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Exploring the relationship between scenario planning and perceptions of learning organization characteristics

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Abstract

This article attempts to verify some assumptions evident in the scenario planning literature through the application of quantitative measures. The Dimensions of the Learning Organization Questionnaire is used to measure participant perceptions of the learning organization characteristics pre- and post-scenario planning intervention. Results are discussed, limitations are identified and clarified, and conclusions are drawn with speculations and refinements for future research.

1. Introduction

Scenario planning has been reported as a method of creating, enhancing, and improving the learning organization [1–3]. While these claims have been abundant in the scenario planning literature, there has been no quantitative support for these claims. Efforts to evaluate scenario planning through quantitative analyses do not exist [4] and for scholars interested in establishing and documenting the effects of scenario planning in an observable, consistent and careful manner, the current lack of sound scenario planning research provides a ripe agenda.

While there is not yet evidence of a correlation between scenario planning, and the construct of organizational learning (which is considered a necessary component of the learning organization), there does seem to be some evidence of individual learning in

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the scenario planning experience although none of it is documented in a rigorous or careful manner. Many authors have based their work in cognitive psychology, and specifically, in the concept of mental models [2,5–8]. This work is also generally descriptive and conceptual and often refers to the classic Royal Dutch/Shell examples and cases [3,9]. These cases and descriptive examples have fueled larger claims that are unfounded according to academic research methods; however, they do spark interest in investigating the phenomena more closely. To be clear, while individual and organizational learning *seem* to be and are reported as intricate components of successful scenario planning, their relationships must be examined more closely.

This article does not intend to be overly critical of scenario planning pioneers. On the contrary, let the work of these exceptionally creative and generative thinkers be acknowledged [2,3,5–12]. In addition, this article also argues that the time has emerged for more careful documentation of what contributes to the success of scenario planning and what contributes to its failure. Furthermore, this careful documentation might best be conducted through the use of academic tools that have been neglected thus far in the analysis of scenario planning projects.

2. Theoretical framework

Chermack [13] devised a method of evaluating performance-based scenario planning. The method consisted of evaluating scenario planning in terms of economic, systems, and psychological domains at the individual, group, and organizational levels. Chermack [13] developed an evaluation heuristic and also a research agenda for assessing performance-based scenario planning according to multiple measures and from multiple methodological approaches (see Fig. 1). This article reports on quantitative research that explores ONE aspect of that matrix—namely, psychological performance (learning) at the organizational level. To clarify, this article explores the effects of scenario planning on perceptions of learning at the organizational level.

In addition to this evaluative framework, Chermack [14] also developed a theory of scenario planning using Dubin's [15] quantitative theory building methodology. In it, Chermack hypothesized "a positive relationship between participation in scenario planning and learning at multiple levels" [14, p. 70]. Thus this study serves in part to provide general evaluation of prevalent claims in the scenario literature that scenario planning enhances organizational learning, and in part to investigate the accuracy of one component of Chermack's [14] theoretical model.

Level of Performance	**Theoretical Foundation and Evaluation Measure**		
	Economic Performance	Psychological Performance	System Performance
Job/Performer			
Group/Process			
Organization		***The focus of this inquiry**	

Fig. 1. Heuristic for evaluating scenario planning in performance contexts (Based on Swanson [33] and Rummler and Brache [34] (Chermack [13])).

2.1. Purpose of the article and research question

This article addresses two core issues with regard to scenario planning: (1) a lack of data-based and empirically-driven studies about the phenomenon, and (2) a lack of general evaluation of scenario planning practices. The purpose of this article is to describe the relationship between scenario planning and perceptions of the learning organization using quantitative methods. Thus, the research question that served as the basis of this inquiry was as follows:

> RQ1—What are the effects of scenario planning on individual perceptions or the organizations' ability to continuously learn and adapt?

We hypothesize that there will be an increase in mean scores of perceptions based on inventories taken before and after the scenario planning intervention.

