

The Effects of Scenario Planning on Perceptions of Organizational Agility

Thomas J. Chermack
Colorado State University
USA

Kevin Lindsey
Colorado State University
USA

Christina Grant
Colorado State University
USA

VA Barber
Colorado State University
USA

Abstract

This article reports the findings from a scenario planning study with four organizations. The focus of the study was to determine the effects of scenario planning on participant perceptions of organizational agility. Researchers gathered pre and posttest organizational agility perception data from participants in four companies surrounding scenario work that lasted approximately four months. Results show no significant change in participant perceptions of organizational agility attributable to scenario planning. Implications, limitations and conclusions are discussed.

Keywords: Scenario Planning, Agility, Quasi-Experiment.

Introduction

Scenario planning is an increasingly applied strategic process in a variety of contexts (Amer, Daim, & Jetter, 2013; Chermack, 2017; Varum & Melo, 2010). Because of the applied nature of scenario planning, it has grown from practice. Thus there are opportunities to build the research base and establish evidence of espoused scenario planning outcomes (Amer, Daim, & Jetter, 2013; Varum & Melo, 2010). Many recent efforts to develop a strong evidence base for scenario planning have shown promise (Cairns & Wright, 2018; Chermack, & Nimon, 2008; Goodwin & Wright, 2001; Montibeller, Gummer, & Tumidei, 2006), and the study of scenario planning has increased in its complexity and rigor.

Scenario planning has been proposed and studied as a process for improving strategic learning (Bowman, 2016; Bradfield, Wright, Burt, Cairns, & Van Der Heijden, 2005; Goodwin & Wright, 2001; Gregory & Duran, 2001), supporting a collaborative organizational climate, and helping decision makers navigate complex environments (Cairns & Wright, 2018; Chermack, & Nimon, 2008; Goodwin & Wright, 2001; Montibeller, Gummer, & Tumidei, 2006; Chang, Tseng, & Chen, 2007; Wright & Goodwin, 2009). Further claims of scenario planning benefits include the ability to help decision makers see a wider set of possibilities, and thereby help decision makers become more adaptive, anticipatory and agile (Rohrbeck, Battistella, & Huizingh, 2015; Wright & Goodwin, 2004). Indeed, the ability to respond faster than the competition to changes in the external environment has long been an espoused core benefit of using scenarios for strategic thinking and decision making (Chermack, & Nimon, 2008; Wright & Goodwin, 2004; Wright & Goodwin, 2009). However, there is no evidence or research to support or refute the claim that scenarios can help decision makers become more agile.

Simultaneously, the phenomenon of agility as it applies to organizations is a relatively new area of research and inquiry (Bernardes & Hanna, 2008; Cummings & Worley, 2015; Sherehiy, Karwawoski, & Layer, 2007). The appeal of organizational agility, and the idea that some process or intervention will help decision makers consistently anticipate potential shifts in the business environment remains an attractive but elusive goal. Several conceptual works in the scenario planning literature have explored aspects of agility and mainly positioned agility as an outcome, or product of scenario planning (McCann, Selsky, & Lee, 2009; Holmqvist & Pessi, 2006). Given the state of research in both fields, there is a strong logical case to explore potential evidence of the connection, both to inform the theory of scenario planning and agility as well as to build stronger, data-driven practice.

Problem Statement, Purpose of the Article and Research Question

Scenario planning has been suggested as a tool that may help decision makers anticipate shifts in the external environment and therefore help their organizations become more agile (Cairns & Wright, 2018; Chermack, & Nimon, 2008; Goodwin & Wright, 2001; Montibeller, Gummer, & Tumidei, 2006; Chang, Tseng, & Chen, 2007; Wright & Goodwin, 2009). However, the claims have been situated in practical observations and anecdotes rather than in repeated instances of disciplined inquiry (Patterson, 2016; Rasmus, 2017). As a result, there is no clear and consistent evidence that use of scenario planning can result in organizations that are indeed more agile. The problem, then, is that:

While there have been strong arguments that scenario planning can promote organizational agility (based on logic and practical observation), there is no research-based evidence to support the arguments.

As has been established, the practice of scenario planning has exceeded its scholarship. To contribute to stronger research, there are two core purposes of this article. First, this article seeks to rigorously examine the link between scenario planning and perceptions of organizational agility, and second, to advance the data-driven, scholarly research base of scenario planning.

Given the identified problem and the purposes of the article, the research question that framed the study was:

RQ1: What are the effects of scenario planning on participant perceptions of organizational agility as measured by the Agility Survey?

Theoretical Framework

While it seems logical that there is a conceptual overlap between scenario planning and organization agility, the literature clarifies the positioning of scenario planning as process, and agility as product. The relevant literature suggests a potential relationship, as well as areas that require further development and elaboration. Following are the main constructs, brief histories of each discipline, and the resulting theoretical framework for situating the study.

