Exploring How Experience and Learning Curves Decrease the Time Invested in Scenario Planning Interventions

Ramirez, R., Bhatti, Y., and Tapinose, E. 2019. Exploring How Experience and Learning Curves Decrease the Time Invested in Scenario Planning Interventions. *Technological Change and Forecasting, Special Issue*. Forthcoming (Accepted on 16 October 2019).

HIGHLIGHTS

- Strategy tool use need not be time intensive -- our research reports executives spend less time than they expected
- Organizational factors - size & prior experience - matter the most in reducing time spent
- These results can be explained as benefiting from learning curve effects
- Scholars can use these findings to better define efficiency in strategic planning and specifically for scenario planning
- Practitioners can learn from this to better plan strategy initiatives and to secure the right resources

ABSTRACT

Scenario planning is a strategy tool which is often deemed to be too expensive and too time intensive. Drawing on learning curve theory, we set out to ascertain whether enacting scenario planning as an iterative, repetitive process and not as a one-off intervention would help practitioners to do it faster. Through a global survey of the practice of scenario planning, we relate how we failed to confirm this proposition, but instead found other factors which appear to affect the time required to carry out scenario planning. Our research suggests that organizational factors, mainly size and prior experience in carrying out scenario planning in the organization, are statistically significant contributors to making scenario planning take less time than practitioners expected; and individual factors also affect this decrease. These individual factors mainly concern prior scenario planning experience, which -unsurprisingly- also significantly shortens the time used to conduct a given scenario planning intervention. The lessons we draw from these findings suggest that the time it takes to use strategy tools, and scenario planning in particular, can be shortened. With this research, scholars can better delineate criteria to enact strategy tools efficiently; and practitioners can better plan strategic initiatives by securing the necessary resources. (200 words)

Keywords: Scenario planning, learning curve, strategy tools, quantitative

(full paper without abstracts, figures, references, or tables 6720 words)

Introduction

Scholars have found 'strategy tools' (Spee and Jarzabkowski, 2009) important for both for strategy education (Jarzabkowski and Whittington, 2008; Jarzabowski, Giulietti, Oliveira, Amoo, 2012) and managerial practice (Dameron et al., 2015). The research we report here is inspired by the practice-based study of strategy (Whittington, 1996; 2007) as it is based on one of the largest surveys of scenario planners, who reported on their practices. There are increasing contributions to understand choices of strategy tools (e.g. Jarratt and Stiles, 2010; Wright, Paroutis, and Bletter, 2013), but less attention has been given to empirically test the

factors affecting their utilization; with several contributions assuming an acceptable level of competence in the implementation of tools (e.g. Healey et al., 2015) - although Hodgkinson et al. (2006) did highlight facilitator experience as a success factor.

In this paper we focus on researching factors which affect the time it takes to do scenario planning (SP henceforth) in practice. We set out to ascertain whether organizations and the practitioners serving them can lower the time needed to conduct SP as result of learning curve effects (Hax and Majluf, 1982; Ghemawat, 1985). We decided to research SP as it consistently ranks as one of the most widely used strategy tools (Rigby and Bilodeau, 2015); while scholars have not studied empirical evidence concerning the factors that affect its implementation in practice. This research responds to Laamanen's (2017) invitation to carry out research which enhances understanding on the application and practice of strategy tools. This paper also engages Sandberg and Tsoukas' (2011) call for analyzing and comprehending the 'practical rationality' of managerial practice – a rationality which they posited as being beyond the academic rationality framed by 'gaps in the literature' (Sarpong, Maclean and Alexander, 2013). Feldman and Worline extended this notion by highlighting the 'practicality of practice theory […] to help current and future managers develop intuitions that are useful for managing dynamic and complex situations' (2016, p.304).

We organize this paper as follows. We first highlight key literatures on scenario planning and learning curve effects which are pertinent to our study. We then describe the source of data of the SP interventions we studied, followed by an explanation of our research methodology and our analysis. We close by discussing our findings and offering recommendations for practice and further research.

Review of relevant literatures

Scenario planning cost and time

Scenario planning is a strategy tool long used in strategic thinking (Schoemaker, 1995) and strategy (Ramirez et al, 2017). The origins of scenario planning are attributed to the military and the RAND institute in the USA and to national planning in France (Berger, 1967; Godet and Roubelat, 1996). It is particularly useful for organizations facing turbulence (Ramirez, Selsky and van der Heijden, 2010) and uncertainty (Tapinos, 2012). Multiple schools of scenario planning thought exist (Bradfield et al., 2005; Amer et al., 2013), and some scholars have stated - with little supporting empirical evidence, in our view - that the most popular one is the so-called intuitive logic approach (Wright, Bradfield and Cairns, 2013). This approach does not use quantitative data to create projections of the future (MacKay and Stoyanova, 2016) and instead investigates the present from a small contrasting set of plausible images of the future (Ramirez and Selin, 2014).

The educational programme, the effects of which we assess here, educates participants about SP within this school and - importantly for our purposes here - subscribes to van der Heijden's (2005) and Ramirez and Wilkinson's (2016) views that doing SP over various iterations is preferable to carrying it out as a 'one off' exercise (typically done in or for 'strategy away days' or in workshops in many firms and government departments). We further ascribe to the association of a scenario intervention to the process of developing

scenarios and using them for strategy development (e.g. Wright et al., 2008) and to activities (e.g. Franco, Meadows and Armstrong, 2013) rather than to the final result. Similar views about the boundaries of SP interventions are shared by Chermack et al. (2015). Given that all survey respondents are graduates of the same SP programme, the focus on the process helps us to assume that within each intervention similar types of activities take place.

