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The effects of scenario planning on participant reports of resilience

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Abstract

Purpose – The purpose of this research is to examine the effects of scenario planning on participant ratings of resilience.

Design/methodology/approach – The research design is a quasi experimental pretest/posttest with treatment and control groups. Random selection or assignment was not achieved.

Findings – Results show a significant difference in reports of resilience for the scenario planning treatment group and no significant difference for the control group.

Research limitations/implications – Limitations include the use of self-report perception measures, possible social desirability of responses and a lack of random selection and assignment.

Practical implications – Practical implications imply that scenario planning can be viewed as a legitimate tool for increasing resilience in organizations.

Social implications – Organizations with an ability to adjust quickly and recover from difficult conditions means reduced layoffs and healthy economic growth.

Originality/value – While there is increasing research on scenario planning, to date, none has examined the effects of scenarios on resilience.

Keywords Scenarios, Intervention, Resilience, Planning, Scenario planning, Quasi-experiment

Paper type Research paper

Scenario planning seeks to develop in individuals, teams and organizations the ability to flexibly and adeptly manage the uncertainty of the future (Wack, 1984; Schwartz, 1991; Chermack, 2011). The study of resilience looks to understand how people – and consequently their teams and organizations – are able to endure stressful situations and succeed despite unforeseen challenges (Luthans *et al.*, 2006; Davydov *et al.*, 2010; Burnard and Bhamra, 2011; Dean, 2012; Fitzpatrick, 2013; Garcia-Dia *et al.*, 2013). It would appear a natural connection exists between these two fields.

Investigation into the effects of scenario planning focuses on how individuals are enabled by the process (Schwartz, 1991; Chermack *et al.*, 2015, 2007; Gallopin, 2002; Chermack and Nimon, 2008; Glick *et al.*, 2012; Haeffner *et al.*, 2012; Veliquette *et al.*, 2012). One theory of scenario planning suggests the process influences five primary domains: dialogue, conversation quality and engagement; organizational learning; mental models; decision-making style and leadership (Chermack, 2005). Work exploring these areas has deepened understanding of how scenario planning effects

participants (Chermack and Nimon, 2008; Glick *et al.*, 2012; Derbyshire and Wright, 2014; Haeffner *et al.*, 2012; Veliquette *et al.*, 2012; Wright and Goodwin, 2009; Wright *et al.*, 2013), and the results of such inquiry show that the scenario planning process changes the perceptions those who experience it. Currently, a growing body of research has begun to demonstrate the concrete, observable impacts scenario planning has on people, teams and organizations (Chermack *et al.*, 2007; Chermack and Nimon, 2008; Glick *et al.*, 2012; Haeffner *et al.*, 2012; Ramirez and Wilkinson, 2014; Veliquette *et al.*, 2012; Wright and Goodwin, 2009; Wright *et al.*, 2013). So far, there is evidence to suggest that participants experience changes in perception of their conversation quality, mental models, and decision-making style (Chermack *et al.*, 2007; Chermack and Nimon, 2008; Glick *et al.*, 2012; Haeffner *et al.*, 2012; Veliquette *et al.*, 2012). Individual perceptions of these domains are influenced and developed by the process; participants experience changes in the way they perceive, discuss and decide about their worlds (Frittaion *et al.*, 2010; Glick *et al.*, 2012; Haeffner *et al.*, 2012; Veliquette *et al.*, 2012).

The transformative potential of scenario planning is enticing even beyond the expressed intention of improving organizational performance (Kahane, 2012). There are frequent calls in the literature for further investigation into the outcomes of scenario planning (Frittaion *et al.*, 2010; Chermack, 2005, 2011). As the literature expands, new areas of impact are under investigation. One potential new area for study – connected to these same themes – is resilience.

A focus on positive organizational scholarship (Cameron and Caza, 2004; Cameron and Quinn, 2006; Cameron *et al.*, 2003; Spreitzer and Sonenshein, 2004) has promoted the study of positive outliers in organizations, teams and individuals. This approach suggests that studying positive differences has more potential to increase overall understanding of organizations than studying problems or average performance (Cameron *et al.*, 2003; Luthans, 2002a, 2002b; Luthans and Youssef, 2007; Luthans *et al.*, 2006; Nelson and Cooper, 2007). Several of the key characteristics that separate high performing organizations, teams and individuals from the average have been identified as hope, self-efficacy, resilience and optimism (Luthans *et al.*, 2006).

Studying these outliers provides strategies for performance improvements in the workplace that can be generated through positive psychological capacities (Youssef and Luthans, 2007). By developing such positive capacities, an organization may be able to constructively impact its overall performance (Luthans *et al.*, 2006, 2008, 2005; Youssef and Luthans, 2007), as well as its employees' perceived work experience (Larson and Luthans, 2006; Luthans *et al.*, 2006, 2008, 2013, 2006; Youssef and Luthans, 2007). While the literature to date provides general guidelines for cultivating positive psychological capacities in employees (Luthans *et al.*, 2006), specific interventions for building such capacities have not yet been fully developed.

Like positive organizational scholarship, scenario planning presents a potential opportunity for organizations to impact organizational performance and employee experience positively. Scenario planning is increasingly well established as a means of preparing individuals and organizations to respond to the uncertainty and chaos of the global work environment (Kahane, 2012; Ramirez *et al.*, 2008; Schoemaker, 1995). Some of the key characteristics of positive psychology are particularly useful for dynamic, high velocity environments. Resilience is one such characteristic.

Situating the study in HRD

Chermack and Swanson (2008) clearly positioned scenario planning as Human Resource Development's (HRD's) strategic learning tool. Because scenario planning is primarily focused on a learning basis for thinking about the future (rather than strictly a financial or budgetary approach), it seems apparent that HRD professionals are well suited to champion scenario planning (Wack, 1984). In other words, the focus of scenario planning is to alter mental models of participants in terms of helping them see the possibilities the future might hold and reveal assumptions that sometimes get "locked in" to planning and decision making (Chermack, 2017; Wack, 1984, 1985a, 1985b). The core mechanism that enables the "unlocking" of these deeply held assumptions is based in learning (Burt et al., 2016). Participants have to learn something that challenges previous ways of thinking (Wack, 1984). Further, while HRD researchers have not specifically focused on resilience to date, the ability to remain focused in turbulent times, and overcome adversity are logical potential components to the development aspect of HRD as a discipline (Swanson and Holton, 2009). These characteristics align directly with previous work led by HRD scholars in the realm of crisis management (Wang et al., 2009). Thus, this study blends two increasingly relevant aspects of HRD research that could be brought to the forefront of the disciplines' focus and suggests further opportunities for research.

Significance of the research

Scenario planning and resilience are increasingly well-studied phenomena (Gallopin, 2002; Chermack et al., 2007; Chermack and Nimon, 2008; Glick et al., 2012; Haeffner et al., 2012; Veliquette et al., 2012; Luthans et al., 2007; Scheier and Carver, 1985). Given the evidence available, it would seem both are also particularly well situated in the movement to study positive outliers in organizations. Efforts to understand the full dimensions of resilience are driving contributions in research on high performance in organizations (Shirey et al., 2008). In addition, a significant opportunity exists to develop a deeper understanding of interventions that have the potential to build resilience. So far, little progress has been made in the study of interventions that might promote resilient behavior (Luthans et al., 2008). Though the construct of resilience is increasingly understood, tools for building and promoting resilience remain vague. It would be valuable to examine an intervention that may promote resilience even if it has never been studied from that perspective. We propose scenario planning is such an intervention. This project contributes to the literature by investigating the ways in which scenario planning may build and develop perceptions of resilience.