Organizational Agility

Organizational agility is a far-reaching concept that encompasses inter-disciplinary views on a wide range of business practices, including: leadership, culture, human resource development, organizational design, technology, manufacturing, product development, and organizational change (Bernardes & Hanna, 2008; Cummings & Worley, 2015; Hickman, 2016; O'Toole, 2001; Schein & Schein, 2017; Sherehiy, Karwawoski, & Layer, 2007; Wang & Ahmed, 2003). Sherehiy, et al. (2007) recognized that adaptability, flexibility, and agility were often used synonymously within the literature to describe the prevailing attributes of "agile organizations." Specifically, speed and flexibility are required to allow organizations to effectively respond to change and uncertainty (Sherehiy et al., 2007).

Cummings and Worley (2015) identified this as "dynamic capability" whereby agility is achieved through an organization's ability to "effectively respond to changing environments and multiple stakeholder demands" (p. 664). In this same vein, O'Toole (2001) focused on the external environment of organizations and defined agility as the "ability to detect and cope with changes in the external environment, especially when the changes are hard to predict" (p. 167). Many authors agree that agility requires internally flexible organizational structures in order to provide for proactive and rapid response to dynamic industry forces (Bernardes & Hanna, 2008; Kidd, 1994; Reed & Blundson, 1998; Sherehiy, Karwawoski, & Layer, 2007).

Agility is currently a buzzword in industry; however, Bernardus and Hanna (2009) noted that there is not as much conceptual development within the literature for agility as there is for similar concepts such as flexibility and responsiveness. Many authors supported the underlying notion that organizational agility is the ability to respond to external environmental forces and stakeholder input, whereby organizations must rapidly and efficiently react (Bernardes & Hanna, 2008; Cummings & Worley, 2015; Hickman, 2016; Kidd, 1994; O'Toole, 2001; Ramesh & Devadasan, 2005; Reed & Blundson, 1998; Schein & Schein, 2017; Sherehiy, Karwawoski, & Layer, 2007). However, what makes an organization truly agile is not just be its ability to react to change, but its ability to recognize, posture, and exploit change to the advantage of the organization (Sharifi & Zhang, 2001). This proactive view of organizational agility seems far more motivating to modern industry, as agile organizations are seen to have the potential to maintain sustainable competitive advantages in markets through the exploitation of inevitable change cycles (Sharifi & Zhang, 2001). Therefore, most literature on the topic of agility is focused on identifying agile characteristics and attributes for organizations to foster.

Attributes and Characteristics of Agile Organizations

Agility is strongly associated with an organization's ability to change. The literature reviewed identified two key areas that require further focus when trying to achieve organizational agility: workforce agility and agile organizational practices (Sherehiy et al., 2007).

Workforce agility

Contrary to industry wisdom, research has shown that manufacturing flexibility is more dependent on workforce agility than technology (Sherehiy, Karwawoski, & Layer, 2007). One recurring key component of an agile organization was the ability to cultivate and maintain a culture of organizational learning (Hickman, 2016). Wang and Ahmed (2003) concluded that "organization learning is not simply a collectivity of individual learning processes, but [it] engages interaction between individuals in the organization, and interaction between organizations as one entity, and interaction between the organization and its contexts" (p.15). Organizational learning focuses on creating institutions that are "learning systems... capable of bringing about their own continuous transformation" (Schon, 1971, p.30). Senge (1990) popularized this notion and identified five key components of organizational learning: personal mastery, mental models, shared vision, team learning, and systems thinking (pp.6-10).

Wang and Ahmed (2003) distilled these components further based on a review of the pertinent literature and identified five focus areas for cultivating a learning organization: individual learning, viewing organizational learning as a system, establishing organizational learning culture as a shared metaphor, knowledge management, and continuous improvement (pp.10-11). Common to most literature on organizational learning is the concept of double-loop learning, whereby individuals use information from their environment to change their mental models and create an open system of organizational learning (Argyris & Schon, 1978; Wang & Ahmed, 2003). Organizational learning and its components are key concepts in fostering an agile workforce.

Agile organizational practices

Literature reviewed showed that agile organizations focus on practices and capabilities that allow for response to market forces through rapid changes to workforce skills, infrastructure, and institutional norms (Bernardes & Hanna, 2008; Ramesh & Devadasan, 2005; Sherehiy, Karwawoski, & Layer, 2007). Core agile capabilities include responsiveness, competency, flexibility, and quickness (Sharifi & Zhang, 2001). For agility to be achieved, however, core capabilities must be achievable across the organizational spectrum to include: organizational systems, processes, technology, people, and innovation (Sharifi & Zhang, 2001; Yusuf, Sarahadi, & Gunasekaran, 1999). Therefore, highly agile organizations measure agility through analysis of production infrastructure, market infrastructure, workforce infrastructure, and information infrastructure (Tsourveloudis & Valavanis, 2002).