Recent research on the application of SP has led to the identification of a range of benefits and outcomes achieved including organizational and individual learning (e.g. Chermack and Nimon, 2013; Meissner and Wulf, 2013; Bhatti et al, 2016). However, some scholars have suggested that the method and approach is often too expensive and too time intensive, with some even questioning whether investing in the effort is worthwhile (e.g. Millet, 2003; Verity, 2003; Bishop, Hines and Collins, 2007; Inayatullah, ed., 2009). Such assertions invite empirical verification and research on factors affecting the utilization of SP specifically, and on strategy tools in general. Past research has shown that strategists' cognitive and personal contexts (Hutzschenreuter and Kleindienst, 2006) such as their experience with regards to utilization (Laquinto and Fredrickson, 1997) influence managers' cognitive models and their practice when strategizing. Resonating with that finding, Stenfors et. al. (2007) found that top managers reported factors such as the underestimation of needed resources, lack of skills, learning demand, and tool complexity as challenges associated with strategy tool implementation.

Based on our experience in working with practitioners, we note that planners often overestimate how much time they wanted to or thought they would require for carrying out SP activity. This view we found is empirically supported by the data we collected though our survey of SP interventions, which we present below in the analysis section. This reflects Schwartz (1991) highlighting that some of the most important attributes for the efficient and successful implementation of SP is the knowledge of the philosophy of the method as well as the experience with its use. But on the other hand, Goodier et al. (2010) stated that, in their experience, one of the greatest challenges of scenario planning interventions is the 'steep learning curve' participants face when they engage with SP for the first time. We therefore sought to explore whether the effects of learning curves could offer an explanation to the overestimation of the actual time required which we found in our data.

Organizational learning and learning curve effects

Organizational learning as an approach to process scholarship was popularized long ago by Chris Argyris and Donald Schon (1974) and was treated as a form of planning by Don Michael (1973) . An increase in learning effectiveness through experience was related to business economics by Boston Consulting Group (BCG) consultants in the mid-1960s, who popularized the idea of 'the experience curve' (Henderson, 1968; Reeves, Stalk, and Scognamiglio, 2013). This was sold as a way to, over time, reduce the cost of producing a unit of almost anything, as operational costs were taken out as producers learnt how to produce better, quicker and cheaper with experience (Hax and Majluf, 1982; Ghemawat, 1985). The learning curve effects have long been applied in diverse applications including in the military and in private firms, all related to organizational learning (Yelle, 1979). Caroll, Rudolph and Hatakenaka (2002) showed that learning at both the individual and

organizational levels takes place as a result of training, and of repetition with the help of reflection on the results of an action or practice. Therefore, we can hypothesize that experience with SP leads to an improved ability to practice it.

Although managerial experience is widely discussed in the strategic management literature (see for example Anand, Mulotte, Ren, 2016), the strategy-as-practice literature has not determined its influence on strategy tools utilization (see Vaara and Whittington, 2012). One of the earliest surveys (Haspeslagh, 1983) on a strategy tool (portfolio planning matrices) identified different levels of experience and utilization of the tool within the Fortune 1000. That study deduced that higher levels of experience allowed the managers to better customize the utilization of the tool.

Exploring the interaction of SP and learning curves makes sense given the common dominator of organizational learning which SP affords. de Geus in his influential Harvard Business Review (1988) article, presented SP as a vehicle to accelerate and improve Shell's organizational learning, which he equated with strategic advantage. This perspective has prevailed since it was published, with many scholars and practitioners treating scenario planning as an organizational learning enhancer (van der Heijden et al., 2002; Bootz, 2010). In this paper however, we propose to explore the reverse proposition, that organizational and individual learning from experience enhances the capability to utilize SP through learning curve effects.

Along these lines, Haeffner et al. (2012) measured the impact of scenario planners' learning characteristics to improve the capability of the leadership to deal with uncertainty. For our purpose, we focus on researching the often-proposed assumption that SP is deemed to be too expensive because it involves considerable investments of valuable executive or consultant time - (Chermack, 2004; Inayatullah, ed., 2009). Van der Heijden (2005) and Ramirez and Wilkinson (2016) suggested that this may not necessarily be the case, particularly if SP is done iteratively. The argument suggested that after doing SP many times, iteratively, learning curve effects would decrease the effort needed per unit of output without decreasing output quality.

Learning curve effects are deemed to be affected by organizational level, task-based, and individual level characteristics (Lapré and Nembhard 2011). These categories reflect the three levels of analysis in the structure of our survey design, which was based on the Jarzabkowski and Kaplan's (2015) framework of strategy tools-in-use. Their framework guides the selection of variables we collected about (i) the organization in which and for which the strategy tool is being used; (ii) the task, process or activity itself; and (iii) the scenario planner or individual involved in the use of the strategy tool. In linking these three levels, we set out to explore the interactions between SP in terms of the time it takes to conduct SP activity and factors that affect learning curves. We tested the following propositions:

P1: The actual time spent on SP is lower than is anticipated.

P2: Time spent on SP is affected by organizational level factors.

P3: Time spent on SP is affected by task-based, or SP related, factors.

P4: Time spent on SP is affected by individual level factors.

Methodology

We compiled a bespoke dataset of actual SP interventions and applied quantitative methods to test our propositions. Data was sourced from graduates of an executive development program on SP offered by the business school of an internationally recognized European university. The programme is well suited for our study because it is designed as an inquiring system (Churchman, 1971), which includes researching how both the program and SP learning works and why. This reflexive approach views organizations and their members (including the authors) as learning systems. The systems include inputs, processes, which outputs that can be continuously improved (Courtney et al., 1998). The inputs affecting SP effectiveness concern both the organizational and individual level characteristics on which we gathered data; the process aspect we analyse draws from the reported SP task characteristics we obtained; and the outputs measured here concern the reported actual time spent on the SP activity by survey respondents.