Unique contributions of the study

This study also contributes to the intervention research basis of HRD (Nimon and Robinson, 2016; Zientek et al., 2016). It has been shown that despite its practice focus, there is surprisingly minimal intervention research published in HRD journals (Nimon and Robinson, 2016; Zientek et al., 2016). The study furthers scenario planning as HRD's strategic learning tool and takes advantage of the fact that intervention research is not common in the scenario planning, resilience studies or HRD literatures. In addition, this study positions resilience as an emerging domain of research that aligns closely with HRD's espoused values and is a good opportunity for further scholarly attention.

Research purpose and questions

The concept of resilience and the process of scenario planning are not completely foreign to each other. In the field of environmental planning, it is not uncommon to see scenario-type strategizing included in discussions of building environmental or species resilience

(Allen *et al.*, 2011; Dean, 2012; Garcia-Dia *et al.*, 2013). Further, from neuroscience to organizational behavior studies, some of the aspects of scenario-style thinking and reflection are cited as promoters of resilient behavior (Dean, 2012; Wu *et al.*, 2013; Svendesen *et al.*, 2014; Paterson *et al.*, 2014). In the field of nursing, in which workers experience often extreme forms of on-the-job stress, scenario thinking activities such as contemplative reflection about specific cases and what does or does not work for handling the stress have been noted to promote resilience – including stronger coping ability and less burnout (Dean, 2012). However, none of the literature has yet provided a clear investigation into how scenario planning may impact individual resilience. The purpose of this study is to determine the effects of scenario planning on participant self-resilience. The following research questions addressed this issue:

RQ1. Does scenario planning affect participant perceptions of self-resilience?

RQ2. Can scenario planning be used as a tool for supporting and enhancing self-resilience?

Theoretical framework
The framework for this study draws from the two fields of scenario planning and resilience. These bodies of research have been initially connected in a few areas – notably environmental planning and nursing – but the possibility that the intervention of scenario planning might contribute to individual perceptions of resilience has not been fully examined. Still, the connection between these areas seems almost immediately apparent. The key domains scenario planning impacts:

• dialogue, conversation quality and engagement;
• organizational learning;
• mental models;
• decision-making style; and
• leadership – link to the concept of resilience because both focus on improving people's perceptions of their capacity to manage and thrive despite uncertainty (Gallopin, 2002; Wu *et al.*, 2013).

In the following sections, we describe the current research in both fields. For scenario planning, we emphasize the importance of the process as an intervention. For resilience, we discuss the implications of being able to develop resilience and perceptions of resilience among individuals – how such development may impact teams and organizations. These two bodies of literature provide the theoretical framework for our study.

Scenario planning
In response to an increasingly unpredictable environment, scholars and practitioners identify scenario planning as an approach that helps individuals, teams and organizations deal with uncertainty (Wack, 1984; Ramirez *et al.*, 2008). Initially developed in the 1960s, scenario planning first earned notoriety as a strategic planning technique through Shell Oil's successful navigation major oil market instability (Chermack, 2011; Wack, 1984). Early victories for organizations using scenario planning cemented the practice as an attractive option for planners working in highly volatile industries (Schwartz, 1991). Since those earliest Shell scenarios, the technique has grown to serve a variety of planning needs – from businesses to communities to national governments (Chermack, and Lynham, 2002; Schwartz, 1991).

Scenarios have the potential to play a helpful role in preparing institutions, organizations and even societies for possible changes. Unfortunately, the field still suffers from insufficient data to concretely support the outcomes of the process. The lack of examples and documented cases of success and failures leads to a potentially inefficient approach (Ramirez *et al.*, 2013). Moreover, the scenario planning process is complex and requires a considerable time commitment on the part of planners and decision makers (Chermack, 2011; Schwartz, 1991). Given these constraints, it is perhaps unsurprising that frequent calls in the literature suggest a lack of evidence-based support to substantiate scenario planning's results. Researchers have recently begun the work of demonstrating the impacts of scenario planning on participants (Chermack and Lynham, 2002; Chermack and Nimon, 2008; Glick *et al.*, 2012; Veliquette *et al.*, 2012; Haeffner *et al.*, 2012).

This emerging research suggests that scenario planning has consistent and observable outcomes. In his theory of scenario planning, shown in Figure 1, Chermack (2011) presented a model illustrating the domains of impact scenario planning has on participants. Studies investigating the connection between these domains and scenario planning provide understanding for the scenario planning aspect of this framework.

Dialogue, conversation quality and engagement. The domain "dialogue, conversation quality, and engagement" is focused on the communication experiences of individuals. Specifically, this domain refers to the quality of strategic conversations – whether they are truly dialogic, encourage engaged participation and drive productive conversations (Chermack, 2011). Two key studies are available on this domain. The first used a quasi-experimental pre-test/post-test design with nine participants from a large organization in the USA. The Conversation Quality and Engagement Checklist was administered to participants before and after a scenario planning intervention. Results supported the authors' hypothesis that mean scores would increase post-intervention (Chermack *et al.*, 2007). The second included a much larger sample of 137 participants from 10 different companies in the USA, Veliquette *et al.* (2012) showed significant results, reinforcing a perceived improvement in communication skills and engagement through scenario planning.

Learning. The second domain – learning – connects to individuals' experiences with their sense of their ability to learn. Additionally, the domain relates to the concept of the learning
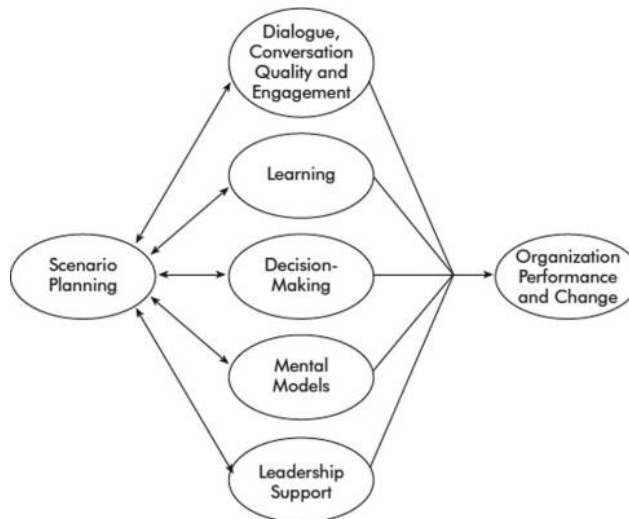

Figure 1.
Theory of scenario planning from Chermack

organization, and how individuals conceptualize learning from an organizational perspective (Chermack, 2011). Again, both an initial and a subsequent replication study have investigated the construct. In the foundational study, the Dimensions of Learning Organization Questionnaire (DLOQ) was administered to nine participants pre- and post-scenario planning intervention. The DLOQ measures seven constructs in total: continuous learning, dialogue and inquiry, team learning, embedded systems, empowerment, system connections and leadership (Chermack *et al.*, 2006). In this first study, significant increases occurred in all but one dimension: embedded systems. For the other six constructs, however, the results reinforced claims in the scenario planning literature – that participants experience increases in perception of their companies as learning organizations (Chermack *et al.*, 2006).

The replication study included 133 participants, and again, for six of the seven constructs, participants showed significant change from pre- to post-test (Haeffner *et al.*, 2012). In this study, continuous learning was the construct for which significant change could not be demonstrated. The authors suggested that this outcome was based on the one-time nature of the scenario planning intervention (Haeffner *et al.*, 2012).