Synthesis

Organizational agility is a broad and relatively weakly defined construct in the literature. Definitions abound; however, agile organizations reliably possess an ability to react quickly to unexpected change and to posture themselves to exploit advantages for the organization. Literature indicates that agility is accomplished through workforce development and institutional practices and capabilities. Agile organizations consistently foster organizational learning as a workforce practice, and assess agile capability in the areas of systems, processes, technology, people, and innovation. Rapid adaptation to unforeseen changes across all areas of an organization is the hallmark of agility.

Scenario Planning

Because the authors assume readers have a general understanding of scenario planning, this portion of the theoretical framework is intentionally kept brief. It is not situated as a comprehensive review of scenario planning literature, rather it provides the basis to understand the research study presented in this research project.

Modern scenario planning was first used in business organizations within the RAND corporation in the 1960's, with Herman Kahn (Amer, Daim, & Jetter, 2013; Varum & Melo, 2010) who founded the Hudson Institute (Derbyshire & Wright, 2017; Varum & Melo, 2010). The Stanford Research Institute began to focus on long-range planning, using similar techniques around the same timeframe (Chermack, 2011). Ted Newland, Pierre Wack, Napier Collins introduced scenario planning at Shell in the 1960's as well, enabling the organization to react quickly, and successfully, to the dramatic increase in oil prices in 1973 (Chermack, 2011; Schwartz, 1996; van der Heijden, 2005). Interest in scenario planning has increased in the research community (Varum & Melo, 2010) and in practice the use of scenario planning has been increasing (Amer et al., 2013).

Scenario planning was developed in two main geographical locations, the United States and France (Varum & Melo, 2010). In France, Godet was using scenarios and developing the La Prospective school (Varum & Melo, 2010). In the United States, the techniques introduced at Shell by Pierre Wack were propagated by Schwartz and van der Heijden (Chermack, 2011; van der Heijden, 2005; Wack, 1985; Varum & Melo, 2010). This technique followed the "intuitive logics" approached introduced by Wack and has become the leading technique within the United States and research literature (Amer et al., 2013).

Defining scenario planning

There are many definitions of scenario planning (Amer et al., 2013; Chermack, 2011; Schwartz, 1996; van der Heijden, 2005). Scenario planning is used to support structured thinking around decision-making (Schwartz, 1996; Van der Heijden, 2005), as a tool for future planning around uncertain and ambiguous situations (Van der Heijden, 2005), and ordering perceptions and allowing creative thinking (Schwartz, 1996). Scenario planning is a strategy building and leadership development tool (Amer et al., 2013; Chermack, 2004; Chermack, 2011; Ogilvy & Schwartz, 1998). While there are different versions of the scenario planning process, the one originally designed by Pierre Wack for Shell Oil was refined by Ogilvy and Schwartz (1998). It is worth noting Spaniol and Rowland's (2018) recent work as a modern integrative contribution to the ongoing discussion of scenario planning definitions.

Outcomes of scenario planning

The outcomes scenario planning might achieve are notably diverse. Some models suggest the practice can build stronger organizational culture and dialogue (Chermack & Lynham, 2002; Chermack, 2011; Schwartz, 1996). Others suggest stronger organizational performance through better leadership capability, including decision making and speed of reaction (Ogilvy & Schwartz, 1998; van der Heijden, 2005; Schwartz, 1996). While research continues to build on the evidence to support such claims, the field is wide open for additional connection points between skill building and scenario planning. The proliferation of topics in the literature today hints at the range of possibilities for further exploration on the topic.

Scenario planning process

Ogilvy and Schwartz (1998) provided the first step-by-step approach to scenario planning, including simpler steps organizational members could follow without necessitating a scenario planning expert or strategic design department in a company. Chermack (2011) further standardized

the process, providing frameworks for scenario exploration and writing, implementation, and success measures. This process benefits researchers as it is highly replicable while also being flexible; it can be adapted based on the organization's size and strategy development or leadership growth needs (Chermack, 2011). Time constraints can also be accommodated, as the number of workshops can be modified to fit within the available time table (Chermack, 2011).

The process begins with a series of interviews with organizational leaders to identify key areas of focus (Montibeller, Gummer, & Tumidei, 2006). Next, workshops with organizational members are facilitated. In the course of the workshops, participants exteriorize their assumptions about current and future stressors on their business. They discuss critical uncertainties and the level of impact those issues may have on their performance organizationally.