The programme has followed the same format year-on-year for more than a decade and as a result, we found that it offers a laboratory-like setting (in the sense that if offers repeatability across cohorts, making the data from one cohort comparable with that of others) to allow us to conduct comparative research. The comparability therefore allows us to treat the learning by different cohorts across iterations of the programme as one single data population. Indeed, the learning setting remains highly comparable in terms of having had the same faculty team, in the same premises, following the same format from one year to another; even if each iteration does have some unique elements (utilizing different live cases, different participants and different facilitators) each time. These characteristics made possible to use the programme as a basis for research which clarifies methodological and epistemological misunderstandings about SP to be conducted (e.g. Ramirez and Selin, 2014; Ramirez and Wilkinson, 2014; Ramirez et al., 2015).

In each SP programme iteration, the senior professionals lending the live cases clients (whom for reasons of simplicity, we will from now on refer to as “client representatives”) come from up to three different real-world organizations which include at least one public or non-profit sector organization and at least one private firm. The SP programme participants are senior strategists and policy makers from national and international companies, government and inter-governmental agencies and NGO’s; as well as academics and consultants. We conducted a survey of 575 graduates of the programme to collect data on the SP interventions they were involved in with their own or their client organizations after they had graduated. This paper draws on 128 SP interventions from around the world in diverse organizations. The database we put together has been used to research several aspects of scenario planning practice. Here we concentrate on analyzing an unexpected finding from the survey – that for many respondents, SP was reported to have taken less time to do than what they reported they had expected to be the case.

Survey design

Our research was conducted using an online survey (see Appendix). The questionnaire architecture of the survey was based on the Jarzabkowski and Kaplan (2015) framework of strategy tools-in-use. There were three aspects in the data: individual learner characteristics, the organizational characteristics employing the individual learners (or those of their client organizations for learners who work as consultants), and their reported SP interventions. Apart from profiling questions for respondent characteristics, the survey included questions concerning the criteria for deciding on scenario planning as a methodology, as well as for the application of the SP intervention and for assessing the outcomes. After designing the survey, we tested it with ten academics and practitioners who were all specialists on scenario planning. With the feedback from this initial test we improved the questionnaire. The respondents of the survey were all the alumni of the SP programme who had completed it between 2004 and 2016. A benefit of using this survey is that while the participants are from diverse geographical settings, working for organizations which are for profit and non-profits, and are mid to top level executives, they all have in common having taken the same SP, as well as a shared interest in learning about scenario planning and possibly carrying out a scenario planning intervention.

The sample included 575 alumni of the SP between 2005 and 2016 who were contacted by email. Of the 575 unique alumni we invited to take part in the survey, 120 emails were returned as undeliverable, but we were able to reduce this number to 69 by contacting the recipients through alternate means. Repeated but respectful reminders resulted in 283 alumni starting the survey (49% response rate). There was no incentive to participate other than to contribute to an understanding of how to improve learning and practice.

The survey platform captured 192 responses as having been fully completed, and thus useable in principle. However, upon further assessments of data quality, we deemed that only 162 were both truly complete and fully useable in practice for analysis, providing us with a final useable response rate of 28%. Of the 162 respondents, 135 had been involved in at least one scenario planning intervention while 27 said they had not carried out or been involved in any SP intervention since having taken the programme. Seven respondents reported on more than one SP intervention, bringing the total SP interventions we analyze here to be 128. We removed the second SP reported by the same respondent in order to report on one SP per unique respondent. Our descriptive statistics range from n=128 to 126, as the statistical analysis software package we used (SPSS) removes the whole row if there is a missing value, depending on the type of test which is run. A survey is deemed completed if the respondent answers all required questions and reaches the end of the survey. A missing value transpires when a respondent does not select an option or answer for a question that is not required.

Descriptive Statistics

Organizations reported by respondents of the survey are of different sizes and belong to various public and private sectors. More than half of the organizations were large ones, with more than 1000 employees and more than £10 billion in turnover (see figure 1).

52% of organizations from our data were for-profit and 48% were non-profit organizations; and the most numerous respondents worked in government – mostly in in foresight, revenue and taxation, or healthcare. Private sector organizations were in many different sectors, such

as Oil & Gas; Healthcare; Manufacturing; Professional Services; Banking; Utilities; Academic; Telecommunications; and Mining (see figure 2).

In terms of geography, there was a balanced mix of organizations. Approximately one-third of the responders work for global organizations, another third work for multinationals with different levels of presence around the world, and the remaining responders work for organizations operating only in one country.

Of our survey respondents, 135 either were involved in, or actually carried out, SP interventions after having graduated from the programme (as above, due to missing values in certain questions, some of our statistical tools limited the analyses to 128 cases). Most of the respondents reported that they had acted as lead facilitator (77%), and/or contributed to an SP intervention (41%), and/or were on the steering group governing the intervention (16%). 10% reported having acted as the key user and 2% were a key buyer. This suggests that the majority of the respondents were facilitating and guiding the process of developing scenarios in their organizations.

From our survey, we drew descriptive statistics for 19 variables we deemed were theoretically useful in exploring our propositions (see table 1). These variables reflected organizational, process or task-related, and individual-level variables affecting SP interventions. Importantly for the purposes of this paper, 24% of the respondents reported to have participated only once in a scenario planning intervention, 41% were involved 2-3 times in SP, and 35% had more than 3 experiences of SP since graduation. So 76% of the participants reported that they had conducted SP interventions more than once.

This proportion is corroborated by responses to another question - when we asked respondents to evaluate on a scale of 1-5 (with 1 meaning the exercise was a one-off initiative and 5 meaning the exercise was a repeated process) 25% responded that they had been involved in a one-off exercise - suggesting again that ¾ of respondents were involved in an iterative SP intervention or that they had carried out multiple (separate) interventions.

