verbally as opposed to writing them down. To complicate matters further, two recent meta-analyses have demonstrated some differences in the criterion-related validity of assessment centers and SJTs focused on different constructs, though the results are less compelling than those found for subgroup differences (Arthur et al. 2003; Christian et al. 2010). As researchers have only just begun to explicitly distinguish between constructs and assessment methods when looking at the validity of available tools (Arthur and Villado 2008), this remains an important area for future research. In order for such research to be maximally useful in practice, we ultimately need to determine which constructs are best measured by which methods and at which level of fidelity. Until we know more about how constructs and methods mutually impact simulation performance, practitioners should be aware that changes to either one may result in unintended consequences.

2.2.3 Selecting an Off-the-Shelf Simulation Tool

There are many well-developed commercially available OTS simulations that one can choose to use rather than build a simulation from the ground up. However, OTS options are, for the most part, targeted toward broad job families such as call center, clerical, manufacturing, or managerial. As a result, they may require some sacrifice in stimuli fidelity because they will not be leveraging the context and job materials applicable for a specific job and organization. To mitigate these concerns, those wishing to use an OTS simulation should be cautious to ensure it is focused on the measurement of those KSAOs identified as critical in a local job analysis. That said, the advantages of using an OTS solution can include rapid implementation, established procedures for scoring, established validity, a reduction in the internal resources needed for development (e.g., I-O psychology expertise, SME input), and lower implementation costs. To help determine whether an OTS solution is right for you, we recommend that practitioners consider the following questions:

- What KSAOs do I need to measure? How does the OTS simulation capture these?
- Has the OTS simulation been developed by test experts (e.g., I-O psychologists) from a reputable firm?
- What is the test developer's history of legal challenges to assessments they have developed?
- What kind of validation support does the test developer provide, if needed? Litigation support?
- What technical documentation is available for the OTS simulation? What were the characteristics of the development and normative samples?
- What level of fidelity is present in the OTS simulation and does it align with stakeholder interests and desires?
- How will the OTS simulation be administered? If it is technology-based, does the administration provider have the necessary resources (e.g., computer servers) to meet the demands of my candidate flow? How will candidate questions, concerns, and complaints regarding the testing process be handled? Can it be delivered in an unproctored setting?
- How will qualification standards be established? Does the test developer provide recommended norms?
- How will simulation data be stored and shared with my organization? What data security protocols are in place?
- What are the upfront (i.e., customization and implementation) and ongoing (i.e., administration) costs associated with the use of this solution compared to those of similar tools?
- Can the test developer share case studies or return on investment analyses from previous uses of the tool?

While there is no one right set of answers to the questions above, giving careful thought to each should enable practitioners to make better decisions as to which OTS solution may best meet their needs.

2.2.4 Approach to Scoring

The nature of a particular simulation will, in many cases, determine whether it is best scored by human raters, automated methods, or a hybrid of the two, so it is important to consider any necessary scoring requirements (e.g., “We don’t have the resources to use human raters on an ongoing basis”) during the planning phase of the development process. In general, simulations with higher response fidelity (e.g., role-plays, physical performance of a task, and orally constructed responses) will require human scorers, while those with lower response fidelity (e.g., responding in a multiple-choice format) can leverage automated scoring, though there are some exceptions to this rule (e.g., where simulation content and automation intertwine, such as simulations to assess computer skills; see Barr and Coughlin 2013, this volume for additional details). The exact KSAOs being assessed can also influence which type of scoring is most appropriate, as some constructs requiring qualitative evaluation (e.g., oral communication or coaching skills) require inferences and judgments that,

at this point, technology is not capable of automating. Costs may also be a significant consideration, as human scoring obviously requires a greater investment on an ongoing basis than does the execution of automated scoring. As automated scoring is covered in great detail elsewhere (see Sydell 2013, this volume), we will focus on some of the considerations that go into human scoring of simulations.