Throughout the process, participants engage in rich, robust dialogue about their current and future realities, and they test potential strategies for risk and reward (Chermack, 2011). Ultimately, the process is a dynamic, engaging experience through which participants learn about their own mental models and those of their colleagues. Stronger alignment and understanding of self, team, and organization are likely outputs of the intervention (Chermack & Lynham, 2002; Chermack, 2011; Chermack, 2017; Ogilvy & Schwartz, 1998). Moreover, better and more flexible decision making is a relatively well-established outcome of the process (Cairns & Wright, 2018; Chang, Tseng, & Chen, 2007; Chermack & Nimon, 2008; Goodwin & Wright, 2001; Montibeller, Gummer, & Tumidei, 2006; Wright & Goodwin, 2009). This indication of improved flexibility connects well with the construct of agility.

Synthesis

It seems likely, given the nature of agility and the process and products of scenario planning that the two may be connected. Scenario planning may offer a technique for improving agility both in individuals and teams. This may be because of the process itself – its emphasis on increasing flexibility in decision making and speed of response times. This study sought to explore whether or not scenario planning and agility are connected, and whether the process may be useful in skill building toward more agile behavior.

Research Hypotheses

The primary research hypothesis was that there will be a statistically and practically significant mean difference on participant perceptions of organizational agility due to participation in scenario planning. The null hypothesis is that there will be no statistical or practical mean difference in perceptions of organizational agility. The primary and null hypotheses are provided symbolically as follows:

$$H0: \mu D = 0$$

$$H1: \mu D > 0$$

The structure of the Agility Survey indicates four sub factors of overall agility (Strategizing, Perceiving, Testing and Implementing) which leads to four sub hypotheses:

H2: Perceptions of Strategizing with significantly increase after participation in scenario planning as measured by the Agility Survey

H3: Perceptions of Perceiving with significantly increase after participation in scenario planning as measured by the Agility Survey

H4: Perceptions of Testing with significantly increase after participation in scenario planning as measured by the Agility Survey

H5: Perceptions of Implementing with significantly increase after participation in scenario planning as measured by the Agility Survey

Research Method

The following sections present the research design, sampling procedures, data collection strategies, instrument selection and a description of the scenario planning intervention.

Research design

The study was a single subject experimental design (Byiers, Reichle, & Symons, 2012). The single subject design refers to the fact that there was an intervention group and no comparison group, also commonly referred to as one form of a quasi-experimental design (Byiers, Reichle, & Symons, 2012). While the gold standard of intervention research remains a true experimental design (intervention and comparison groups with random selection and random assignment), single subject experimental designs are particularly useful in exploratory research (Byiers, Reichle, & Symons, 2012). Because the relationship between scenario planning and agility has not been studied empirically (Puthenveetil, Sorensen, Yaeger & Anderson, 2017), researchers selected the exploratory approach.

It was not possible to achieve random selection of organizations or participants due to the nature of the scenario planning intervention -- scenario planning participants are chosen very purposefully. This limitation is discussed in a later section.

Power

Following Faul, Erdfelder, Lang, and Buchner (2007), G*Power was used for power and sample size analysis. To achieve a power of .88, an alpha of .05 and an effect size $f = .25$, 45 matched pairs (pretest to posttest) responses were required.

Sample

Participants in this study were selected by convenience. After the study was approved by IRB, several local organizational leaders were sent recruitment documents, a description of the scenario planning intervention, a brief description of the study and an outline of the research project. Leaders who expressed an interest were contacted for further discussion and clarification. Researchers were able to recruit four organizations into the study, ultimately resulting in complete responses (participation in all workshops and completion of both the pre and post measures) from 42 participants among the four organizations – a relatively small sample size.

Data collection

Data were collected from participants at the start of the first scenario planning workshops, and at the end of the final scenario planning workshops (approximately four months later) using paper-based surveys.

Instrument selection and justification

Organization agility is difficult to measure at best. While a few survey instruments have been developed, the choice was simple. The instrument selected to measure participant perceptions of organizational agility was the Agility Survey, developed by Worley, Williams and Lawler (2014). While agility is a relatively immature construct (as demonstrated by the literature review), the Agility Survey is clearly the most commonly used measure of agility with the most robust track record. It should be noted that perceptions of organization agility do not equal an objective

assessment of organization agility. In thinking about how to judge the degree to which an organization can be considered agile, the need for understanding specific events comes to mind.

Description of the intervention

The research study presented can be classified as intervention research (Hodkinson & Healy, 2008), meaning that researchers facilitated applied scenario planning projects in four organizations and collected data around these scenario planning interventions. Data were collected as pre- and posttests in an attempt to isolate any results to the scenario planning intervention. Having established the general nature of the study, there is no standardized approach to scenario planning interventions (Varum & Melo, 2010). Scholars and practitioners in the field have developed a wide variety of processes, methods and tools that can span from one day to 12 months or more (Varum & Melo, 2010). The purpose of the following sections is to describe how the team facilitated and delivered scenario planning for the four organizations participating in the study.