3. Scenario planning

Scenario planning is a multi-faceted organizational intervention aimed at recognizing the fact that the business environment is uncertain. Thus scenario planning assumes the best way to cope with uncertainty is to try and include it in the planning process. Based on both external and internal analyses, scenario planning usually occurs over multiple workshops in which key driving forces in the business environment are identified as well as the main concerns of managers and executives. A distilled list of issues is compiled and then ranked first according to impact on the business agenda and then uncertainty. This ranking exercise produces a matrix with impact on the "*X*" axis and uncertainty on the "*Y*" axis. Elements ranked high in both categories become the core elements of the scenarios themselves. Further workshops allow participants to explore the "what ifs" in each of the scenarios and eventually, the current strategic agenda is assessed in the context of each scenario. A general stepped approach to scenario planning according to the Center for Innovative Leadership [16] is as follows:

1. identify a strategic organizational agenda, including assumptions and concerns about strategic thinking and vision,
2. challenge existing assumptions of organizational decision makers by questioning current mental models about the external environment,
3. systematically examine the organizations external environment to improve understanding of the structure of key forces driving change,
4. synthesize information about possible future events into three or four alternative plots or story lines about possible futures,
5. develop narratives about the story lines to make the stories relevant and compelling to decision makers, and
6. use stories to help decision makers "re-view" their strategic thinking.

Scenario planning is generally regarded as something of an organic process and has thus been viewed as difficult to study and there are many complicating factors. Certainly, creative elements in the scenario process must be allowed to emerge, and so the steps provided are merely a framework for structuring scenario projects.

4. The learning organization

Yang et al. [17] clarified:

> A difference between two related yet distinct constructs—the learning organization and organizational learning. The construct of the learning organization normally refers to organizations that have displayed these continuous learning and adaptive characteristics, or have worked to instill them. Organizational learning, in contrast denotes collective learning experiences used to acquire knowledge and develop skills'' (p. 34).

The importance of this distinction for the purposes of this study is significant in that it provides the opportunity to suggest that all learning organizations feature learning at the individual, group, and organizational levels. It is not feasible, however, to suggest that all organizations that engage in learning at the organizational level can be labeled as learning organizations.

Thus, we arrive at the preliminary conclusion that the learning organization is much more than an organization that instills and promotes learning at the organizational level. More importantly, that organizational learning can be thought of as aggregate learning, or the sum of multiple individual learning experiences. For the purposes of this study, it is important to clarify that a learning organization is an organization thought to be capable of continuous learning and adaptation. While the scenario planning literature does not get to a level of detail sufficient to differentiate these terms, one additional feature of this article is that it provides clarification in line with the more developed literature on the learning organization.

Scenario planning literature proposes that organizational learning is a good measure of scenario planning based on the nature of scenario planning itself. That is, scenario planning purports to change the way participants view the world by expanding their abilities to consider possibilities. This expansion is purported to take place through an alteration of individual mental models. Cognitive theory espouses that learning is the primary driver of mental model change.

4.1. Dimensions of the learning organization

Watkins and Marsick [18,19] have developed the Dimensions of the Learning Organization Questionnaire based on over 30 years of experience working with organizations interested in increasing their capacity to support learning at all levels. Their instrument is based on seven key constructs. These constructs are defined in Table 1.

Each of these constructs is measured by a collection of items on the instrument and each of these constructs is considered a characteristic of the learning organization [18,17,20–22] measured by a six-point Likert scale. The questions are directed at individual behaviors. Further details concerning the DLOQ instrument itself are presented in a discussion of the methodology.

Having outlined the lack of research-based studies in scenario planning and having reviewed the key concepts and purpose of this study, it is clear that organizational learning and learning organization literatures are conceptually related to scenario planning, and thus, the logic for undertaking this study is hopefully made clear. That is, this study seeks to explore organizational learning as defined by the seven constructs submitted by

Table 1
Definitions of constructs for the Dimensions of the Learning Organization Questionnaire (Watkins and Marsick [19])

Dimension	Definition
Create continuous learning opportunities	Learning is designed into work so that people can learn on the job; opportunities are provided for ongoing education and growth
Promote dialogue and inquiry	People gain productive reasoning skills to express their views and the capacity to listen and inquire into the views of others; the culture is changed to support questioning, feedback, and experimentation
Encourage collaboration and team learning	Work is designed to use groups to access different modes of thinking; groups are expected to learn together and work together; collaboration is valued by the culture and rewarded
Create systems to capture and share learning	Both high- and low-technology systems to share learning are created and integrated with work; access is provided; systems are maintained
Empower people toward a collective vision	People are involved in setting, owning and implementing a joint vision; responsibility is distributed close to decision making so that people are motivated to learn toward what they are held accountable to do
Connect the organization to its environment	People are helped to see the effect of their work on the entire enterprise; people scan the environment and use information to adjust work practices; the organization is linked to its communities
Provide strategic leadership for learning	Leaders model, champion, and support learning; leadership uses learning strategically for business results

Yang et al. [17] and Watkins and Marsick [18,19] as a reasonable and desirable outcome of scenario planning.

5. Method

The following sections detail the research method, sampling strategy, and instrument used in the conduct of this research study.