Decision-making style. One of the most consistent themes in scenario planning literature is the notion that decision-making ability is positively impacted by the process (Schwartz, 1991; Wack, 1984). The domain of decision-making style considers participant decision-making tendencies and the preferred style for making decisions. The General Decision-Making Style Survey, developed by Scott and Bruce (1994), was used in a study of 84 managers in a pre-test/post-test design (Chermack and Nimon, 2008). The findings supported the hypothetical and theoretical assertions that scenario planning would change decision-making styles. The results showed that a scenario planning experience decreased rational decision-making and increased intuitive decision-making (Chermack and Nimon, 2008).

Mental models. For Pierre Wack and the original team of Shell scenarists, mental models were perhaps the essential target of scenario planning work. An integral element of the scenario planning process is exposing underlying assumptions – bringing to light the mental frameworks of decision makers. Scenario planning encourages participants to realize how their mental models shape their decision-making and create their assumptions about the world. The Mental Models Style Survey was intitially used in a pre- and post-test design with a sample of 129 participants (Glick *et al.*, 2012). This survey measures five constructs: political, financial, efficiency, social and systems mental model styles.

Results for this study showed a significant decrease in participant political mental model style and significant increases in efficiency, social and systems mental model styles (Glick *et al.*, 2012). Such results support assertions in the literature that scenario planning shifts mental models toward more shared, transparent thought patterns.

Leadership support. Leadership as a primary component of scenario planning is based in the fact that like any organization development intervention, leadership support is essential. Projects requiring significant resources and political support to encourage participation and engagement (such as scenario planning) do not go far without leaders expressing their sponsorship and backing (Cummings and Worley, 2014).

Scenario planning outcomes – summary. Most importantly, the evidence from these previously reviewed studies demonstrates that scenario planning is effective at influencing change in participants – from shifts in decision-making style, to enhanced perceptions of organizational learning, to changes in mental models. Work is ongoing to support the premise that such changes positively impact organizational, team or individual performance; however, the initial outcomes do tend to confirm this notion (Glick *et al.*, 2012;

Veliquette *et al.*, 2012; Haeffner *et al.*, 2012). These cases can provide important insights into new projects that attempt to provide relief for struggling communities and nations (Chermack and Lynham, 2002).

Scenario planning aims to make uncertainty a part of planning and enables organizations to avoid major strategic loss using an alternative way of thinking and planning (Wright and Goodwin, 2009). Scenario planning's advantage is its ability to incorporate uncertainty as a basic feature of the organizational environment. Moreover, through scenario planning, participants are able to change their decision-making style, mental models, dialogue and conversation quality and perspectives of organizational learning. These changes are essential in developing capable thinkers within the organization – able to go beyond contingency planning, and think in dynamic and agile ways. Where some schools of strategic management focus on the creation of contingency-play style strategies, scenario planning aims at the core of the thought processes – the unspoken assumptions, the preconceived notions and the critical uncertainties – of the decision makers responsible for maneuvering their organizations through increasingly volatile landscapes.

By accepting the reality of ambiguity and integrating it into the planning process, decision makers can widen the scope of what is assumed to be true about what the future might hold (Chermack, 2011). The core purpose of scenario planning is to change the mental models of participants and decision makers by showing them unexpected future worlds and the dynamics that make them plausible (Wack, 1984).

Ultimately, scenario planning cultivates and enhances participants' capacity to manage uncertainty (Glick *et al.*, 2012; Veliquette *et al.*, 2012; Haeffner *et al.*, 2012). A potential next step for researchers and practitioners is to leverage scenario planning's potential to develop such characteristics – to use the technique to build skills among participants. With these studies as a background, this paper focuses on the personal characteristic of resilience and how it might be influenced by the use of scenario planning.

Resilience
The concept of resilience has been studied since the 1800s. During its conceptual development, resilience has been constructed as a trajectory, a continuum, a system, a trait, a process, a cycle and a qualitative category (Flach, 1988; Rutter, 1985; Jacelon, 1997; Tusaie and Dyer, 2004; Bonanno, 2004). Rutter (1985) proposed a continuum with vulnerability and resilience at either end. Another perspective highlighted a model of resilience that identified two stages – integration and reintegration (Flach, 1988). Tusaie and Dyer (2004) cited the value of resilience in dealing with stressful life transitions that equates to Redfern Jones' statement that resilience "is a person's ability to survive difficult times, overcome trauma and carry on regardless". In theories of resilience as a trait, much attention has been given to the idea that a combination of physical and psychological characteristics, including body chemistry and personality factors, give individuals the skills to be resilient (Jacelon, 1997).

Psychological resilience is defined as the capacity to move on in a positive way from negative, traumatic or stressful experiences (Tugade *et al.*, 2004). Resilience can be differentiated from recovery in that recovery from an event means that there is a period in which normal functioning is suspended, whereas resilience involves maintenance of equilibrium, with no loss of normal functioning (Bonanno, 2004).

Although the concept of resilience has been widely studied, a uniform definition of this concept is not available and many scholars have advocated for greater clarity in the use of definitions (Polk, 1997, Luthar and Cicchetti, 2000). However, Rutter (1985) argued the concept of resilience has been constructed broadly and that this is necessary and appropriate. In the available literature, some authors have defined resiliency in terms of qualities, traits or

characteristics. For instance, Giordano (1997) listed qualities associated with resilience such as resourcefulness, self-confidence, curiousness, self-discipline, level-headedness and flexibility. She also highlighted the importance of emotional stamina and problem-solving.

Similarly, Jacelon (1997) suggested that resilient individuals are generally intelligent, with a strong sense of self. Tugade *et al.* (2004) used a metaphor to describe the relationship between resilience in individuals and the elasticity and malleability of certain metals. In illustrating this metaphor, they emphasized the differences between brittle and malleable metals, likening the properties of these malleable metals to the psychological qualities in some individuals that allow them to withstand strain and hardship. This example is closely related to the work of Pipe *et al.* (2012), which showed healthcare workers who are able to leverage their individual capacities during times of negative or extreme stress are likelier to successfully manage the deleterious consequences of such hardships.

Resilience is closely related to other personal strength traits, such as sense of coherence and self-esteem (Nygren *et al.*, 2004). Among other things, resilience has been found to be associated with not only a higher general health and wellbeing but also an ability to cope. The higher the resilience, the better the coping strategies are and the less prone individuals are to feelings of hopelessness or suicide attempts; further, more resilient people tend to have better therapy outcomes (Portzky *et al.*, 2010).

A study conducted by Black and Ford-Gilboe (2004) on adolescent working mothers found that both mothers' resilience and health work predicted health-promoting lifestyle practices, even after controlling for the effects of employment status and professional support, suggesting that both of these variables play an important role in creating a family context in which health is nurtured. Health work was the strongest unique predictor of health-promoting lifestyle practices, followed by resilience.

The concept of resilience is typically subdivided into several essential traits: purpose, perseverance, equanimity, self-reliance and existential aloneness (Wagnild, 2009). Purpose is described as having a sense of one's meaning or purpose in life. Perseverance is willingness to continue even when faced with discouragements or challenges. Equanimity is the perception of the world as being balanced overall – not fully bad or fully good, but composed of both bad and good things at different times. Self-reliance is a clear awareness of individual capabilities as well as limitations that leads to a sense of confidence. And existential aloneness, sometimes described as coming home to oneself, is the ability to be alone without fear or anxiety about isolation; in other words, resilient people are comfortable on their own (Wagnild, 2009).

Based on such evidence, resilience would be an asset both to individual and their organizations, because it will allow for both to survive the unpredictability and uncertainty of the current global environment. A resilient individual is able to cope with the ups and downs of the economy as well as the multitude of demands that the organization may put on him/her. By being resilient, an employee brings a sense of sustainability to the organization that might not be there otherwise. In much the same way, scenario planning offers a greater ability for coping with such ups and downs – a stronger ability to handle the dynamic, unstable environments in which organizations must thrive. The connection between scenario planning and resilience is a tantalizing one. In the next section, we describe our methods for this study into that connection.