Interviews and workshops

Once the project logistics, meeting dates and participants were established, the research team began by interviewing approximately six individuals in each of the four organizations. Participant interviews were based on the seven questions developed by Pierre Wack at Shell (Chermack, 2017; van der Heijden, 2005). These interviews were not part of the research project, and were specifically intended to understand the strategic issues, dynamics, contexts and situations each of the four organizations were facing.

Once the interviews were complete, the scenario projects proceeded through the use of several workshops. Initial workshops were designed around the popular approach developed by Ogilvy and Schwartz (2004). These workshops involved brainstorming on a key strategic issue, ranking by impact, ranking by uncertainty, and the selection of a 2X2 matrix based on critical uncertainties. The workshops were generally viewed as group interviews and the outcome was to determine the framing forces for each organization (2X2 matrix).

Scenario building and feedback

Once a matrix was developed for each participating organization, the research team held several additional meetings (without the organizational participants) to develop the scenario structures. The team used news articles, academic research, Internet searches, relevant books and other sources to fill in the details of the scenarios and create realistic, but surprising plot lines. Once initial drafts of the scenarios were complete, the team provided them to the original set of organizational participants for comment and adjustment. Participants were invited to consider each scenario and its level of a) plausibility, b) challenging nature and c) relevance to the focus of the scenario project. This exercise was not part of the research study -- the intent was to tailor the scenarios according to the criteria provided and approach a balance. The team edited the written scenarios based on organizational participant feedback and finalized each set of scenarios for use in decision-testing and strategy development.

Connection to strategy

Further workshops were scheduled to consider existing strategies and options against the scenarios. Organizational participants were asked to judge the current strategies and associated options in terms of their potential risks and benefits (using a 1-10 scale), using customized worksheets and digital ranking applications. Information from these exercises was plotted in a series of visual displays, intending to show how organizational strategies and options might perform under the conditions provided within the scenarios and across the set of scenarios.

Results

The following sections contain descriptions of the data analysis strategy, procedures, assumptions, score reliability and validity and finally the matched pairs (pretest – posttest) test results.

Data analysis

Pretest and posttest survey responses to the Agility Survey were input into IBM SPSS Statistics. Analyses were conducted to generate basic descriptive statistics and to ensure the data met the required assumptions underlying a matched pairs *t*-test.

Assumptions for statistical tests

There are three assumptions foundational to matched pairs *t*-tests. They are: (1) the data are continuous (not discrete), (2) the data are normally distributed and (3) the sample of pairs is a simple random sample from its population.

Descriptive statistics

Descriptive statistics showed the data generally followed an acceptable normal distribution (skewness and kurtosis statistics were all within acceptable ranges), meeting the first assumption of a matched pairs *t*-test. Further, given the use of the selected survey instrument, data were continuous, meeting the second assumption of a matched pairs *t*-test. Again, researchers were not able to achieve random selection from the population, which is recognized and discussed in the limitations section.

Score reliability

The overall Cronbach's Alpha score was .88 for the pretest and .82 for the posttest. Further, reliability coefficients for the four sub-factors of the instrument are shown in Table 1.

Table 1. *Reliability coefficients for perceptions of agility measures*

Factor	Pretest	Posttest
Strategizing	.84	.81
Perceiving	.78	.73
Testing	.87	.92
Implementing	.79	.83

Score validity

Given the acceptable score reliability statistics, research proceeded with an exploratory factor analysis to make a judgment about score validity. Researchers considered a confirmatory factor analysis but because of the relative novelty of the Agility Survey and the sample size, researchers concluded that an exploratory factor analysis (EFA) was the more appropriate, conservative and responsible assessment (Field, 2005). Researchers performed a principal components analysis (PCA) using varimax rotation (Field, 2005). Because the instrument has an established theoretical structure, four factors were requested and eigenvalues below .40 were suppressed (Field, 2005).

t-test results

Because the assumptions underlying the *t*-test were generally met (with the exception of random selection and assignment), researchers proceeded with the primary analysis.

Table 2. *matched pair t-tests for perceptions of organizational agility scores*

	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval		<i>t</i>	df	<i>p</i>	<i>D</i>
				Lower	Upper				
Strategizing - Strategizing_post	0.06	0.81	0.13	0.32	0.20	0.48	40.00	0.63	.11
Perceiving - Perceiving_post	0.09	0.76	0.12	0.15	0.33	0.78	40.00	0.44	.05
Testing - Testing_post	0.06	0.81	0.13	0.31	0.20	0.47	40.00	0.64	.11
Implementing - Implementation_post	0.11	0.72	0.11	0.12	0.34	1.00	40.00	0.33	.51

Discussion

Matched pair *t*-test results from the Agility Survey participants ($N = 42$) were unconvincing. No statistically significant difference was observed for strategizing ($p = .63$), perceiving ($p = .44$), testing ($p = .64$), or implementing ($p = .33$). Mean differences were inconsequential with no mean difference achieving greater than one standard deviation. Furthermore, the confidence interval indicated tight coupling between pre and post-test results with no difference in the means attaining greater than 0.33 points of change on a 0 to 6 scale.