5.1. Sample

Participants in a scenario planning project at a large educational institution in the southern US served as the sample for this research study. Participants were selected on the basis of a single criterion—participation in the scenario planning project. Given the lack of data-based inquiry that examines the scenario planning phenomena, this study aimed primarily to provide a data-based assessment of scenario planning practices. In total there were ten participants ($N = 10$). One participant dropped out of the planning project leaving a total of 9 participants that completed the entire project and submitted data points. Clearly the sample size is a limitation and an analysis of this limitation is discussed in depth after the implications of the study are presented.

5.2. Instrument

The learning organization is a popular, though ill-understood phenomenon. "The concept of the learning organization has received increasing attention in the field of organization studies, yet little is known about how to measure it" [17, p. 31]. Most writing

and research on the concept of the learning organization and organizational learning is conceptual and descriptive, offering little empirical evidence.

The task of choosing an instrument, however, was simple. In 2004, Yang et al. provided general evidence of reliability and validity for the Dimensions of Learning Organization Questionnaire developed by Watkins and Marsick in 1999 [17]. One of only a few instruments available that measures constructs of the learning organization, and the only one that has undergone extensive statistical measurements of reliability and validity, the DLOQ seemed a clear choice for the purposes of the study.

The DLOQ features seven dimensions that are reflective of characteristics of learning organizations identified in several years of literature reviews and case studies and were presented in Table 1. These dimensions include (1) continuous learning, (2) dialogue and inquiry, (3) team learning, (4) embedded systems, (5) empowerment, (6) system connections and (7) leadership.

Validity: The DLOQ has undergone significant validity testing. Yang et al. [19] employed criterion indices for assessing their model validity. These six indices included the χ^2 test, goodness-of-fit index, goodness-of-fit index adjusted for degree of freedom, Bentler's [23] comparative fit index, Bentler and Bonnett's [24] non-normed fit index and Steiger's [25] root mean square error of approximation. All of these tests yielded the conclusion that the instrument is a valid one. For full discussion, please see Yang et al. [27]. Further, several additional studies [17,26] have provided validity analyses that lend support to the claim that the DLOQ is a valid instrument. Due to our small sample size, we did not think it would be beneficial to perform these tests again; however, this reporting of previous testing is meant to provide a general sense that the DLOQ is an appropriate proxy for learning organization characteristics.

A few limitations concerning the instrument validity should be noted. First, the sampling strategy for validation was one of "convenience" [17] rather than random. While the original sample was relatively large ($N = 836$), "…random sampling with more diverse organizations is needed to validate the instrument further" [17, p. 52]. The second limitation of note is that the sample used for the original factor analysis [17] involved only one participant from each of 836 organizations in order to maximize the sample size. Yang et al. [17] have called for further research conducted within single organizations to establish further evidence of instrument reliability. A final note of importance is that the instrument is perception based. Studies are emerging [26] that correlate the perception-based data in the DLOQ with more objective measures of organization performance (such as financial and stock market performance). These studies suggest that the DLOQ is indeed a good proxy for actual organization performance in general. Additional studies that link data from the instrument with objective measures of organizational performance [26] will continue to increase the validity of the instrument.

5.3. Data collection and analysis

The research design for this project included general descriptive statistics and a paired sample *t*-test of pre-scenario planning and post-scenario planning scores on Watkins and Marsick's Dimensions of the Learning Organization Questionnaire. The *t*-test was chosen because it provides a measurement of mean scores based on inventories taken before and after the scenario planning intervention. The overall strategy for this study was to take a measurement with the Dimensions of the Learning Organization instrument prior to

participation in scenario planning and then another measurement using the same instrument upon completion of the scenario planning project. Approximately 3 months time passed between measurements. The idea was then to compare the pre- and post-scores and attempt to attribute any significant differences in mean scores on the seven constructs of the DLOQ to participation in the scenario planning process.

The objective of the data analysis was to examine claims that scenario planning is a method of enhancing or improving organizational learning, or developing a learning organization. Questionnaires were administered at meetings held at times scheduled for the scenario planning project. At least one of the authors was present at each session. Participants were given the questionnaires and asked to return them upon completion, which took approximately 1 h for each meeting. The analysis began with examining simple descriptive statistics, specifically looking at participant variance among the seven dimensions (according to mean scores). Further analysis included paired sample *t*-tests.