Method

This section describes the research participants, sampling approach, instrument, research design, data collection and data analysis.

Sample
Research participants were volunteers in scenario planning projects held in four organizations in the Western USA. Scenario projects were conducted over the course of four months. Participants were not compensated for their participation, except the full benefits of scenario planning and its outcomes were explained in detail. Overall, the sample was a convenience sample, and subjects were free to terminate involvement in the research project at any time. Comparison group data were collected from four similar organizations that did not receive scenario planning. Though the scenario planning interventions were delivered by different teams of researchers, a primary scenario planning expert oversaw the design, development and delivery of each scenario planning project in each of the four organizations to ensure a degree of consistency in method. A section below describes the intervention in detail. None of the companies included in the study currently use scenario planning as part of their ongoing training or learning and development activities.

Power analysis A power analysis using G* Power (Faul *et al.*, 2007) revealed that 48 participants were required in the treatment and control groups to achieve adequate power for statistical analyses at 0.05 with an effect size $f = 0.25$.

Instrument
Wagnild and Young's Resilience Scale measures an individual's perception of his/her ability to tolerate stresses of life, and to thrive while making meaning out of life's challenges (Wagnild and Young, 1990). This instrument is a 17-item "Personal Competence subscale" and an 8-item "Acceptance of Self and Life" subscale (Wagnild, 2009, p. 107). Resilience is made up of five characteristics: meaningful life, perseverance, self-reliance, equanimity and existential aloneness (Wagnild, 2009).

Discussion of instrument properties. The Resilience Scale was initially developed through qualitative studies and literature review in 1990 (Wagnild and Young, 1990). The initial scale consisted of 50 items derived from the qualitative research that were sent to an original random sample ($n = 1,500$) of older adults in a variety of circumstances in the USA Pacific Northwest. The study yielded a 54 per cent response rate and a strong overall internal consistency score ($r = 0.91$). Exploratory principal components factor analysis showed a two-factor solution, rather than the theorized five-factor solution. Based on eigenvalues, the original 50 items were reduced to 25, and then to 14 (Wagnild and Young, 1993). The 14-item version of the Resilience Scale showed a single factor solution that accounted for 53 per cent of the variance and a high internal consistency ($r = 0.97$) (Wagnild and Young, 1993; Wagnild, 2003, 2009; Wagnild and Collins, 2009).

The Resilience Scale has been used in a variety of settings ranging from business organizations, non-profits, clinical use, work with older adults, work with youth and work with individuals who have experienced traumatic events (Wagnild and Young, 1993; Wagnild, 2003, 2009; Wagnild and Collins, 2009). To establish a relatively robust track record for the Resilience Scale, Table I reports the variance explained and Cronbach's alpha for several previous studies.

Authors	Validity method	Variance explained (%)	Cronbach's alpha
Wagnild and Young (1993)	PCA/EFA	46	0.85
Wagnild (2003)	PCA/EFA	Not Reported	0.90
Wagnild (2009)	PCA	53	0.91
Wagnild and Collins (2009)	PCA	53	0.94

Table I.
Cronbach's alphas for resilience scale

Description of the scenario planning intervention
A brief description of the procedure used for scenario planning will be helpful here to clarify the research and data collection processes. The scenario planning approach used for these interventions was the process originally developed by Wack and Newland for Royal Dutch/Shell, and as documented and described by Schwartz (1991), van der Heijden (1996), and most extensively by Chermack (2011, 2017). The procedure included sets of phases that brought key decisions makers and stakeholders together to discuss major issues in their business environment. The first step involves a series of interviews with primary decision makers in the organization from which a central question or pressing issue is identified. Once that focal point is determined, a series of workshops is conducted with organization members.

Workshops for this study followed the same structure in all organizations. This structure comes from Chermack's (2011) detailed description of the scenario planning process. Five workshops were hosted for each organization. A brief description of each workshop is presented here.

The first workshop involved brainstorming and ranking critical uncertainties and predetermined elements. During this session, participants considered the framing question identified by their leadership, and then listed all of the potential uncertainties at work in their environment. Next, they sorted those items according to degree of uncertainty and impact on a 2×2 matrix. Finally, they chose from the ranked items the two most uncertain and most impactful to create a 2×2 frame for their scenarios.

Between the first and second workshops, the facilitators crafted four scenarios to fit the matrix, integrating all the items discussed and ranked as critical uncertainties or predetermined elements. In the second workshop, participants read the scenarios and responded to them, editing for plausibility, accuracy and fit. Between the second and third workshops, the facilitators reworked the scenarios based on participant feedback.

In the third workshop, participants generate options based on the scenario content. This process involves wind tunneling – a component of scenario planning in which participants identify signals from the scenarios and discuss potential alternatives for action should they see those signals in their real environment.

The fourth workshop consists of ranking the options generated in the previous session, working the group toward consensus about best actions when faced with a particular set of signals from the scenarios. Options were plotted on a graph, and a visual display showed the participants which options tended to occur most frequently in their responses to signals.

The fifth and final workshop was a presentation of overall results, including recommendations for next steps and delivery of the packaged scenario workbook – the brainstorming and ranking, the scenarios, the options and option ranking.

For all the scenario planning interventions, facilitators were overseen by one expert scenario planning guide and manager. All work was directed through him, and he ensured compliance with the scenario planning technique and integrity of the steps in the process.

Research design
The basic research design was a quasi-experimental study, using pretests and posttests with intervention (treatment) and comparison (control) groups. The research strategy was to use paired samples *t*-tests to compare pretests and posttests, hypothesizing that the scenario planning intervention would have a positive impact on intervention group participant reports of self-resilience.

Data collection
Data were collected in two phases. Pretest data were collected at a kickoff meeting in each of the four participating organizations. The scenario planning intervention was briefly

explained and researchers also summarized the overall research process. Posttest data were collected at the conclusion of the final scenario planning workshop. For the comparison group, participants received a link to an electronic survey on the same day the intervention group pretest data were collected, and again on the same day the intervention group received the posttest.

Data analysis
The primary data analysis technique chosen to answer the research question was the *t*-test. Assumptions were checked and met. Data were examined for basic normality, nesting within organizations, reliability, validity and finally the paired samples *t*-tests that are the foundation of the study.

Results
This section presents the results from the data analysis, which included basic descriptive statistics, tests to show the data meet standard assumptions (Zientek *et al.*, 2016), hierarchical liner modeling (HLM), score reliability and validity assessment and finally the *t*-tests comparing scores from treatment and control groups with effect sizes.