Analysis and Results

Our data did not allow us to establish what we initially set out to explore, i.e. Van der Heijden (2005) and Ramirez and Wilkinson (2016) proposition that if SP is done many times, iteratively, then learning curve effects would decrease the effort needed per unit of output without decreasing output quality. We did however find support for other factors which we found to be important in shortening the time required for SP engagements. The factors which we found to be consistent with learning curve effects broadly reflect organizational level, task-based, and individual level characteristics (Lapré and Nembhard 2011). We outline next how we arrived at these main findings.

We first carried out a confirmatory factor analysis on the data to confirm that the 19 variables referred to above which we used for this study could be validly condensed into three key factors we wanted to explore – organizational, process, and individual level. Then we compared the difference between the reported amount of time the scenario planners reported they had anticipated they would need to devote with the actual amount they reported they had actually spent to test P1. Next we explored correlations to identify the

interactions among the relevant factors. Finally, we carried hierarchical and ordinal regression modelling to test P2-P4 and the direction and scale of the interactions involved.

In the factor analysis shown in table 2a, several variables have cross loadings. Therefore, we redistributed the factor loadings using Varimax rotation as shown in table 2b, which helped us to identify factors that speak to organizational characteristics, to task or process characteristics, and to individual ones. Based on theoretical understanding, three variables however related better to adjacent factors, which we show with the use of arrows in table 2b. The Kaiser-Meyer-Olkin (KMO) test measures how suited our data is for factor analysis and this value of 0.582 tells us that just about half of the proportion of variance in our variables is explained for by underlying factors. KMO values of less than 0.5 tell us that in this case factor analysis is not useful. However, the Bartlett's test of Sphericity with high value of Chi-Square, which is highly significant, suggests the factor analysis may still offer value in reducing the variables.

The four variables marked under “Additional Scenario planning-based variables” in table 1 concern specific ways of describing and defining the scenario set which participants reported to have produced; and the task-based variables concern SP as practice (Whittington, 1996). Although we did not find the "Additional Scenario planning-based variables" to be statistically significant in our models, such as whether scenarios were expressed in narrative form or with the help of systems diagrams, including them did improve the overall goodness fit of the model, increasing its predictive power. Task-based factors concerning SP practices also were helpful, and these were statistically significant.

We compared two dependent samples to explore whether there is a statistically significant difference between them – the time the respondents expected to spend and the actual time they spent in SP. The Descriptive Statistics Table (table 1) shows that the median is 3 for the amount of time respondents wanted to devote and is 2 for the amount of time they actually spent, which suggests that actual time expended was less time than what had been anticipated.

This is confirmed by the Wilcoxon Signed Ranks test shown in table 3, where we can see that there is statistically a highly significant difference (p=0.00) between the time that was anticipated would be needed versus the time that was reported to have been actually utilized. This result again was the same when we used a second test, i.e. a signed test which does not assume distribution symmetry between the two questions being compared - a requisite for the former test to be valid. Though the criteria for this second test are less stringent, it reduces the robustness of the test in comparison to the Wilcoxon Signed Ranks test. However, both tests tell us that there is a significant difference between the two times which our respondents reported.

We can see from the ranks (also in table 3) that of the 128 respondents (recall that the number was reduced from 135 due to some missing values), only 5 spent more time producing their SP engagement than they had anticipated would be the case. About half of the respondents, 61, spent the same amount of time as expected; while 62 spent less. Given there is a significant decrease in the amount of time reported to have been actually spent than that which was expected, **we find support for P1**.

We next set out to identify variables and factors which could account for the time it takes to conduct SP activity as reported by our survey respondents. The correlation matrix in table 4

suggests there is a statistically significant correlation between the time they anticipated would be needed and

- the size of the organization they work for (as employees or consultants) in terms of number of employees;
- the number of prior years of experience the respondent had had with scenario planning; and
- the number of times the respondent was involved in SP.

For the time they reported they had actually spent, there was again a significant correlation with

- the size of the organization in terms of number of employees.

But rather than experience of the respondent with SP, here the significant correlation of reported actual time used is with

- the amount of scenario planning undertaken at the organization; as well as
- the number of times the respondent had been involved in SP.

We used an ordinal regression (because our dependent variable is in the form of a ranked Likert scale data and not interval data) to model the direction and scale of these correlated variables on the time respondents reported they had actually spent. Note that in our survey we had solicited the actual duration of the intervention. The variable does not tell us whether the actual duration the respondents report to us was more or less than what they had anticipated. We included it as a task-level variable into the model as we interpreted this to be specific to how long the activity lasted. For our dependent variables, we relied on two other questions in our survey which we believe are more amenable to comparing across the different organizations as they capture, the " percentage of your time did you want to devote to scenario planning activities" and "percentage of your time did you (actually) devote" during the time when scenario planning was 'active' in the organisation)?". To this effect, we used responses to the time that the respondent actually devoted to the SP intervention as the primary dependent variable.

We conducted a hierarchical ordinal regression modelling in a stepwise fashion by analyzing first organizational factors, then added task-based scenario planning factors, and finally adding individual factors. Table 5 shows the results of the four models we obtained. We found that Model 4 best fit the time spent on SP with p=0.004. However, the goodness of fit test is significant for one dimension but not the other one, providing mixed results. The R-squared value shows that Model 4 explains 50.7% of the variance in the dependent variable. Although a figure of above 50% is generally considered pretty high for the social sciences (Aron, Aron and Coups, 2008), Moksony (1990) suggested that further goodness of model fit tests need to be used. For this further testing of the model fit, we used the test of parallel lines, which assesses the proportional odds assumption -- which here is important because it checks if the effect of independent variables is uniform across all of the dependent variable values. We found the p value was not statistically significant for good model fit, which here is p=1.00, and we therefore failed to reject the null proposition required to conclude that the assumption holds. We also explored using the time the respondents wanted to spend as a dependent variable, but it did not pass the test for parallel lines with p=0.000.