5.4. Hypothesis

We hypothesize an increase in mean scores on the seven constructs of the learning organization as measured by the DLOQ. More specifically, we hypothesize that participation in scenario planning will change participant perceptions of their organizations' capability to continuously learn and adapt. The null hypothesis and our hypothesis are provided symbolically as follows:

$$H_0 : \mu_D = 0,$$
$$H_1 : \mu_D \geqslant 0.$$

6. Results

A reliability analysis of the DLOQ scale for this study using Cronbach's α returned a value of .94. According to Nunnely [27] a value of .70 or greater generally indicates a

Table 2
Descriptive statistics for participant responses on the DLOQ

Variable	Description	*N*	Minimum	Maximum	Mean	*SD*
CONTLEAR	Create continuous learning opportunities	9	2.71	5.00	4.00	0.84
DIALINQU	Promote dialogue and inquiry	9	3.50	5.00	4.48	0.70
TEAMLEAR	Encourage collaboration and team learning	9	3.00	5.33	4.38	0.77
EMBSYS	Create systems to capture and share learning	9	1.00	4.50	3.37	1.04
EMPOWER	Empower people toward a collective vision	9	3.83	5.00	4.25	0.64
SYSCONN	Connect the organization to its environment	9	1.83	4.67	4.10	1.09
LEADERS	Provide strategic leadership for learning	9	2.50	5.33	4.40	0.86
CONTLEAR2	Create continuous learning opportunities	9	4.29	5.57	5.14	0.43
DIALINQU2	Promote dialogue and inquiry	9	4.83	5.83	5.21	0.33
TEAMLEAR2	Encourage collaboration and team learning	9	4.83	5.67	5.21	0.29
EMBSYS2	Create systems to capture and share learning	9	2.67	5.50	4.13	1.06
EMPOWER2	Empower people toward a collective vision	9	4.00	5.67	5.06	0.61
SYSCONN2	Connect the organization to its environment	9	2.83	5.83	5.00	0.98
LEADERS2	Provide strategic leadership for learning	9	4.83	6.00	5.29	0.42
Valid *N* (listwise)	Create continuous learning opportunities	9				

Table 3
Paired-Sample T-Test Results for the Seven Dimensions of the DLOQ

		Paired differences mean	*SD*	*t*	*Sig.* (1-tailed)
Pair 1	CONTLEAR–CONLEAR2	1.22	1.18	2.91*	.0115
Pair 2	DIALINQU-DIALINQ2	.83	.93	2.53*	.0195
Pair 3	TEAMLEAR–TEAMLEA2	.10	1.02	2.50*	.007
Pair 4	EMBSYS–EMBSYS2	.87	1.88	1.32	.1145
Pair 5	EMPOWER-EMPOW2	.82	1.08	2.13	.035
Pair 6	SYSCONN–SYSCON2	1.17	1.31	2.52*	.02
Pair 7	LEADERS–LEADERS2	1.13	.69	4.59**	.0015

*Significant at $\alpha < .05$.
**Significant at $\alpha < .01$.

reliable instrument. General descriptive statistics for both pre- and post-data are provided in Table 2.

The constructs of greatest variance among the participant responses were ''embedded systems'' and ''system connections''. This could be because these constructs are more abstract than the others in the instrument and may have the greatest range of possible interpretations by participants. Table 3 provides the results of the *t*-test.

7. Conclusions

The scenario planning intervention is associated with increased perceptions of organizational learning across the board. Six of the seven constructs on the DLOQ showed a significant change from pre- to post-test scores, five were significant at the $p = .05$ level and one was significant at the $p = .01$ level.

For the variable ''Continuous Learning'' a *t*-score of 2.913 was returned ($p < .05$) indicating a significant difference in pre- and post-scores. There have been considerable claims in the scenario planning literature that the process is based on an idea of continuous learning. Our data does seem to support this claim overall, however, the limitations of a small sample size are unavoidable. ''Dialogue and Inquiry'' also increased (*SD* .93) and was found significant ($p < .05$). Kolb's [28] learning loop is frequently cited as a relevant model to represent how leading scenario thinkers suggest that learning takes place throughout the exercise. Van der Heijden [2] has also published theoretical work on the espoused purposes of scenario planning, one of which he claims is to engage the organization in continuous learning practices. There is also considerable support for the significant findings with regard to dialogue and inquiry. Dialogue is the primary means through which scenario planning occurs, as it is largely an exercise in communicating points of view. Georgantzas and Acar [1], van der Heijden [8], Schwartz [11], Wack [3], Ringland [29] and Senge et al. [32] have linked scenario work to that of Bohm [30] and expressed that dialogue and inquiry are the primary means through which mental models are revealed and changed. The variable with the most significant increase in score was ''Team Learning'' (*SD* 1.02; $t = 2.50$; $p < .05$) which is not surprising given the close interpersonal and team learning requirements of scenario planning. Team learning is also a critical component argued in the scenario literature [32]. Because the people involved in the scenario process are so critical to its outcome, the scenario team should be assembled very