In executing human scoring of simulations there are a number of things that must be considered and planned for. First, detailed rating guidelines or checklists need to be created as part of the development process to guide the scoring. These guidelines should focus on observable behaviors and not rely on inferences about internal thought processes of the candidates. Assessors must also be familiar with the simulation and well calibrated in using the rating guidelines. We recommend including samples of different performance levels to be reviewed and discussed during the training. These samples serve as anchors that help calibrate assessors and are useful as references in making ratings in the live simulation setting. Choice of assessors (i.e., psychologists, managers, and job experts) is also important to consider. Research suggests that psychologists are better at discriminating among different constructs measured in a single simulation (Lievens and Conway 2001), but for some simulations requiring familiarity with a task that can only be gained with years of experience or formal education (e.g., welding or computer programming) it will not be an option to use psychologists as assessors. One way to mitigate this concern is to use a hybrid approach where psychologists observe technical assessors and assist them in making their ratings. Regardless of who the assessors are, the total number of constructs assessed should be limited to no more than five, as several studies have demonstrated that assessors are typically unable to make reliable distinctions among a greater number of dimensions (e.g., Thornton and Byham 1982; Shore et al. 1990). If multiple assessors will be observing and scoring candidate behavior, which is recommended, then a procedure for combining scores across assessors must also be established. Mechanical combination (e.g., averaging scores across assessors) has been shown to be superior to consensus or clinical-based methods (e.g., discussing scores and coming to consensus) in forming overall candidate scores (e.g., Feltham 1988; Russell 1985). However, if a consensus discussion is desired for other compelling reasons (e.g., stakeholder concerns), then a formal procedure should be established and followed to obtain final scores (see Jansen 2012, for an example of an effective consensus meeting procedure).

2.2.5 Proctored Versus Unproctored

When determining whether a simulation requires a proctor, the concerns to be addressed are largely the same as for most other selection tests, revolving around the security of test content, the potential for cheating, and administrative efficiency. While the decision to use a proctor may, in some cases, be driven by the design of the simulation itself, there is some flexibility within these constraints. For example, a simulation requiring candidates to appear on site and use an expensive piece of equipment such as a flight simulator will by its very nature require a proctor. Other types of simulations, such as telephone-based role-plays, may be amenable

to either proctored or unproctored settings. While organizations may have concerns that the person engaging in the role-play is not the actual job candidate, advances in voiceprint and streaming video/webcam technology now allow us to verify the candidate's identity during the simulation (e.g., by asking the candidate to hold up his or her identification), or at a later date (e.g., by ensuring the candidate looks like the person in the video).

As technology continues to evolve, we are seeing increases in the types and volume of simulations being administered in an online, unproctored format, even those that include a cognitive ability component. Key benefits to this approach include lower administration costs and greater ease with which candidates can apply for the position. Disadvantages include the necessary diligence to implement advanced security features such as creating parallel forms, item randomization, response-dependent branching, and making it more difficult for candidates to capture test content and share it with others. In large part, the decision to administer simulations in an unproctored setting will depend on the level of comfort an organization has with such an approach. Practitioners should consider the necessity of a proctor as early in the simulation design phase as possible, so that they can confirm the necessary resources will be available when the simulation is put into use with live candidates.

2.2.6 Use of Technology

The use of job simulations in the selection context warrants some additional discussion regarding the use of technology beyond that which has been noted earlier. Specifically, modern technology, regardless of how advanced it is, will carry with it some limitations regarding availability, bandwidth, flexibility, and ease of use. Such limitations can be experienced during the design phase (e.g., how the test will be programmed and set up), during the administration phase (e.g., whether the necessary technology is available to candidates, particularly in the global context of developing countries), and in the post-administration environment (e.g., how simulation scores will be databased and stored). While it may be tempting to defer the management of such challenges to a test development firm, even organizations looking to implement an OTS solution will often be faced with these issues as they begin to integrate simulation technologies with their existing human resource information systems (e.g., linking simulations with an applicant tracking system, ATS). While complete coverage of the technological implications for simulation programming, implementation, and data management is beyond the scope of this chapter, we also touch on some of these topics in Sect. 2.3, Role of the Simulation in the Candidate Lifecycle, and we refer the reader to Hawkes (2013, this volume).

2.2.7 Managing the Interests of Simulation Stakeholders

As with any wide-reaching organizational intervention, the stakeholders impacted by simulations each bring with them a distinct set of motives, opinions, and goals. In addition, each group likely has differing levels of knowledge and expertise with

regard to the assessment process. To help practitioners navigate needs of each group, we have outlined some of them below, along with recommendations regarding how they can be addressed. It will become apparent that simulations are better suited to addressing some stakeholder concerns than others. Our hope is that by exploring these issues, practitioners will be able to make more educated decisions regarding whether and how to use simulations for selection purposes.