The parameter estimates from Model 4 indicate the direction and scale of the independent variables on the dependent variable -- time actually spent. These estimates are shown in table 6. The interpretation is usually done by referring to the odds-ratios. However, in our case, we are not interested in the magnitude of the increase in the dependent variable as our data is ranked but not interval, i.e. we do not know the distance between the choices and neither is this distance standardised across the respondents. We are therefore only interested in whether the effect of different independent variables on the dependent variable is significant and in which direction.

The model suggests that three organizational factors (i) size in terms of number of employees, (ii) size in terms of turnover, and (iii) amount of SP undertaken in organizations; each have highly significant effects on reducing the time actually expended on doing SP. Indeed, the larger the organization is, the less time is actually needed to carry out SP. We also find that the amount of SP undertaken in organizations has a greater influence on reducing time to enact SP than the size of the organization. **This lends support for P2**, in the sense that the more SP which an organization undertakes, the less time it actually utilises to enact each SP intervention**.**

In terms of the task-based factors, the iterative learning curve effects on SP practices was not statistically significant in the model, contrary to our expectations. This held up even when other SP factors, such as whether the scenarios were described in terms of narratives or systems diagrams; or who was involved in defining and describing them were included. Indeed, none of these variables were significant in our model. This may be because insufficient iterations were conducted within the program (2-3 iterations) to support learning curve effects; or it may be that learning curve effects are not as applicable to SP practices as they are to other practices such as operations in a factory. Further research will ascertain this. Based on this main variable not being significant, **our research cannot sustain P3.**

However, we did find some individual level factors, mainly concerning the years of experience after having taken the SP programme; and the number of times alumnae reported having been involved in SP (once or 2-3 times) to have statistically significant and highly significant, respectively, effects on reducing the time actually spent on SP. We also found the number of years of prior SP experience to have a slightly greater influence on reducing the time which was actually required to enact an SP intervention than does the number of times of prior SP experience. Overall, this means that prior experience with SP plays a key role at the individual level in reducing the time spent in an SP intervention, which **supports P4**.

While we primarily sought to establish what leads to spending less time on SP interventions, our results also offer insights on those practitioners who reported they spent more than expected time in conducting their SP interventions. Factors which are significantly correlated with more than expected time spent on a given SP intervention include the diversity of the organizational portfolio (where 1 is operating in a single activity only and 5 represents a very diverse portfolio with very diverse activities). Unsurprisingly, SP reported to be of lower quality was associated with less time spent, whilst higher quality is reported to be correlated with more time spent; and –again, unsurprisingly -- the longer the duration of a given SP engagement, the higher the amount of time actually spent on it.

Overall, our findings suggest that organizational characteristics in terms of size and experience have greater impact on reducing time than do the practitioners' individual

characteristics. We were surprised to find that the larger the organization is (in terms of employees or turnover), the less time is spent on a given SP intervention. This finding suggests that the size effect may be due to larger organizations may host more prior SP activity, and therefore require a reduced time spent on a given SP intervention. Another possible explanation is that experience or learning curves apply more in larger than in smaller firms, but we have no evidence from our data set to support this view.

The effect of individual factors concerning prior experience of SP in number of years as well as the number of times they have been involved in SP interventions implies that for people with more experience, less time is expended in a given SP engagement or intervention. What we did not find support for is the proposition that the iterative nature of the SP process itself would on its own / by itself reduce the actual time spent on SP activity. A possible explanation is that the individual and organizational experience ex-ante effects are so important that extra iterations do not add much of a difference to the effects these two characteristics already have in shortening time expended in enacting SP engagements. The fact that the number of iterations are also not statistically significant in the other direction, i.e. to add to the time spent on SP, supports the suggestion that the effect of prior individual and organizational experience strongly counter-acts any time that would otherwise be expected to be decreased from adding to the number of iterations of the SP activity.

Discussion

We discuss two other possible explanations for why less time was reported to actually have been invested in a given SP engagement than what the respondents reported they had expected to be the case.

The first one has to do with the possibility that the learning from the executive programme makes SP look more difficult than the practice is later found to be in the field. This may be because all kinds of permutations of SP tools and techniques are studied in the program but only one variety will be deployed in a given engagement afterward. This possible explanation can be supported when we revisit the characteristics the respondents have prior to attending the executive education programme. The number of years of scenario planning experience respondents reported to have had before attending the programme ranged from zero to forty years. 47% of all respondents said they had had zero experience (i.e. had not undertaken any scenario planning intervention prior to attending our executive education programme), 46% had fewer than 10 years' experience; and 7% had at least 10 years of SP experience before attending the programme. With almost half of the respondents in our data base having no scenario planning experience whatsoever prior to attending the programme, it is not surprising that in learning about SP in detail over a very intensive week, they might be overwhelmed about the breadth and variety of possible practices involved and therefore would tend to over-estimate the amount of (possible) work that they might want to undertake within the limited conditions that any one single intervention allows for. Thus, the results reporting using less time than expected would be explained by the respondents having gained a very rich understanding of the myriad possibilities which scenario planning offers at the time of attending the programme (loading up possibilities for action), and the subsequent discovery in enacting the SP intervention after the programme that deploying only the ones needed for a specific intervention actually require less time in practice.

The preceding explanation is also supported by the fact that the vast majority of respondents (97%) felt that participation in the SP executive education programme changed their own definition of what scenario planning actually is; and that 95% felt that participation in the SP programme changed their evaluation of the quality or level at which scenario planning is practiced. Moreover, 70% stated that the SP programme substantively changed their understanding of what scenario planning is. Only 12% stated that their evaluation of the quality of scenario planning was not changed or has only changed slightly.