Test results indicated that there was no statistical or practical mean difference in perceptions of organizational agility after the scenario planning intervention. The null hypothesis was accepted, and primary and sub hypotheses were rejected. The research results indicate that participants in this study did not experience a meaningful shift in their perceptions concerning organizational agility after participating in scenario planning.

Limitations

Rohrbeck et al., (2015) and Wright and Goodwin (2004) claimed that scenario planning can encourage organizational agility by exposing leaders and decision makers to a greater scope of possibilities. However, little research has been conducted to advance this notion with empirical evidence. Further complicating the study of the effects of scenario planning on organizational agility, is the fact that agility as an organizational attribute is a relatively new field of enquiry (Bernardes & Hanna, 2008; Cummings & Worley, 2015). Even the definitions of organizational agility are wide-ranging and include an impressive breadth of organizational disciplines (Bernardes & Hanna, 2008; Cummings & Worley, 2015; Hickman, 2016; O'Toole, 2001; Schein & Schein, 2017; Sherehiy, Karwawoski, & Layer, 2007; Wang & Ahmed, 2003).

This study sought to measure individual perceptions of organizational agility and did not measure agility as a desired attribute of an organization. Though, individual perceptions of organizational agility may not have been significantly or practically affected by the scenario

planning intervention in this study, that is not to say definitively that scenario planning has no effect on agility.

Random sampling was not possible because scenario planning interventions purposefully seek representation from key organizational levels, important stakeholders, and exceptional outsiders (Chermack, 2011). In lieu of this limitation, a quasi-experimental design was used to achieve single subject exploratory research outcomes (Byiers, Reichle, & Symons, 2012). The research team measured pre and post-perceptions of organizational agility using the Agility Survey for four scenario planning interventions, over a period of four months. Scenario planning used to achieve strategic thinking is a continuous process and one scenario planning intervention (in each of four organizations) may not be enough to measure meaningful changes in perception (Wack, 1985; Chermack, 2011, Chermack, & Nimon, 2008). Further, the amount of time between interventions may have dampened the impact on individual perceptions.

Finally, using Faul et al. (2007) it was determined that 45 matched pairs of pre and post-test responses were necessary to achieve reasonable assurance of valid field data. The research team was only able to achieve 42 matched pairs. Conclusions drawn from the field of data collected should be limited with the understanding that the population surveyed was less than optimal. Finally, time may play a role in changing perceptions of agility. In this case, posttest data were collected at the conclusion of the final scenario planning workshop. Decision makers would not have had adequate time to absorb what was learned from the scenario exercise, apply it to relevant decisions and see the outcomes at the time of posttest measurement.

Recommendations for Future Research

The research team focused on the effect that scenario planning had on the perceptions of organizational agility in participants. However, the research conducted did not fully address the question: what are the effects of scenario planning on organizational agility? Sherehiy et al. (2007) identified speed and flexibility as necessary qualities of agile organizations as any potential measurement instrument is limited and incomplete. Further research may do well to identify organizations with systemic scenario planning practices and measure their overall speed and flexibility in responding and adapting to external forces.

Scenario planning as a tool to achieve strategic thinking is an important vector for future researchers to pursue. As this study was not able to achieve the optimal population sample, further research should include greater than 45 participants. Also, scenario planning is not a one-time single intervention solution for strategic change (Ramirez & Wilkinson, 2016). When done properly, scenario planning should be incorporated into the long-range strategic planning cycles of the organization (Wack, 1985; Chermack, 2011). Therefore, longitudinal studies of perception could be pursued with organizations that systemically use scenario planning as a method to achieve strategic goals. A longitudinal study on participants would account for the holistic implementation of scenarios into strategy, much of which occurs after the initial interventions.

Conclusion

Organizational agility is a relatively new area of research with broad definitions spanning many professional disciplines (Bernardes & Hanna, 2008; Cummings & Worley, 2015; Hickman, 2016; O'Toole, 2001; Schein & Schein, 2017; Sherehiy, Karwawoski, & Layer, 2007; Wang & Ahmed, 2003). Scenario planning as means to achieve organizational agility has been a general curiosity in the literature, but has not been well researched (Rohrbeck, Battistella, & Huizingh, 2015; Wright & Goodwin, 2004). This study attempted to bridge the research gap by addressing the question: what are the effects of scenario planning on participant perceptions of organizational agility as measured by the Agility Survey?