Descriptive statistics
Data analysis began with assessment of demographic data. Because researchers were not able to obtain random assignment to treatment or control groups, it was important to examine the degree to which the groups may have been similar. Although researchers were not able to obtain data concerning the control group organizations, participant demographics show reasonable similarities for participant tenure and positions (Tables II and III). Overall, researchers were able to obtain participation from 48 individuals in the intervention group and 44 individuals in the comparison group. Sample size figures met the requirements that resulted from a power analysis, suggesting that the study achieve adequate power based on sample size to perform the selected analysis. However, generalizability was limited because of lack of random selection and assignment to the intervention and comparison groups, resulting in a quasi-experimental study. Participants represented eight different organizations in total with four in the

Demographic variables	Intervention group		Comparison group	
	n	(%)	*n*	(%)
Age of the organization				
0-5 years	6	12.5	NA	NA
6-10 years	1	2.1	NA	NA
11-15 years	1	2.1	NA	NA
16-20 years	2	4.1	NA	NA
21+ years	38	79.2	NA	NA
Total	48	100	NA	NA
Total number of employees				
Less than 100	14	29.2	NA	NA
101-500	10	20.8	NA	NA
501-1,000	1	2.1	NA	NA
1,001-10,000	16	33.3	NA	NA
10,001 +	7	14.6	NA	NA
Total	48	100	NA	NA

Table II.
Descriptions of the organizations

Demographic variables	Intervention group		Comparison group		Scenario planning
	n	(%)	*n*	(%)	
Tenure in the organization					
0-2 years	7	14.6	5	11.4	
3-5 years	6	12.5	5	11.4	
6-10 years	17	35.4	16	36.4	
10+ years	18	37.5	18	40.9	**317**
Total	48	100	44	100	
Position level					
Line Worker	19	39.6	21	47.7	
Middle Manager	20	41.7	9	20.5	
Senior Manager	8	16.7	9	20.5	**Table III.**
Executive	1	2.1	5	11.4	Descriptions of the
Total	48	100	44	100	participants

intervention group that received the scenario planning intervention and four in the comparison group that did not.

Skewness and kurtosis. To assess data normality and foundational assumptions, skewness and kurtosis were examined. Data skewness values ranged from -1.16 to -0.63 and kurtosis values ranged from -0.31 to 0.81. Overall, skewness and kurtosis values indicated a data distribution within acceptable ranges (Hair *et al.*, 2006; Leech *et al.*, 2005).

Hierarchical linear modeling. To ensure data met the assumption of independence of observations, researchers computed difference scores from pre- to post-tests, and examined the data using the interclass correlation coefficients (ICC). The ICC score indicates the amount of variance accounted for among multiple groups, taking into account the nestedness of the data. Because the research design involved four different organizations, it was necessary to understand data-nestedness and explore whether a significant amount of variance was coming from a single organization. Essentially, participants were reporting from within four separate organizations and with such a design it is critical to check that data varied consistently across them. In other words, HLM procedures check to make sure that all the variation in scores does not come from a single organization.

For this study, the ICCs were 0.02 for the pretest and 0.01 for the posttest. The ICCs equate to percentages and any value exceeding 11 generally requires closer examination (Lee, 2000). In this case, given that the scores were two and one per cent respectively, there was no need for further analysis because the independence of observations assumption is adequately met.

Reliability
To assess score reliability, Cronbach's alphas were computed for the pretest and posttest data in both the intervention and comparison groups. For the pretest, Cronbach's alphas were 0.93 for the intervention group and 0.87 for the comparison group. For the posttest, Cronbach's alphas were 0.95 for the intervention group and 0.89 for the comparison group. Reliability estimates were all above the recommended 0.70 (Nunnally, 1970).

Validity
A factor analysis was conducted to assess score validity. Because previous score validation efforts have been conducted for data using the Resilience Scale, two approaches to factor

analysis were used. First, a single dimension was requested from SPSS because previous examinations of score validity yielded a single factor solution. The initial one-factor solution explained 54.39 per cent of the variance. A second analysis was conducted based on the original theoretical structure of the instrument, and therefore requested a five-factor solution from SPSS. Five dimensions (or factors) were requested to force the original theoretical structure of the Resilience Scale. The results for multi-factor solution explained 80.06 per cent of the variance, indicating a stronger factor analysis for the multi-dimensional structure. However, the single-factor solution is more conservative (Nimon, 2009; Thompson, 2003) and lends enough score validity to this study to proceed with the assumption that the instrument measures what it intended to measure. It is also noted that the sample size was not adequate for factor analysis results to carry much weight.

Paired-sample t-test for the intervention group
A paired samples *t*-test was used to determine if there was a change in resilience scores for participants in the scenario planning intervention, compared to the group that did not. Scores were averaged for all 48 participants for the pretest completed prior to the first scenario planning workshop, and the posttest just following the end of the last workshop.

The results of the *t*-test indicated the resilience scores aggregated across all four organizations (pretest mean of 3.91, posttest mean of 4.20) showed a significant change after participation in the scenario planning intervention $t(48) = 2.38$, $p = 0.02$. An effect size was also computed to estimate treatment effect magnitude ($d = 0.60$), which is generally interpreted as a medium effect (Cohen, 1988).

Paired-sample t-test for the comparison group
For the comparison group, a *t*-test was also computed in an attempt to lend further weight to the intervention explaining the significant finding in the treatment group, consistent with quasi-experimental research designs. The *t*-test results showed a non-significant result for the comparison group (pretest mean of 4.32, posttest mean of 4.43, $t(48) = 1.85$, $p = 0.07$). Results indicate there was no significant change in participant reports of self-resilience for the comparison group. An effect size was also computed for the comparison group ($d = 0.03$) that reinforced non-significant findings. In other words, there was no evidence for either statistical or practical significance.

Discussion
For this study, we sought to evaluate the potential connection between scenario planning and perceptions of self-resilience among participants. Resilience literature suggests that a stronger sense of self-resilience enables individuals to weather stressors of the work environment more effectively (Luthans *et al.*, 2006, 2008, 2005, 2008; Youssef and Luthans, 2007). Where resilience has been studied, typically the focal point is existing resilience – that sense which is already developed within the individual or team being studied. Our work seeks to investigate the value of scenario planning as a resilience-building tool, a means of developing perceived self-resilience in participants.

For this work, we focused on two research questions:

RQ1. Would scenario planning effect participant perceptions of self-reliance? and

RQ2. Can scenario planning be used as a tool to develop resilience in participants?

Our results indicate significant changes in participant perceptions of self-resilience. Though this is a first attempt to investigate scenario planning and resilience together, the outcome suggests that further research is warranted, and that scenario planning does impact

perceptions of resilience. The results from the control group further reinforce that undergoing scenario planning changes participants with regard to their perceptions of self-resilience. Because the control group showed no change, we can be more certain that the scenario planning process was responsible for the change in the intervention group.

The second question we posed – whether scenario planning can be used to develop resilience in participants – requires further research, but we interpret our results to suggest that the answer to this question is "yes, scenario planning does influence perceptions of resilience". The results presented here indicate that participants did experience an increase in their perceptions of self-resilience after completing the scenario planning workshops. Thus, it stands to reason that the scenario planning process can be used specifically as a tool to develop perceptions of self-resilience in participants. These results are promising and warrant additional exploration.

The research study clearly shows significant changes in the intervention group and no changes in the comparison group. It seems clear that the scenario planning process has helped participants in their perceptions of self-resiliency. These results are likely the consequence of the unique and collaborative processes that make up scenario planning. Claims have consistently been made that scenario planning positively effects participants; these results are another step toward corroborating that anecdotal data. Because the basic premise of scenario planning is that organizations and decision-makers can respond faster when adversity strikes, as scenarios have prepared them, the notion that participants would perceive themselves as more self-resilient after scenario planning follows as another outcome of the process.

Perceptions of the individual participants clearly reflect support for this premise, and further, when viewed as a multi-group case study, all four scenario planning groups had aggregate perspectives of improved resilience after the scenario planning intervention. This study is a starting point in the exploration of scenario planning's potential to support the development of self-resilience; the outcomes here suggest this is a worthwhile area for scholarly and practitioner focus. Cultivating a stronger sense of resilience among individuals may positively influence performance in organizations. Scenario planning itself has also suggested to have the same outcome – stronger organizational performance. For those who would strengthen their team members' capacity to manage uncertainty and withstand the challenges of work, scenario planning presents a technique to build those skills.