A second possible further explanation we examined was that the alumni would have benefited from learning curve effects. This idea was based on the fact that during the programme, each participant was involved in at least two rounds of scenario planning with a live case, and helped prepare the senior professionals who had lent their case to take the scenario planning as a third iteration back into their respective organisations. This means that by the time programme alumnae tried their own scenario planning intervention, they were in effect already within the fourth iteration of applying the approach they had learnt in the programme if they had no prior experience with SP upon taking the programme. But we were unable to establish sufficient evidence from our survey to support this proposition. However, we did find strong support for prior organizational experience with SP followed by prior individual experience with SP as significantly reducing the reported time used on SP activity. This, as we have argued above may be best explained for through learning curve effects that capitalise on prior experience

We have been able to show that the engagement with SP creates experience and experience improves practice, which according to the respondents of this survey contributes positively to efficiency in terms of the time it actually takes to enact SP activity. Considering that Eggers and Kaplan (2013) view that experience drives the development of resources to form capabilities and competences, and that SP can be seen to be a dynamic organisational capability (Ramirez, Österman and Grönquist, 2013), the findings in our study are commensurate with the building of organizational dynamic capabilities. This is even more salient when we consider that organizational level factors were found to be most influential in our dataset followed by individual level factors. That we found both organizational experience and individual experience to both matter lends support to the work of Gomez (2010), who - based on Bourdieu's concept of 'habitus' - stipulated that managerial experience evolves and that managers become strategists through practice. Our results also lend support to the literature on the power of collective and organizational learning (e.g. Levitt and March, 1988) and the role of learning from experience in organizations (Huber, 1991).

There are however limits to the benefits that can be accrued from learning curves. Recently, Clark, Kuppuswamy, and Staats (2018) showed how diverse activities which are not aligned to goals can reduce the effects of learning by doing. Their findings - from the hospital industry - that goal relatedness is an important consideration for learning outcomes support, resonates with Bhatti et al.'s (2016) finding that a clear purpose and the application of it are important to achieving desired outcomes in SP. When this alignment is achieved, the benefits of learning curve effects in reducing actual time as compared with that first anticipated may be better realized. For respondents who did not report a reduction in time effort, and who may have seen an escalation of time expended, there could have been a

possible misalignment of the purpose with execution to cancel out any learning curve effects. This offers another avenue for further exploration from our data and may help to explain the non-significance of the iterative and repetitive nature of the SP in our sample data.

We acknowledge that the use of an alumni database from an executive education programme entails limitations regarding the generalizability of the findings. In terms of the typical retrospective bias possibilities which arise in survey research, we think that our having surveyed alumnae over a very long period reduces that bias because the differences in lag times between having attended the programme and the reported interventions don't appear in our data to have been conditioned by when the respondent took the programme. Also for some of our respondents, it is possible that the less time they reported to have spent in actually carrying out the intervention may be explained by a lack of engagement of key people in their organisation with the process. We do not have data to test for this and leave it for future research.

The takeaway from our findings is that the more investment organizational leaders put into undertaking SP - particularly in large organizations - the less time is required to conduct any one future SP intervention. This matters to strategists because the quicker and more often that SP can be incorporated in organizations, the more agile and flexible they can be in the face of increasing turbulence and contextual uncertainty (Ramirez et al., 2017). As a consequence of the importance of experience in decreasing time to carry out SP activity highlighted in this paper, leaders may consider providing individuals with resources and time to practice with SP activity either within their own organizations or elsewhere as an investment to reduce the times they will dedicate to future actual SP interventions.

Conclusion

Over the course of utilizing our database on SP interventions, arguably the largest database on SP practices to have been developed to date, we came across a subtle, yet important finding, which is that many respondents reported actually spending less time than they reported they had expected to use in conducting SP interventions.

We have found that some characteristics of their organizations and of their individual SP experience offer explanations as to why this may be so, lending supporting empirical evidence to the idea that learning curve effects matter in SP.

This reading is supported by our finding that the more experienced SP practitioners in terms of years and number of times they have done SP interventions, and those working in organizations with greater SP activity, reported using less time than the less experienced ones did.

To our knowledge, ours is the first empirical research to consider whether the supposed excessive time required for SP which some researchers have reported can be shortened, and to identify organizational as well as individual characteristics supporting this shortening.

Based on our findings, practitioners may cite the positive effects of learning curves when securing necessary buy-in to conduct SP, and to marshal the right amounts of resources and time from their organizations to carry out strategic programmes and activities.

The lessons we have drawn may be applicable to other strategy tools as well, but this is something further research will need to establish. Beyond SP, we have shown the strengths offered by studies of strategy tools in practice by revealing micro- and meso- level characteristics which can help organizations and planners to be more efficient and effective in the use of such tools.

In the theoretical parts of our paper, we have observed that little attention has been given to the factors affecting the utilization and implementation of strategy tools in general. This offers the possibility of carrying out more research to ascertain why process or task level iteration amounts were not a good indicator for learning curve effects in this study on SP. Next iterations of this work may seek to gather more objective and absolute measures of not only whole scenario interventions but also of the time that different participants devote to their respective roles and contributions. And beyond the effect on time to execute SP, further research can look at what other outcomes, such as the actual cost of carrying out SP (assuming that time is money), impacts on decision-making; or whether the effects on improving satisfaction and value drawn from enacting the tools can be supported with the effects of the learning curve.

References

Amer, M., Daim, T.U. and Jetter, A., 2013. A review of scenario planning. Futures, 46, pp.23-40.

Anand, J., Mulotte, L. and Ren, C.R., 2016. Does experience imply learning? Strategic Management Journal, 37(7), pp.1395-1412.