To begin, recruiting and staffing functions are challenged by the availability of qualified labor, cultural changes, and increasingly diverse candidate pools (Ployhart 2006). However, as noted earlier, research indicating that simulations exhibit less adverse impact than more traditional assessment methods (Schmitt et al. 1996) was telling only part of the story (e.g., Roth et al. 2008). As the labor market evolves and candidate demographics continue to change, recruiting and staffing functions should be careful to consider the extent to which cognitive abilities are measured in simulations, just as they would for any other assessment methodology. As aptly pointed out by McDaniel et al. (2007), this should also include giving thought to the way in which simulation instructions are given to candidates. Because knowledge instructions (“Please select the best possible response to this situation”) are more closely correlated with measures of cognitive ability than behavioral instructions (“Please select how you would respond in this situation”), reductions in adverse impact realized by moving to a simulation format may be mitigated if thought is not given to the instructions in addition to test content and medium.

A second key set of stakeholders are the hiring managers and their respective lines of business, who are often facing pressures to reduce the cycle time to fill empty requisitions. In this case, simulations may provide an important benefit. Consider, for example, an online and catalogue-based clothing retailer who wishes to hire call center representatives for sales positions. The position requires successful employees to communicate with customers, make decisions regarding upselling opportunities, search through a computer database to check the availability of items and sizes, and enter customer and order information via a keyboard quickly and accurately into an ordering system. If we were to imagine what this process might look like without using simulations to measure candidate skills and abilities, we might envision a multiple-hurdle process that includes a resume screen and reference check to assess keyboarding skills and experience using customer databases, a cognitive ability test to measure decision-making ability, and an interview to assess communication skills. On the other hand, an organization may instead decide to implement a single-hurdle process consisting of a well-designed simulation for call center customer sales positions. The simulation might involve listening and responding to audio files of “customers” calling into the center, or even live assessors role-playing the part of customers. In this scenario, candidates would listen to the “customers” while simultaneously entering information provided into a database and interacting with a website to search for available products and sizes. Candidates would also have to respond to customer requests and engage in upselling behaviors, either by speaking with a live role-player or by choosing a response option on the screen. In this simulated environment, the organization is now able to more efficiently screen candidates on a variety of skills and abilities. One test is able to measure multiple KSAOs, and

scheduling challenges like the ones faced when setting up interviews can be reduced or avoided. As a result, when they are well designed and implemented, simulations can help organizations shorten the selection process and reduce cycle time without sacrificing the quality of successful candidates.

A third important group to consider when implementing simulations for selection is human resources (HR) personnel looking to understand the strengths and areas of opportunity in their talent base. Often, HR must balance the benefits provided by simulations with the potential for resistance to assessment from current employees and hiring managers, particularly those employees who may be applying for internal positions. As such, HR personnel, and often I-O psychologists, must “sell” the assessment process to an audience without assessment expertise. While the higher level of fidelity and increased face validity of simulations can make it easier for HR teams to obtain buy-in and support from end users like hiring managers, it is quite evident that some organizational stakeholders still struggle with the idea of simulations in general, for example, the hypothetical nature of role-plays.

To address these concerns, HR teams must first understand the motivations of simulation end users. Surprisingly, however, there has been a lack of research on internal stakeholder reactions to assessment, and we recommend that additional studies be completed in this area. In the meantime, a recent report on barriers to simulation implementation may be of some help. In a survey of federal agencies completed by the United States Merit Systems Protection Board (2009), the most frequently cited barriers to using job simulations for selection included insufficient time to develop assessments, lack of knowledge on the part of stakeholders such that they are not comfortable determining whether simulations are beneficial, insufficient resources to develop and/or administer simulations, and insufficient resources to train test administrators. Addressing these concerns will be critical for HR to successfully convince end users of the benefits simulations can provide. Further, to the extent that HR can take a more consultative approach and facilitate honest dialogue with hiring managers and simulation end users, this report found that they may be able to promote greater openness to simulation use.