carefully, often involving outside thinkers referred to as "remarkable people" (van der Heijden, 1997 [8]). "Empowering People" was a significant construct ($t = 2.13$; $p < .05$) and some theoretical work has supported the assumption that scores on this construct would increase [3; 9] "System Connections" was a significant construct ($t = 2.52$; $p < .05$) and this significance may demonstrate the close link between the kind of thinking required in scenario planning and popular system theory. Scenario work is clearly based in systems thinking as most any of the prevalent books and articles on scenario planning refer to the work of Senge [32] and his considerable contributions to the systems literature in organizational contexts. It is also possible to see this link in the *Fifth Discipline Fieldbook* [32], which is published as a guide to organizational learning and contains numerous articles by leading scenario thinkers. Finally, "Leadership" was a highly significant construct ($t = 4.59$; $p < .01$) which may verify assumptions and anecdotes that scenario projects require top-level support or they usually do not have much impact.

The construct that did not return significant results was "Embedded Systems". More specifically, the description of these constructs from Watkins and Marsick [19] are as follows: "Both high- and low-technology systems to share learning are created and integrated with work; access is provided; systems are maintained" (p. 139). There is minimal mention of this construct in the scenario planning literature. While scenario planning itself is viewed by some as a technology for sharing learning, few companies use scenario planning on an ongoing basis. Van der Heijden [2] discussed four purposes of scenario planning—one of which was scenario planning as a continuous learning tool. He also suggested that few companies use scenarios for this purpose, but that it was possibly the use with the greatest potential impact on the organization.

It is extremely important to note that while there are numerous writings that support the findings of this small study, none of these writings draw on empirically analyzed data. Some case studies have produced valuable insights into how the process of scenario planning works, but not in a way that allows us to generalize to the majority of scenario exercises. And so this study attempts to provide a first step in studying scenario planning in a manner that aims for this kind of generalization. Of course, there are some serious limitations that do not allow this study to attain a level consistent with such generalization.

Overall, we can conclude from this study that the link between scenario planning and organizational learning requires additional study. While our findings might be insightful, or aid in the design of future studies to elaborate on our suspicions that these two phenomena are closely linked, our small sample size limits the data in ways that prevent even the smallest of generalizations. However, we believe that the existing lack of quantitative research studies pertaining to the effects of scenario planning is a detriment to the development of the process and its legitimization as an effective organizational intervention. It is in this spirit that we provide our results and hope that they may lay the foundation for future studies that go beyond theoretical of conceptual contributions to the development of scenario planning practices.

7.1. Limitations and recommendations for future research

While this study does provide a data-based assessment of some portion of the relationship between scenario planning, organizational learning, and the potential for developing a learning organization, there are some considerable problems with the research presented. Dillman [31] identified four sources of error in survey research, namely,

(1) sampling error, (2) coverage error, (3) measurement error and (4) non-response error. Overall, this study is in violation of only one of these sources of error, but it is to a great extent. The sample size for this study is small enough that the results could simply be attributed to chance. That is, the sample size is not large enough to alleviate the possibility that the results could have simply become significant by chance. A small sample size limits the conclusions that can be drawn from the data and generalizability as a whole. Our data, however, supports claims made by previous literature reviews and conceptual articles, and is simply arguing for further development of this area. We do not attempt to draw broad conclusions about the effects of scenario planning interventions, rather we submit our findings as a first step toward investigating the effects of scenario planning on learning in organizations.

While sample size is certainly a critical flaw in the study, a lack of research-based studies in the scenario planning literature could indicate that there would be some value in reporting the results that were found. In addition, there are clear implications for moving forward. First, while it is unlikely that most studies of scenario planning practices will include large samples (for example, samples of 200 or more), the solution may be to begin studying the phenomenon longitudinally. That is, small samples from similar situations over long periods of time could be combined into larger samples that would avoid the problems with error found in this study and others with small samples.

It is also possible that large enough samples could come from the expanding contexts in which scenario planning is applied. For example, scenarios are being adopted as tools for exploring the possible futures of small countries and developing nations. In these contexts (and possibly large enough corporate contexts) situations could arise that involve enough participants to alleviate problems with sample size. In any event, further research must be done with proper sample sizes to investigate claims that scenario planning improves learning in organizations and is a tool for developing learning organizations. The design of this study is sound, but could be improved with the use of a control group. Therefore, further research that we intend to undertake will involve these adjustments.

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