Implications for the practice of resilience and scenario planning
As scenario planning theory is further developed, and as practitioners and researchers seek to build the body of evidence supporting scenario planning's usefulness, the intersection with resilience study is a meaningful one. These results suggest that another domain of scenario planning is resilience, or perhaps that one of the existing domains could be expanded to include this construct. Like decision-making, conversation quality and engagement, perceptions of organizational learning and mental models, resilience is a characteristic of participants that can be influenced directly by participation in the scenario planning process. For scenario planning as a field, improvement in perception of self-resilience is yet another positive outcome, another reason to encourage organizations to choose this strategic planning process.

In resilience studies, there is a consistent call for additional tools and resources – new means of cultivating stronger self-resilience in individuals to positively impact their experiences and the outcomes for their teams and organizations. Our work demonstrates that scenario planning may be a useful development strategy to this end. Moreover, scenario

planning presents a variety of benefits beyond resilience to those who engage in it. There is potential for future study to understand the interactions between the outcomes of the process.

Limitations and recommendations for future research

Sample size is one potential limitation of this study. However, the results, especially when compared against the control group, suggest the significance warrants further work in this area. The sample size is adequate to meet the power requirements for a *t*-test. Still, a larger sample size is desirable and would increase the generalizability of the results and the confidence with which they may be communicated. Regardless of sample size, there are three important limitations that must be recognized in considering the results of this research. They are:

(1) the use of perception-based measures;

(2) the social desirability of responses; and

(3) the lack of random selection and assignment.

Each of these is briefly presented and discussed.

Perception-based measures

Perception-based measures as the foundation of the study can be problematic because they are not usually an accurate assessment of reality. Individual perceptions do not constitute actual individual resilience, but participant perceptions of it. As with many phenomena in organization sciences, it is difficult to find concrete and objective indicators of individual characteristics and how they may indicate performance. The track record of the Resilience Scale lends some credibility to the research, but does not overcome the clear limitation that participant perceptions are always biased interpretations of reality. Additional research might focus on observed behaviors over time to gain a degree of objectivity.

Social desirability of responses

Self-report measures are often susceptible to bias. As with any self-report measure, questions on the Resilience Scale are constructed in a way that could prompt participants to answer in a specific way. Social pressure to give a positive view of an organization can generate validity issues in survey research. Although there are analysis strategies that assess the susceptibility to faking, they are difficult to implement, and require forethought on the part of instrument authors that is not common. No such assessment of the Resilience Scale was found, and without any detailed analysis of participant response and behavior, it is possible that social pressures played a role in the results.

Lack of random sampling and assignment

The cornerstone of true experimental research is the use of random sampling and random assignment to the treatment and control groups. This study did not use random sampling or random assignment, classifying it as a quasi-experimental study. Instances of true experimental research in organizations are rare because of the difficulties in obtaining randomness in the complex political systems that constitute social organizations. Resilience and scenario planning are not different in that the challenges to study them in real time in organizations often prevent the ability to use random sampling and assignment. This particular study has attempted to address the problem, albeit weakly, by arguing that the individual demographics of participants in treatment and control groups are similar enough to preclude any major issue.

Specific limitations of the study design
Quasi-experimental research designs as executed in this study are limited by the use of only two data points. While we compared scores on pretests between intervention and comparison groups and found significant increases for the intervention group but not for the comparison group, there is still a question of how long such changes in perception can be sustained on conclusion of the scenario work. A longitudinal research design would allow for the tracking of how long perceptual changes can remain intact, and how they may impact decision-making in the organization at a later point in time. Previous research has indicated that scenario planning can positively shift decision-making (Wright and Goodwin, 2009), learning culture (Haeffner *et al.*, 2012), organizational climate (Chermack *et al.*, 2016) and mental models (Glick *et al.*, 2012). Linking these variables with techniques such as structural equation modeling would provide a bigger picture of the variables involved in scenario work, and is an appropriate design for assessing the larger impact of scenario planning. Of course, the study design could be improved with random selection and random assignment to intervention or comparison groups, but is unlikely to be achieved because of the nature of scenario planning as an intervention.

Future investigation may benefit from the use of objective measures or observable behavior. However, a substantive examination of the Resilience Scale suggests a track record of utility and consistent results. As the concept of resilience evolves and becomes more well-defined, additional or alternate measures may be required to further the potential connection between it and scenario planning. Nonetheless, the results presented here are promising and implicate a potentially promising line of research that connects strategy and human resources in terms of the utility of individual resilience and its effect on the whole organization.

A final consideration for enhancing the study may be to incorporate qualitative approaches to add greater detail to our understanding of perceptions of self-resilience and scenario planning. Mixed methods or case studies are strong possibilities for investigating applied phenomena that do not easily lend themselves to a post-positivist paradigm. The results presented here provide a context for such inquiry.

Conclusions
There is exciting potential for mutual benefit between the fields of scenario planning and resilience studies as potential HRD domains of research. Early work in both areas shows a strong connection, and the prospect of having a developmental tool such as scenario planning to build resilience in team members promises returns on organizational performance. Moreover, the possibility for enhancing individuals' experiences in their work environment provides a solid basis for further exploration of the union between these two topics. This article has continued to position scenario planning as an important tool for HRD scholars and practitioners, and has suggested resilience as an additional domain of study that aligns with HRD values. Finally, this study has provided another example of intervention research in HRD and related disciplines.

References

Allen, C.R., Cumming, G.S., Garmestani, A.S., Taylor, P.D. and Walker, B.H. (2011), "Managing for resilience", *Wildlife Biology*, Vol. 17 No. 4, pp. 337-349, doi: 10.2981/10-084.

Black, C. and Ford-Gilboe, M. (2004), "Adolescent mothers: resilience, family health work and health-promoting practices", *Journal of Advanced Nursing*, Vol. 48 No. 4, pp. 351-360.

Bonanno, G.A. (2004), "Loss, trauma, and human resilience: have we underestimated the human capacity to thrive after extremely aversive events?", *The American Psychologist*, Vol. 59 No. 1, pp. 20-28.

Burnard, K. and Bhamra, R. (2011), "Organizational resilience: development of a conceptual framework for organizational responses", *International Journal of Production Research*, Vol. 49 No. 18, pp. 5581-5599, doi: 10.1080/00207543.2011.563827.

Burt, G., Mackay, D.J., van der Heijden, K. and Verheijdt, C. (2016), "Openness disposition: readiness characteristics that influence participant benefits from scenario planning as strategic conversation", *Technological Forecasting and Social Change*.

Cameron, K. and Caza, A. (2004), "Introduction: contributions to the discipline of positive organizational scholarship", *American Behavioral Scientist*, Vol. 47 No. 6, pp. 731-739.

Cameron, K. and Quinn, R. (2006), *Diagnosing and Changing Organizational Culture*, Jossey-Bass, San Francisco, CA.

Cameron, K., Dutton, J. and Quinn, R. (2003), *Positive Organizational Scholarship*, Berrett-Koehler Publishers, San Francisco, CA.

Chermack, T.J. (2005), "Studying scenario planning: theory, research suggestions, and hypotheses", *Technological Forecasting & Social Change*, Vol. 72 No. 1, pp. 59-73, doi: 10.1016/j.techfore.2003.11.003.

Chermack, T.J. (2011), *Scenario Planning in Organizations*, Berrett Koehler, San Francisco, CA.

Chermack, T.J. and Lynham, S.A. (2002), "Definitions and outcome variables of scenario planning", *Human Resource Development Review*, Vol. 1 No. 3, pp. 366-383, doi: 10.1177/1534484302013006.