A final and perhaps most important group of stakeholders is comprised of the job candidates themselves. While it can be assumed that the motivated test-taker has selection for the target job as his primary goal, his reaction to the recruiting and selection process itself can impact his attraction to the organization, even if he is not selected (Chapman et al. 2005). Because we know that candidates tend to prefer assessments they perceive as job-related (i.e., face valid; Gilliland and Cherry 2000; Richman-Hirsch et al. 2000), and because simulations are, by their very nature, more face valid than their traditional counterparts, simulations can lead to more positive candidate reactions. In addition, the wide availability of the Internet and social networking sites means that increasing numbers of candidates are sharing links and information about jobs and job simulations. This can translate to more widespread knowledge of a particular organization and potential interest (or disinterest) in working there. As a result, modern organizations can and should consider simulations to be an important branding and recruitment tool when looking to attract new talent

(Yu and Cable 2012). It should also be noted that when considering job candidate reactions to selection procedures, not all candidates are the same. While some researchers have broken out candidate groups based on key demographic information such as race and gender (see Ryan and Ployhart 2000 for an overview), little work to date has been done on the motivations and reactions of specialized candidate groups (e.g., candidates who are members of labor unions, internal versus external candidates). Additional work in this area is needed. We direct the reader to Bruk-Lee et al. (2013, this volume), for a more comprehensive look at candidate reactions to simulations in the selection context.

When choosing to implement simulations in lieu of or in addition to more traditional assessment methods, it is important to give due consideration to each of these critical stakeholder groups. While we have provided some tactical approaches to responding to their unique needs, we also strongly advocate the use of a comprehensive change management approach that includes a robust communication strategy when rolling out a new selection procedure of any kind. We concur with Higgs et al. (2000), who note that “a selection process is a product to be marketed in an organization,” and we recommend that internal and external practitioners carefully consider the following questions before using simulations in the selection context:

- Why is the simulation being implemented? What value will it bring?
- How can we ensure high-level organizational support for the new process?
- Who will be impacted by the simulation (e.g., external candidates, internal candidates, hiring managers, and recruiters)? How will they be impacted?
- How will the simulation be positioned and “marketed” to candidates, recruiters and hiring managers?
- Will training be required for test administrators? Hiring managers? Others? How will this training occur?
- How will simulation results be stored and communicated? What level of detail will be provided and to whom?

While complete coverage of the change management approach needed to successfully implement a simulation for selection purposes is beyond the scope of this chapter, the interested reader is advised to review Muchinsky (2004) for more information.

2.3 Role of the Simulation in the Candidate Lifecycle

Like other assessment methods, simulations can play an important role before, during, and after their administration. However, given their greater fidelity and the fact that they are often technology-enabled, simulations make unique contributions to the experiences of organizations and individuals that are worthy of discussion here. This section will take a chronological look at the issues facing individuals and organizations when simulations are used for selection purposes—discussing their impact

Table 2.1 Role of the simulation in the candidate lifecycle

	Individual factors and concerns	Organizational factors and concerns
Pre-Administration	<p>Perceptions and expectations regarding the organization and its brand</p> <p>Perceptions and expectations regarding assessments</p> <p>Ease of access to the assessment (e.g., technology requirements and location)</p>	<p>Differential candidate access to the assessment (e.g., technology requirements and location)</p> <p>Development and maintenance costs, including translation concerns where applicable</p> <p>Opportunities to use assessments as a means of candidate recruitment and attraction</p> <p>Test security issues (e.g., the extent to which simulation content is available online)</p>
Administration	<p>Attitudes toward the assessment process (e.g., candidate reactions and test anxiety)</p> <p>Obtaining a realistic preview of the job to help evaluate person-job fit</p>	<p>Providing a realistic preview of the job so that undesirable candidates self-select out of the process</p> <p>Providing reasonable test accommodations</p> <p>Administration costs/efficiency</p> <p>Cheating (e.g., candidates using helpful confederates in an unproctored setting)</p>
Post-Administration	<p>Candidate reactions to the assessment process</p> <p>Post-assessment behaviors that impact the candidate (e.g., accepting or declining a job offer)</p>	<p>Post-assessment candidate behaviors that impact the organization (e.g., accepting or declining a job offer, promoting or badmouthing the organization, and likelihood of challenging assessment results)</p> <p>Subgroup performance differences and adverse impact</p> <p>Decisions regarding how simulation data will be stored, used, and communicated (e.g., what level of detail will be shared with hiring managers and providing feedback as a means of on-boarding new employees)</p>

before, during, and after their administration—with the goal of equipping practitioners with the information they need to make more informed decisions regarding the use of simulations in their or their client’s organizations. It will become evident that some of the issues described below (e.g., candidate reactions and test security concerns) are covered elsewhere in depth, as they are not unique to simulation use. In an effort to provide the reader with a complete list of such concerns, we have mentioned them here, but they will only be reviewed at a high level; we will focus our discussion on those topics we believe to be distinguishing with regard to simulations as opposed to other assessment methods. An overview of the issues mentioned is provided in Table 2.1.