Using a quasi-experimental single subject design, the research team collected pre and post-survey results from 42 scenario planning participants. The Agility Survey provided the research team with four sub-categories of organizational agility to assess: perceptions of strategizing, perceptions of perceiving, perceptions of testing, and perceptions of implementing. Results showed that there was no statistical or practical mean difference in pre and post-survey results amongst participants.

This study represents the first empirical attempt at understanding the effects that scenario planning may have on organizational agility, and limitations have been clarified. The research question for this study only addressed participant perception of organizational agility. It did not address the effects of scenario planning on agility as a desired attribute of an organization in more objective terms. Other limitations of this study include sample size and duration. It should be recognized that scenario planning appears to present a reasonable and logical tool in achieving organizational agility outcomes and further research would not be in vein. Vectors for further research include but are not limited to: longitudinal studies on participant perceptions, and speed and flexibility studies on organizations that systemically incorporate scenario planning into their strategic agenda.

Correspondence

Thomas J. Chermack
Colorado State University
USA
E-mail: tjchermack@gmail.com

References

- Amer, M., Daim, T. U., & Jetter, A. (2013). A review of scenario planning. *Futures*, 46, 23-40.
- Argyris, C., & Schon, D. (1978). *Organisational learning: A theory of action perspective*. New York, NY: Addison-Wesley.
- Bernardes, E., & Hanna, M. (2008). A theoretical review of flexibility, agility and responsiveness in the operations management literature. *International Journal of Operations and Production Management*, 29(1), 30-53.
- Bowman, G. (2016). The practice of scenario planning: An analysis of inter-and intra-organizational strategizing. *British Journal of Management*, 27(1), 77-96.
- Bradfield, R., Wright, G., Burt, G., Cairns, G., & Van Der Heijden, K. (2005). The origins and evolution of scenario techniques in long range business planning. *Futures*, 37(8), 795-812.
- Byiers, B. J., Reichle, J., & Symons, F. J. (2012). Single-subject experimental design for evidence-based practice. *American journal of speech-language pathology*.
- Cairns, G., & Wright, G. (2018). Making scenario interventions matter: Exploring issues of power and rationality. *Futures & Foresight Science*, e10.
- Chang, M. S., Tseng, Y. L., & Chen, J. W. (2007). The scenario planning approach for the flood emergency logistics preparation problem under uncertainty. *Transportation Research Part E*, 43(6), 737-754.
- Chermack, T. J. (2004). Improving decision-making with scenario planning. *Futures*, 36(3), 295-309.
- Chermack, T. J. (2011). *Scenario Planning in Organizations: How to Create, Use, and Assess Scenarios*. San Francisco, CA: Berrett-Kohler Publishers, Inc.
- Chermack, T. J. (2017). *Foundations of Scenario Planning: The Story of Pierre Wack*. Routledge.
- Chermack, T. J., & Lynham, S. A. (2002). Definitions and outcome variables of scenario planning.