Chermack, T.J. and Nimon, K. (2008), "The effects of scenario planning on participant decision-making style", *Human Resource Development Quarterly*, Vol. 19 No. 4, pp. 351-372, doi: 10.1002/hrdq.1245.

Chermack, T.J. and Swanson, R.A. (2008), "Scenario planning: human resource development's strategic learning tool", *Advances in Developing Human Resources*, Vol. 10 No. 2.

Chermack, T.J., van der Merwe, L. and Lynham, S.A. (2007), "Exploring the relationship between scenario planning and perceptions of strategic conversation quality", *Technological Forecasting and Social Change*, Vol. 74, pp. 379-390, doi: 10.1016/j.techfore.2006.03.004.

Chermack, T.J., Coons, L.M., Nimon, K., Bradley, P. and Glick, M.B. (2015), "The effects of scenario planning on participant perceptions of creative organizational climate", *Journal of Leadership & Organizational Studies*, Vol. 22 No. 3, pp. 355-371.

Cohen, J. (1988), *Statistical Power Analysis for the Behavioral Sciences*, L. Erlbaum Associates, Hillside, NJ.

Davydov, D.M., Stewart, R., Ritchie, K. and Chaudieu, I. (2010), "Resilience and mental health", *Clinical Psychology Review*, Vol. 30 No. 5, pp. 479-495, doi: 10.1016/j.cpr.2010.03.003.

Dean, E. (2012), "Building resilience", *Nursing Standard*, Vol. 26 No. 32, pp. 16-18.

Derbyshire, J. and Wright, G. (2014), "Preparing for the future: development of an 'antifragile' methodology that complements scenario planning by omitting causation", *Technological Forecasting & Social Change*, Vol. 82, pp. 215-225.

Faul, F., Erdfelder, E., Lang, A.-G. and Buchner, A. (2007), "G*Power 3: a flexible statistical power analysis program for the social, behavioral, and biomedical sciences", *Behavior Research Methods*, Vol. 39, pp. 175-191.

Fitzpatrick, J. (2013), "Resilience interventions", *Archives of Psychiatric Nursing*, Vol. 27 No. 3, p. 111, doi: 10.1016/j.apnu.2013.03.003.

Flach, F.F. (1988), *Resilience: Discovering New Strength at Times of Stress*, Ballantine Books, New York, NY.

Frittaion, C.M., Duinker, P.N. and Grant, J.L. (2010), "Narratives of the future: suspending disbelief in forest-sector scenarios", *Futures*, Vol. 42 No. 10, pp. 1156-1165, doi: 10.1016/j.futures.2010.05.003.

Gallopin, G.C. (2002), "Planning for resilience: scenarios, surprises, and branch points", in Gunderson, L.H. and Holling, C.S. (Eds), *Panarchy: Understanding Transformations in Human and Natural Systems*, Island Press, Washington, DC, pp. 361-394.

Garcia-Dia, M.J., DiNapoli, J.M., Garcia-Ona, L., Jakubowski, R. and OFlaherty, D. (2013), "Concept analysis: resilience", *Archives of Psychiatric Nursing*, Vol. 27 No. 6, pp. 264-270, doi: 10.1016/j.apnu.2013.07.003.

Giordano, B.P. (1997), "Resilience – a survival tool for the nineties", *AORN Journal*, Vol. 65, pp. 1032-1036.

Glick, M., Chermack, T.J., Luckel, H. and Gauck, B.Q. (2012), "Effects of scenario planning on participant mental models", *European Journal of Training and Development*, Vol. 36 No. 5, pp. 488-507, doi: 10.1108/03090591211232066.

Glick, M., Chermack, T.J., Luckel, H. and Gauck, B.Q. (2012), "Effects of scenario planning on participant mental models", *European Journal of Training and Development*, Vol. 36 No. 5, pp. 488-507, doi: 10.1108/03090591211232066.

Haeffner, M., Leone, D., Coons, L. and Chermack, T.J. (2012), "The effects of scenario planning on participant perceptions of learning organization", *Human Resource Development Quarterly*, Vol. 22 No. 4, pp. 519-542, doi: 10.1002/hrdq.21147.

Hair, J., Black, B., Babin, B., Anderson, R. and Tatham, R. (2006), *Multivariate Data Analysis*, 6th ed., Prentice Hall, Upper Saddle River, NJ.

Jacelon, C.S. (1997), "The trait and process of resilience", *Journal of Advanced Nursing*, Vol. 25 No. 1, pp. 123-129.

Kahane, A. (2012), *Transformative Scenario Planning: Working Together to Change the Future*, Berrett-Koehler Publishers, San Francisco, CA.

Lee, V.E. (2000), "Using hierarchical linear modeling to study social contexts: the case of school effects", *Educational Psychologist*, Vol. 35 No. 2, pp. 125-141.

Leech, N.L., Barrett, K.C. and Morgan, G.A. (2005), *SPSS for Intermediate Statistics: Use and Interpretation*, Lawrence Erlbaum, Mahwah, NJ.

Luthans, B., Luthans, K.W. and Avey, J.B. (2013), "Building the leaders of tomorrow: the development of academic psychological capital", *Journal of Leadership and Organizational Studies*, Vol. 21 No. 2, pp. 191-199, doi: 10.1177/1548051813517003.

Luthans, F. (2002a), "The need for and meaning of positive organizational behavior", *Journal of Organizational Behavior*, Vol. 23, pp. 695-706, doi: 10.1002/job.165.

Luthans, F. (2002b), "Positive organizational behavior: developing and managing psychological strengths", *Academy of Management Executive*, Vol. 16 No. 1, pp. 55-72.

Luthans, F. and Youssef, C.M. (2007), "Emerging positive organizational behavior", *Journal of Management*, Vol. 33 No. 3, pp. 321-349.

Luthans, F., Vogelgesang, G.R. and Lester, P.B. (2006), "Developing the psychological capital of resiliency", *Human Resource Development Review*, Vol. 5 No. 1, pp. 25-44, doi: 10.1177/1534484305285335.

Luthans, F., Avey, J.B. and Patera, J.L. (2008), "Experimental analysis of a web-based training intervention to develop positive psychological capitcal", *Academy of Management Learning & Education*, Vol. 7 No. 2, pp. 209-221.

Luthar, S.S. and Cicchetti, D. (2000), "The construct of resilience: implications for interventions and social policies", *Development and Psychopathology*, Vol. 12 No. 4, pp. 857-885.

Nelson, D. and Cooper, C.L. (2007), *Positive Organizational Behavior: Accentuating the Positive at Work*, Sage, Thousand Oaks, CA.

Nimon, K. (2009), "Regression commonality analysis: demonstration of an SPSS solution", *Multiple Linear Regression Viewpoints*, Vol. 36 No. 1, pp. 10-17.

Nunnally, J.C. (1970), *Introduction to Psychological Measurement*, McGraw Hill, New York, NY.

Nygren, B., Bjorkman, R.K., Lejonklou, A.K. and Lundman, B. (2004), "Reliability and validity of a Swedish language version of the resilience scale", *The Journal of Nursing Measurement*, Vol. 12 No. 1, pp. 169-178.

Paterson, T.A., Luthans, F. and Jeung, W. (2014), "Thriving at work: impact of psychological capital and supervisor support", *Journal of Organizational Behavior*, Vol. 35 No. 3, pp. 434-446. doi: 10.1002/job.1907.

Pipe, T., Buchda, V., Launder, S., Hudak, B., Hulvey, L., Karns, K. and Pendergast, D. (2012), "Building personal and professional resources of resilience and agility in the healthcare workplace", *Stress and Health*, Vol. 28, pp. 11-22.