2.3.1 Pre-Administration

Concerns experienced by individuals prior to simulation administration primarily fall into two buckets: candidate perceptions/expectations and ease of access to the assessment. While research has explored a wide variety of factors that can impact candidate attraction outcomes (see Chapman et al. 2005 for an overview), we are concerned primarily here with how candidates perceive the assessment (simulation) process, and their attraction to the organization and its brand. As increasing numbers of organizations look to their customer base as a feeder for their candidate pool (consider, for example, the quick service restaurant or retail industries), it is likely that candidate perceptions of an organization will have an increased impact on job pursuit intentions. Candidate reactions and the impact of simulations on candidate perceptions are discussed in greater depth in Bruk-Lee et al. (2013, this volume).

With regard to ease of access to the assessment, the challenges faced by individuals are largely the same for simulations as for more traditional test types. That is, proctored tests require candidates to travel to a test site. Unproctored tests require candidates to have access to a test administration method, most often the Internet, and any necessary supporting technology such as a computer and a webcam. For those without the economic means to easily access the Internet from home, poorer test performance may result given the greater cognitive demands associated with using an unfamiliar testing medium while simultaneously being asked to perform in a high-stakes environment. This issue may be further exaggerated in the case of a novice job seeker as she participates in a job simulation for a position in which she has little to no experience. Some have even argued that lack of easy access to the Internet should be viewed as a disability requiring a reasonable test accommodation (Naglieri et al. 2004).

Differential candidate access to the assessment is a concern for organizations as well. As technology continues to evolve and technology-enabled simulations become more sophisticated, we might expect to see larger differences in the level of access candidates have to unproctored tests, such that more advanced operating systems and internet browsers are required to participate in the assessment process. To the extent that different candidate demographics have differential access to these technologies, the diversity of candidate pools may be impacted, potentially causing an increase in the frequency of legal challenges. As a result, organizations looking to leverage cutting-edge technology for the administration of an unproctored simulation should carefully consider the downstream impact to their candidate pool and be prepared to offer test administration alternatives, such as taking the test at a location with the required equipment available.

A second organizational concern in the pre-administration phase is the cost required to develop and maintain simulation content. Like their traditional counterparts, simulations will cost more to create and sustain to the extent that they are customized, highly technical, and require advanced technology to deliver. However, given the speed with which modern jobs and technology are advancing, technology-based

simulations may require more frequent updating than traditional assessments or telephone-based role-plays. While research has consistently indicated more favorable candidate reactions to simulations and work samples than to paper-and-pencil measures (Chan and Schmitt 2004), we are unaware of any research that has examined the extent to which an outdated simulation can potentially negatively impact candidate reactions. While it is evident that simulations which are outdated in the sense that they no longer reflect critical aspects of the job have the potential to increase litigation risk, the extent of the impact of outdated simulation style elements (e.g., referring to a pager message as opposed to a text message) remains unclear. In other words, is using an outdated simulation the same as or potentially worse than a more traditional assessment method from a candidate reactions perspective? While the answers to these questions are yet to be discovered, organizations should at a minimum consider the extent to which the target jobs are changing and could require the updating of simulation content. For this reason, when making an investment to develop a technology-based simulation, we recommend the use of a future-oriented job analysis whenever possible, along with making plans to revisit and potentially update simulation content on a regular basis.