- Human Resource Development Review*, 1(3), 366-383. doi:10.1177/1534484302013006
- Chermack, T. J., & Nimon, K. (2008). The effects of scenario planning on participant decision-making style. *Human Resource Development Quarterly*, 19(4), 351-372. doi:10.1002/hrdq.1245
- Cummings, T., & Worley, C. (2015). *Organizational Development and Change* (10 ed.). Stamford, CT: Cengage Learning.
- Derbyshire, J., & Wright, G. (2017). Augmenting the intuitive logics scenario planning method for a more comprehensive analysis of causation. *International Journal of Forecasting*, 33(1), 254-266.
- Faul, F., Erdfelder, E., Lang, A. G., & Buchner, A. (2007). G* Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior research methods*, 39(2), 175-191.
- Field, A. P. (2005). Is the meta-analysis of correlation coefficients accurate when population correlations vary?. *Psychological methods*, 10(4), 444.
- Goodwin, P., & Wright, G. (2001). Enhancing strategy evaluation in scenario planning: a role for decision analysis. *Journal of management studies*, 38(1), 1-16.
- Gregory, W. L., & Duran, A. (2001). Scenarios and acceptance of forecasts. In J. S Armstrong (Ed.), *Principles of forecasting: A handbook for researchers and practitioners*. Boston: Kluwer Academic Publishers.
- Hickman, G. (2016). *Leading organizations prespectives for a new era* (3rd ed.). Thousand Oaks, CA: SAGE Publications Inc.
- Hodgkinson, G. P., & Healey, M. P. (2008). Cognition in organizations. *Annual review of psychology*, 59.
- Holmqvist, M., & Pessi, K. (2006). Agility through scenario development and continuous implementation: a global aftermarket logistics case. *European Journal of Information Systems*, 15(2), 146-158.
- Kidd, P. (1994). *Agile manufacturing: forging new frontiers*. Reading, MA: Addison-Wesley.
- McCann, J., Selsky, J., & Lee, J. (2009). Building agility, resilience and performance in turbulent environments. *People & Strategy*, 32(3), 44-51.
- Montibeller, G., Gummer, H., & Tumidei, D. (2006). Combining scenario planning and multi-criteria decision analysis in practice. *Journal of Multi-Criteria Decision Analysis*, 14(1-3), 5-20.
- Ogilvy, J. A., & Schwartz, P. (1998). Plotting your scenarios. In L. Fahey, R. Randall (Eds.), *Learning from the Future* (pp. 57-90). New York: John Wiley & Sons.
- O'Toole, J. (2001). When leadership is an organizational trait. In W. Bennis, G. Spreitzer, & T. Cummings, *The future of leadership: today's top leadership thinkers speat to tomorrow's leaders* (pp. 158-174). San Francisco, CA: Jossey-Bass.
- Patterson, L. (2016). How to use scenarios to achieve marketing agility. *Marketing Profs*. Retrieved from: <http://www.marketingprofs.com/articles/2016/31233/how-to-use-scenarios-to-achieve-marketing-agility>.
- Puthenveetil, J. P. (2016). *An Assessment of the Role of Scenario-Based Anticipatory Organizational Learning in Strategy Development—An Organization Development Perspective*. Benedictine University.
- Ramesh, G., & Devadasan, S. (2005). Literature review on the agile manufacturing criteria. *Journal of Mangement Technology*, 18(2), 182-201.
- Ramirez, R., & Wilkinson, A. (2016). *Strategic reframing*. Oxford, UK: Oxford University Press.
- Rasmus, D. (2017). Scenario planning for human resources: Key to agility and anticipation. Retrieved from: <https://www.peoplemattersglobal.com/article/training-development/scenario-planning-for-human-resources-key-to-agility-and-anticipation-16407>.
- Reed, K., & Blundson, B. (1998). Organizational flexibility in Australia. *International Journal of Human Resource Management*, 9(3), 457-477.

- Rohrbeck, R., Battistella, C., & Huizingh, E. (2015). Corporate foresight: An emerging field with a rich tradition. *Technological Forecasting and Social Change*, 101, 1-9.
- Schein, E., & Schein, P. (2017). *Organizational Culture and Leadership* (5 ed.). Hoboken, NJ: John Wiley & Sons, Inc.
- Schon, D. (1971). *Beyond the stable state*. New York, NY: Random House.
- Schwartz, P. (1996). *The Art of the Long View: Paths to Strategic Insights for You and Your Company*. New York, NY: Doubleday.
- Senge, P. (2006). *The fifth discipline the art and practice of the learning organization*. New York, NY: Crown Publishing Group.
- Sharifi, H., & Zhang, Z. (2001). Agile manufacturing in practice: application of a methodology. *International Journal of Operations and Production Management*, 21(5/6), 772-794.
- Sherehiy, B., Karwawoski, W., & Layer, J. (2007). A review of enterprise agility: concepts, frameworks, and attributes. *International Journal of Industrial Ergonomics*, 37, 445-460.
- Spaniol, M. J., & Rowland, N. J. (2018). Defining scenario. *Futures and Foresight Science*, 1(1), 1-13.
- Tsourveloudis, N., & Valavanis, K. (2002). On the measurement of enterprise agility. *Journal of Intelligent and Robotic Systems*, 33(3), 329-342.
- van der Heijden, K. (2005). *Scenarios: The Art of Strategic Conversation*. San Francisco, CA: John Wiley & Sons.
- Varum, C. A., & Melo, C. (2010). Directions in scenario planning literature—A review of the past decades. *Futures*, 42(4), 355-369.
- Wack, P. (1985). Scenarios: Shooting the rapids. *Harvard Business Review*, 63(6), 139-150.
- Wang, C., & Ahmed, P. (2003). Organisational learning: a critical review. *The Learning Organization*, 10(1), 8-17.
- Worley, C. G., Williams, T. D., Williams, T., & Lawler III, E. E. (2014). *The agility factor: Building adaptable organizations for superior performance*. John Wiley & Sons.
- Wright, G., & Goodwin, P. (2009). Decision making and planning under low levels of predictability: Enhancing the scenario method. *International Journal of Forecasting*, 25(4), 813-825.
- Yusuf, Y., Sarahadi, M., & Gunasekaran, A. (1999). Agile manufacturing: the drivers, concepts and attributes. *International Journal of Production Economics*, 62(1-2), 33-43.