Argyris, C. and Schon, D.A., 1974. Theory in practice: Increasing professional effectiveness. Jossey-Bass.

Aron, A., Aron, E. and Coups, E.J., 2008. Statistics for the behavioral and social sciences: A brief course. Upper Saddle River, NJ: Pearson Prentice Hall.

Berger, G., 1967. Stages of foresight. Presses universitaires de France.

Bhatti, Y. Ramirez, R., and Riaz, S. 2016. Using Live Cases to Learn Scenario Planning – How the purpose matters for impact and meaningfulness. Academy of Management Annual Meeting, 5-9 August 2016, Anaheim. Academy of Management Proceedings, 2016:1 10973; https://journals.aom.org/doi/10.5465/AMBPP.2016.10973abstract

Bishop, P., Hines, A. and Collins, T. 2007. The current state of scenario development: an overview of techniques. Foresight, 9(1), pp.5-25.

Bootz, J.P. 2010. Strategic foresight and organizational learning: A survey and critical analysis. Technological forecasting and social change, 77(9), pp.1588-1594.

Bradfield, R., Wright, G., Burt, G., Cairns, G. and Van Der Heijden, K., 2005. The origins and evolution of scenario techniques in long range business planning. Futures, 37(8), pp.795-812.

Carroll, J.S., Rudolph, J.W. and Hatakenaka, S., 2002. Learning from experience in high-hazard organizations. Research in organizational behavior, 24, pp.87-137.

Chermack, T.J., 2004. Improving decision-making with scenario planning. Futures, 36(3), pp.295-309.

Chermack, T.J. and Nimon, K., 2013. Drivers and outcomes of scenario planning: a canonical correlation analysis. European Journal of Training and Development, 37(9), pp.811-834.

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, 22(3), pp.355-371.

Churchman, C.W., 1971. The design of inquiring systems basic concepts of systems and organization. NY: Basic Books.

Clark, J.R., Kuppuswamy, V. and Staats, B.R., 2018. Goal Relatedness and Learning: Evidence from Hospitals. Organization Science, 29(1), pp.100-117.

Courtney, J., Croasdell, D. and Paradice, D., 1998. Inquiring Organizations. Australasian Journal of Information Systems, 6(1).

Dameron, S., Lê, J.K. and LeBaron, C., 2015. Materializing strategy and strategizing material: Why matter matters. British Journal of Management, 26(S1).

De Geus, A.P., 1988. Planning as learning. Harvard Business Review, March/April, pp. 70-74.

Eggers, J.P. and Kaplan, S., 2013. Cognition and capabilities: A multi-level perspective. Academy of Management Annals, 7(1), pp.295-340.

Feldman, M. and Worline, M., 2016. The practicality of practice theory. Academy of Management Learning & Education, 15(2), pp.304-324.

Franco, L.A., Meadows, M. and Armstrong, S.J., 2013. Exploring individual differences in scenario planning workshop: A cognitive style framework. Technological Forecasting and Social Change, 80(4): pp.723-734.

Ghemawat, P., 1985. Building Strategy on the Experience Curve. Harvard Business Review, March-April, pp. 143-148.

Godet M., and Roubelat F., 1996. Creating the future: The use and misuse of scenarios. Long Range Planning, 29(2), pp. 164-171.

Gomez, M.L., 2010. A Bourdesian perspective on strategy-as-practice. In Golsorkhi, D., Rouleau, L., Seidl, D. & Vaara, E. (Eds.), Cambridge handbook of strategy as practice, pp. 141–155. Cambridge: Cambridge University Press.

Goodier, C., Austin, S., Soetanto, R. and Dainty, A., 2010. Causal mapping and scenario building with multiple organizations. Futures, 42(3), pp.219-229.

Haeffner, M., Leone, D., Coons, L. and Chermack, T., 2012. The effects of scenario planning on participant perceptions of learning organization characteristics. Human Resource Development Quarterly, 23(4), pp.519-542.

Haspeslagh, P., 1982. Portfolio Planning - Uses and Limits. Harvard Business Review 60(1), pp.58- 73.

Hax, A.C. and Majluf, N. S., 1982. Competitive Cost Dynamics: The Experience Curve Interfaces, 12(5), pp. 50-61.

Healey, M.P., Hodgkinson, G.P., Whittington, R. and Johnson, G., 2015. Off to plan or out to lunch? Relationships between design characteristics and outcomes of strategy workshops. British Journal of Management, 26(3), pp.507-528.

Henderson, B. 1968. The Experience Curve. https://www.bcg.com/en-gb/publications/1968/business-unit-strategy-growth-experience-curve.aspx (Accessed 04 Aug, 2019).

Hodgkinson, G.P., Whittington, R., Johnson, G. and Schwarz, M., 2006. The role of strategy workshops in strategy development processes: Formality, communication, co-ordination and inclusion. Long range planning, 39(5), pp.479-496.

Huber, G.P., 1991. Organizational learning: The contributing processes and the literatures. Organization science, 2(1), pp.88-115.

Hutzschenreuter, T. and Kleindienst, I., 2006. Strategy-process research: What have we learned and what is still to be explored. Journal of management, 32(5), pp.673-720.

Inayatullah, S., 2009 Questioning scenarios, Journal of Futures Studies, 13(3), pp. 75-79.

Jarratt, D. and Stiles, D., 2010. How are methodologies and tools framing managers' strategizing practice in competitive strategy development? British Journal of Management, 21(1), pp.28-43.

Jarzabkowski, P., Giulietti, M., Oliveira, B. and Amoo, N., 2013. “We don’t need no education”—Or do we? Management education and alumni adoption of strategy tools. Journal of Management Inquiry, 22(1), pp.4-24.