For global organizations, the need to translate simulation content will also impact cost, and under some circumstances, translating simulation content for global use can require some additional diligence beyond that required for more traditional assessment types. Simulations are often designed to look and feel like the target job. This means that a computer screen may actually look and feel like a website, database, or other job tool. When translating content from one language to another, unlike a paper-and-pencil assessment, the look and feel of the words on the screen become important characteristics of the test itself. Thus, challenges can arise if the number of characters/words it takes to say something in one language is significantly different than in another language. To ensure an equivalent look and feel in different languages, words may need to be adjusted so that they fit on the screen and/or are laid out in a similar manner in both versions of the test. However, as is well known, changes of this sort may create issues with regard to the psychometric equivalence of the test across multiple languages. As a result, to the extent possible, practitioners are urged to even more carefully consider word choice when developing simulation content in its original language. Eliminating jargon and idiomatic expressions may no longer suffice. Thought should be given to keeping text as simple as possible so that translated versions of the simulation more readily mirror the content of the native language and so that the look and feel of the simulation is not negatively impacted after translation. In addition, practitioners should use appropriate back translation services by experienced translators to mitigate potential test equivalence issues. If concerns regarding test equivalence still exist, studies to examine the psychometric properties of both versions may be warranted. To identify more specific recommendations in this regard, additional research is needed regarding the physical appearance of tests in the selection context (Ryan and Ployhart 2000).

This leads us to the third concern organizations face during the pre-administration phase: using simulations to attract and recruit candidates. As candidates continue

to desire the ability to conveniently look for jobs close to home or across the globe, the popularity of using the Internet for this purpose is likely to remain high. Organizations have responded in kind, increasing their use of the Internet to attract and assess candidates. This creates a critical branding and recruitment opportunity for organizations looking to hire top talent. As such, organizations who choose to share job simulation content online (e.g., to unproctored test-takers who are able to access the test simply by visiting the company's website) should consider the speed with which this information can be communicated to a large audience, i.e., how quickly something can "go viral," and the message that it will send to those who see it. One recommendation in this area is that organizations partner their branding and marketing teams with test developers during early phases of simulation development to ensure that assessments are psychometrically sound while simultaneously portraying the organization in accordance with its brand standards.

A fourth and final consideration for organizations is the security of simulation content. For many companies, there is a strong desire to keep their pre-employment assessment methods under lock and key. Understandably, they are concerned that answer keys will become public, enabling candidates who do not possess the KSAOs required for success in the position to make it through the selection process. This often requires organizations to keep not only their answer keys, but also the assessment content itself secure. Unlike some traditional assessment methods (e.g., cognitive abilities tests or measures of personality), however, simulations often contain content that informed job candidates could reasonably be able to predict. For example, a candidate for a position as an airline pilot likely understands that, if hired, he will one day have to fly a plane. Thus, requiring job candidates to successfully operate a flight simulator would be no surprise to anyone applying for the position. As such, an airline might even publicize the fact that they use flight simulators to select highly qualified candidates, resulting in several key benefits. First, this may discourage unqualified candidates who cannot perform the task from applying. Second, making simulation content available to the public can provide potential candidates an opportunity to practice the skills required for success. Third, top candidates may in fact be more attracted to organizations that use engaging, cutting-edge selection processes, viewing them as leaders in their field. Fourth, if the simulation is developed well and adequately represents the organization's culture and brand, candidates who enjoy the assessment process may also be a better fit for the company and recommend it to others. We caution, however, that the benefits to making simulation content available online are not universal. Like any assessment method, the possibility that candidates will cheat and "game" the test still exists. As simulation content continues to improve and we are able to achieve closer to 100 % overlap between simulation content and the target job, we will be able to move from simulating job activities to enabling a realistic job tryout in a safe environment. In this case, a candidate's ability to "game" the job tryout would essentially translate to his ability to "game" or do well in the actual job—in other words, his ability to be an effective performer if selected for the position.

2.3.2 *During Administration*

While in the midst of any pre-employment assessment experience, candidate performance can be impacted by a variety of attitudinal and individual differences, including things like test anxiety, locus of control, and level of motivation/desire to be selected for the target position. Because the outcomes of these factors are not unique to the pre-employment simulation experience, we will not explore them in detail here. However, some thought should be given to whether the level of such variables, e.g., test anxiety, will be increased or decreased in the simulation environment as compared to a more traditional pre-employment assessment method. As noted previously, the candidate reactions chapter (Bruk-Lee et al. 2013) of this volume can provide some guidance in this regard.