Polk, L.V. (1997), "Toward a middle-range theory of resilience", *Advances in Nursing Science*, Vol. 1 No. 3, pp. 1-13.

Portzky, M., Wagnild, G., DeBacquer, D. and Audenaert, K. (2010), "Psychometric evaluation of the Dutch Resilience Scale RS-nl on 2365 healthy participants: a confirmation of the association between age and resilience found with the Swedish version", *The Scandinavian Journal of Caring Sciences*, Vol. 1, pp. 86-92, doi: 10.1111/j.147-6712.2010.0084x.

Ramirez, R. and Wilkinson, A. (2014), "Rethinking the 2x2 scenario method: grid or frames?", *Technological Forecasting and Social Change*, Vol. 86 No. 2, pp. 254-264, doi: 10.1016/j.techfore.2013.10.020.

Ramirez, R., Selsky, J.W. and Van Der Heijden, K. (Eds.). (2008), *Business Planning for Turbulent Times: New Methods for Applying Scenarios*, Earthscan, London.

Ramirez, R., Osterman, R. and Gronquist, D. (2013), "Scenarios and early warnings as dynamic capabilities to frame managerial attention", *Technological Forecasting & Social Change*, Vol. 80 No. 4, pp. 825-838.

Rutter, M. (1985), "Resilience in the face of adversity: protective factors and resistance to psychiatric disorder", *The British Journal of Psychology*, Vol. 147, pp. 598-611, doi: 10.1192/bjp.147.6.598.

Scheier, M.F. and Carver, C.S. (1992), "Effects of optimism on psychological and physical well-being: theoretical overview and empirical update", *Cognitive Therapy and Research*, Vol. 16 No. 2, pp. 201-228.

Schoemaker, P.J. (1995), "Scenario planning: a tool for strategic thinking", *Sloan Management Review*, Vol. 36, pp. 25-25.

Schwartz, P. (1991), *The Art of the Longview: Planning for the Future in an Uncertain World*, Doubleday, New York, NY.

Shirey, M.R., Ebright, P.R. and McDaniel, A. (2008), "Sleepless in America: nurse managers cope with stress and complexity", *Journal of Nursing Administration*, Vol. 38 No. 3, pp. 135-131.

Spreitzer, G. and Sonenshein, S. (2004), "Toward the construct definition of positive deviance", *American Behavioral Scientist*, Vol. 47 No. 6, pp. 828-847.

Svendesen, E.S., Baine, G., Northridge, M.E., Campbell, L.K. and Metcalf, S.S. (2014), "Recognizing resilience", *American Journal of Public Health*, Vol. 104 No. 4, pp. 581-583, doi: 10.2105/AJPH.2013.301848.

Thompson, B. (2003), "Score reliability", in Thompson, B. (Ed.), *Contemporary Thinking on Reliability Issues*, Sage, Newbury Park, CA.

Tugade, M.M., Frederickson, B.L. and Barrett, L.F. (2004), "Psychological resilience and positive emotional granularity: examining the benefits of positive emotions on coping and health", *Journal of Personality*, Vol. 72 No. 6, pp. 1161-1190, doi: 10.1111/j.1467-6494. 2004.0029.x.

Tusaie, K. and Dyer, J. (2004), "Resilience: a historical review of the construct", *Holistic Nursing Practice*, Vol. 18 No. 1, pp. 3-8.

van der Heijden, K. (1996), *Scenarios: The Art of Strategic Conversation*, John Wiley, New York, NY.

Veliquette, A.J., Coons, L.M., Mace, S., Coates, T. and Chermack, T.J. (2012), "The effects of scenario planning on participant perceptions of conversation quality and engagement", *International Journal of Technology Intelligence and Planning*, Vol. 8 No. 3, pp. 254-277, doi: 10.1504/IJTIP.2012.048573.

Wack, P. (1984), "Scenarios: the gentle art of re-perceiving: one thing or two learned while developing planning scenarios for Royal Dutch shell", Working paper HBS - N 9-785-042, Harvard Business School.

Wagnild, G.M. (2009), "A review of resilience scale", *Journal of Nursing Measurement*, Vol. 17 No. 2, pp. 105-113.

Wagnild, G.M. and Collins, J.A. (2009), "Assessing resilience", *Journal of Psychosocial Nursing and Mental Health Services*, Vol. 47 No. 12, pp. 28-33.

Wagnild, G. and Young, H.M. (1990), "Resilience among older women", *Image: The Journal of Nursing Scholarship*, Vol. 22 No. 4, pp. 252-255.

Wagnild, G.M. and Young, H.M. (1993), "Development and psychometric evaluation of the resilience scale", *Journal of Nursing Measurement*, Vol. 1 No. 2, pp. 165-178.

Wang, J., Hutchins, H.M. and Garavan, T.N. (2009), "Exploring the strategic role of human resource development in organizational crisis management", *Human Resource Development Review*, Vol. 8 No. 1.

Wright, G. and Goodwin, P. (2009), "Decision making and planning under low levels of predictability: enhancing the scenario method", *International Journal of Forecasting*, Vol. 25 No. 4, pp. 813-825.

Wright, G., Bradfield, R. and Cairns, G. (2013), "Does the intuitive logics method – and its recent enhancements – produce 'effective' scenarios?", *Technological Forecasting & Social Change*, Vol. 80 No. 4, pp. 631-642.

Wu, G., Feder, A., Cohen, H., Kim, J.J., Calderon, S., Charney, D.S. and Mathé, A.A. (2013), "Understanding resilience", *Frontiers in Behavioral Neuroscience*, Vol. 7 No. 10, pp. 1-15, doi: 10.3389/fnbeh.2013.00010.

Youssef, C.M. and Luthans, F. (2007), "Positive organizational behavior in the workplace: the impact of hope, optimism, and resilience", *Journal of Management*, Vol. 33 No. 5, pp. 774-800, doi: 10.1177/0149206307305562.

Zientek, L., Nimon, K. and Hammack-Brown, B. (2016), "Analyzing data from a pretest-posttest control group design: the importance of statistical assumptions", *European Journal of Training and Development*, Vol. 40 Nos 8/9, pp. 638-659.

Further reading

Folke, C., Carpenter, S.R., Walker, B., Scheffer, M., Chapin, T. and Rockstöm, J. (2010), "Resilience thinking: integrating resilience, adaptability, and transformability", *Ecology and Society*, Vol. 15 No. 4, pp. 419-439.

Goodwin, P. and Wright, G. (2010), "The limits of forecasting methods in anticipating rare events", *Technological Forecasting & Social Change*, Vol. 77, pp. 355-368.

Goodwin, P. and Wright, G. (2001), "Enhancing strategy evaluation in scenario planning: a role for decision analysis", *Journal of Management Studies*, Vol. 38 No. 1, pp. 1-16.

Luthans, F., Avey, J.B. and Avolio, J. (2010), "The development and resulting performance impact of positive psychological capital", *Human Resource Development Quarterly*, Vol. 21 No. 1, pp. 41-67, doi: 10.1002/hrdq.20034.

Norman, S., Luthans, B. and Luthans, K. (2005), "The proposed contagion effect of hopeful leaders on the resiliency of employees and organizations", *Journal of Leadership and Organizational Studies*, Vol. 12 No. 2, pp. 55-64, doi: 10.1177/107179190501200205.

Ramirez, R. and Vasconcelos, F. (2011), "Complexity in business environments", *Journal of Business Research*, Vol. 64 No. 3, pp. 236-241.

Staw, B.M. and Ross, J. (1980), "Commitment in experimenting society: a study of the attribution of leadership from administrative scenarios", *Journal of Applied Psychology*, Vol. 65 No. 3, pp. 249-260.

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