A second factor impacting individuals during simulation administration is the extent to which the simulation provides a realistic preview of the target job. If candidates can use the simulation experience to learn more about the position, they will be better able to evaluate how well they might fit the role and choose to self-select out of the process if the position is deemed undesirable. In addition, to the extent that simulation content is made publicly available, savvy candidates may recognize the simulation as an opportunity to practice the skills required for success in the job, essentially using the simulation as a method of pre-employment training. Using simulations as a preview of the job can provide lasting benefits for organizations as well, as RJPs have been shown to lead to lower turnover (Earnest et al. 2011).

During the administration phase, organizations should also consider the need to accommodate persons with disabilities. As noted by Naglieri et al. (2004), internet-based tests—and by extension, simulations delivered in electronic form—are too new for us to understand all of the possible potential accommodations. To date, organizations have often implemented accommodations that were useful for paper-and-pencil-based assessments (e.g., providing candidates with extra test time), and some have offered basic technological accommodations like increasing font size, or allowing the use of screen-reader software (e.g., Job Access With Speech (JAWS) or Window-Eyes). While we may be able to readily identify potential accommodations for some of the demands of technology-enabled simulations (e.g., listening to audio files, watching videos, and clicking on a screen), it is likely that there are still other accommodations yet to be identified. With regard to internet testing, Tippins et al. (2006) recommend that organizations consider accommodations that allow candidates to take tests in non-computer formats, but this becomes more difficult particularly for more intense and psychologically involved online simulations. Future research remains to be done in these areas, and practitioners are urged to keep a close eye on relevant legal cases.

The remaining organizational factors that become relevant during simulation administration parallel the pre-administration issues noted above: cost and security. With regard to cost, organizational stakeholders will be concerned with the level of human and technological resources needed to administer assessments, and how efficiently the simulation can meet the demands of the volume of candidates taking the test. The security concerns at this stage of the process surround the opportunity for

candidates to cheat on the test, especially in unproctored settings (e.g., by enlisting the help of a talented confederate to take the test for them). As noted above, these concerns are not unique to the simulation environment, so we will not go into further detail here, though the interested reader may wish to review Ryan and Tippins (2009) for more information.

2.3.3 *Post-Administration*

Once the simulation is complete, we can classify the concerns of the individual into two broad categories: perceptions (i.e., candidate reactions) and behaviors. The behaviors we refer to are those relevant to the job application and selection process that will have a direct impact on the candidate, specifically the decision to accept or reject a job offer. As before, we encourage the interested reader to review the Bruk-Lee et al. (2013) chapter of this volume for a deeper dive on the current state of research regarding candidate reactions and subsequent outcomes for more information.

Organizational considerations during the post-assessment phase begin with those candidate behaviors that have a direct impact on the organization. These include accepting or declining a job offer, promoting or badmouthing the organization, and the likelihood of challenging assessment results. While the first two of these are also addressed in Bruk-Lee et al. (2013), there is a lack of research on the third issue. To date, little work has been done to evaluate the extent to which simulations differ from their traditional counterparts in terms of the likelihood of a legal challenge, though there are some initial findings that assessment centers and work samples tend to be viewed favorably by the courts (Terpstra et al. 1999). In addition, research on candidate reactions that has examined litigation intentions suggests that simulations may lower the chances of a legal challenge (Hausknecht et al. 2004). As a result, until this hypothesis can be more fully explored, we recommend that organizations take steps to ensure candidates view simulations positively.

A second consideration for organizations at this stage is the potential for adverse impact as a result of subgroup performance differences. As noted above, subgroup differences are greater for simulations to the extent that they require higher levels of cognitive ability and information processing. Correspondingly, we would expect subgroup performance differences to be exaggerated if one subgroup has less familiarity with the testing modality, as members of that group will have to focus greater levels of attention on the mechanics of the test (e.g., scrolling with a mouse and clicking on a computer screen) than those already familiar with such activities. For example, despite the fact older generations are using the Internet more often and for a greater variety of activities (Jones and Fox 2009), generational differences may exist with regard to the level of comfort candidates feel in using the technologies necessary to support some types of simulations. Additional research is needed to examine whether candidates from different generations and socioeconomic statuses perform differently on technology-based simulations as opposed to more traditional assessment types.

A final issue for organizations to consider is how simulation data will be stored, used, and communicated, that is, what level of detail will be shared with candidates, hiring managers, and HR. Because simulations have the ability to closely mirror, or even replicate, the conditions of the job, they provide a unique opportunity for organizations to provide feedback to newly hired employees and their managers for the purposes of onboarding and training. Doing so can help to get employees up to speed more quickly than otherwise possible. In addition, in this modern age of “Big Data,” savvy companies may use simulation results—for selected and non-selected candidates alike—to study the defining characteristics of their candidate pool such as skill strengths and gaps and how these are changing over time. Companies looking to take a more strategic look at their workforce and sources of talent may find the information simulations can provide to be invaluable in this regard.

In short, individuals and organizations have a variety of concerns before, during, and after simulation use. At times, the concerns of the individual and the concerns of the organization are similar, e.g., how the candidate will react to the organization’s brand and the fairness of the process and whether particular groups of candidates will have differential access to the test. However, organizational concerns regarding simulation use also extend to familiar areas in the field of personnel selection such as test content, security, and adverse impact.

2.4 The Future of Using Simulations for Selection

In projecting toward the future, we will share a quote from novelist William Gibson, “The future is already here—it’s just not evenly distributed.” The two “projections” about simulation design and application that we share in this concluding section are already part of today’s landscape in some organizations for some populations in some parts of the world. Our prognostication is that these will simply become ubiquitous in the next 3–5 years.

2.4.1 *Gaming*

The design of simulations will change. Members of the generation entering the labor market in the middle of the second decade of the twenty-first century have played video games all their lives. These games are engaging and increasingly they are social, involving interaction with other players. Consistent with a desire that assessment tools promote the employment brand, engage candidates, and produce valid scores reflective of motivated test-takers, simulations are likely to take on additional, game-like features. The United States Military has been at the forefront of these efforts (see their Special Team Challenge or Patriot Missile System games at <http://www.goarmy.com/downloads/games.html>). There are conferences around gaming in HR applications, including assessments (e.g., <http://www.GSummit.com>)

and organizations like Reckitt Benckiser have embraced whimsical, fun-oriented games that get at person-environment fit and other job relevant constructs as part of the employee selection process (e.g., <http://www.InsanelyDriven.com>). The simulations typically used for pre-employment assessment today may look in a few years like “Pong” looks to those playing today’s online games.

2.4.2 *What Test? What Candidate?*

The boundary between an online game played for fun and challenge and a pre-employment assessment that influences hiring decisions is going to get increasingly blurry. There are recruiting organizations that post challenging games on the Internet for which undergraduate or professional school students register in order to receive prizes. These simulations are used to measure such constructs as decision-making under stress and creative problem solving. These organizations then identify for hiring organizations those students on each campus who had the highest scores. These students become the priority candidates approached during recruiting visits on campus.

Over the course of time, simulations will increasingly be embedded within company websites for a wide range of potential audiences. At one end are customers who want to know more about what it feels like to work at the target company and might become candidates if sufficiently intrigued by the simulation experience. On the other end, there are traditional, focused job candidates who are submitting to what they know to be a pre-employment assessment. Our key point is that these ambiguities surrounding who is really and consciously a candidate and when an assessment is a test are particularly likely to arise in deploying simulations rather than other assessment techniques. As a result, there will be an increased need to carefully consider the ethics associated with allowing for informed consent of test-takers regarding assessment purpose and use.

2.5 Conclusion

Simulations have a long and strong track record of validity as selection tools in high-stakes environments, though as in the case of all selection tools, there are multiple and complex factors that may, in specific settings, impact optimal simulation design, implementation, and delivery. We have discussed a wide array of these factors in this chapter. Where possible, we have attempted to not only highlight the complexities but to provide research- and practice-oriented guidance for practitioners. However, it should be clear that there remain many open research questions regarding the use of simulations for selection purposes. Some of these questions are fundamental:

- When and how does greater simulation fidelity produce stronger validities? What is the relative importance of stimulus versus response fidelity?
- What are the design elements of simulations that most strongly contribute to candidate perceptions of employer branding and procedural fairness?
- As simulations evolve into increasingly game-like experiences, what generational and other subgroup performance differences will emerge and how will these differences affect simulation validities?

We conclude, then, by urging continued academic–practitioner collaboration to answer these and many other questions raised here about the use of simulations in selection through rigorous, theory-guided empirical research.

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