Jarzabkowski, P. and Kaplan, S., 2015. Strategy tools-in-use: A framework for understanding “technologies of rationality” in practice. Strategic Management Journal, 36(4), pp.537-558.

Jarzabkowski, P. and Whittington, R., 2008. A strategy-as-practice approach to strategy research and education. Journal of Management Inquiry, 17(4), pp.282-286.

Laamanen, T., 2017. Reflecting on the past 50 years of Long Range Planning and a research agenda for the next 50. Long range planning, 50(1), pp.1-7.

Lapré, M.A. and Nembhard, I.M., 2011. Inside the organizational learning curve: Understanding the organizational learning process. Foundations and Trends® in Technology, Information and Operations Management, 4(1), pp.1-103.

Laquinto, A.L. and Fredrickson, J.W., 1997. Top management team agreement about the strategic decision process: A test of some of its determinants and consequences. Strategic Management Journal, 18(1), pp.63-75.

Levitt, B. and March, J.G., 1988. Organizational learning. Annual review of sociology, 14(1), pp.319-338.

MacKay, R.B. and Stoyanova, V., 2017. Scenario planning with a sociological eye: Augmenting the intuitive logics approach to understanding the Future of Scotland and the UK. Technological Forecasting and Social Change, 124, pp.88-100. Moksony, F., 1990. Small is beautiful. The use and interpretation of R2 in social research. Szociológiai Szemle, Special issue, pp.130-138.

Meissner, P. and Wulf, T., 2013. Cognitive benefits of scenario planning: Its impact on biases and decision quality. Technological Forecasting and Social Change, 80(4), pp.801-814.

Michael, D.N., 1973. On learning to plan and planning to learn: The social psychology of changing toward future responsive societal learning. CA: Jossey-Bass.

Millett, S.M. 2003. The future of scenarios: challenges and opportunities. Strategy and Leadership, 31(2), pp.16-24.

Ramirez, R., Churchhouse, S., Palermo, A. and Hoffmann, J., 2017. Using Scenario Planning to Reshape Strategy. MIT Sloan Management Review. Summer Issue, 2017.

Ramirez, R., Mukherjee, M., Vezzoli, S. and Kramer, A.M., 2015. Scenarios as a scholarly methodology to produce “interesting research”. Futures, 71, pp.70-87.

Ramírez, R., Österman, R. and Grönquist, D., 2013. Scenarios and early warnings as dynamic capabilities to frame managerial attention. Technological Forecasting and Social Change, 80(4), pp.825-838.

Ramírez, R. and Selin, C., 2014. Plausibility and probability in scenario planning. Foresight, 16(1), pp.54-74.

Ramirez, R., Selsky, J.W. and Van der Heijden, K., 2010. Business planning for turbulent times: new methods for applying scenarios. Routledge.

Ramirez, R. and Wilkinson, A., 2014. Rethinking the 2× 2 scenario method: grid or frames? Technological forecasting and social change, 86, pp.254-264.

Ramírez, R. and Wilkinson, A., 2016. Strategic Reframing: The Oxford Scenario Planning Approach. Oxford University Press.

Reeves, M., Stalk, G. and Scognamiglio, F., 2013. BCG Classics Revisited: The Experience Curve. BCG Henderson Institute. Available at: https://www.bcg.com/publications/2013/growth-business-unit-strategy-experience-curve-bcg-classics-revisited.aspx (Accessed 04 Aug, 2019).

Rigby, D. and Bilodeau, B., 2015. Management Tools & Trends 2015. Bain and Company. Available at: https://www.bain.com/insights/management-tools-and-trends-2015/ (Accessed 29 Nov, 2018).

Sandberg, J. and Tsoukas, H., 2011. Grasping the logic of practice: Theorizing through practical rationality. Academy of Management Review, 36(2), pp.338-360.

Sarpong, D., Maclean, M. and Alexander, E., 2013. Organizing strategic foresight: A contextual practice of 'way finding'. Futures, 53, pp.33-41.

Schoemaker, P.J., 1995. Scenario planning: a tool for strategic thinking. Sloan management review, 36(2), p.25.

Schwartz, P., 1991. The art of the long view: paths to strategic insight for yourself and your company. New York: Doubleday.

Spee, A.P. and Jarzabkowski, P., 2009. Strategy tools as boundary objects. Strategic Organization, 7(2), pp. 223-232.

Stenfors, S., Tanner, L. and Haapalinna, I., 2004. Executive use of strategy tools: building shared understanding through boundary objects. Frontiers of E-Business research, pp.635-645.

Tapinos, E., 2012. Perceived environmental uncertainty in scenario planning. Futures, 44(4), pp.338-345.

Van der Heijden, K., 1995. Scenarios: The Art of Strategic Conversation. Chichester: J. Wiley and Sons.

Van der Heijden, K., Bradfield, R., Burt, G., Cairns, G. and Wright, G., 2002. The sixth sense: Accelerating organizational learning with scenarios. John Wiley & Sons.

Verity, J., 2003. Scenario planning as a strategy technique. European Business Journal, 15(4), pp. 185-195.

Whittington, R., 1996. Strategy as practice. Long range planning, 29(5), pp.731-735.

Whittington, R., 2007. Strategy practice and strategy process: family differences and the sociological eye. Organization studies, 28(10), pp.1575-1586.

Wright, G., Bradfield, R., Cairns, G., 2013. Does the intuitive logics method – and its recent enhancements – produce “effective” scenarios?, Technological Forecasting and Social Change. 80(4), pp. 631-642.

Wright, R.P., Paroutis, S.E. and Blettner, D.P., 2013. How useful are the strategic tools we teach in business schools?. Journal of Management Studies, 50(1), pp.92-125.

Wright, G., Van der Heijden, K., Burt, G., Bradfeld, R. and Cairns, G., 2008. Scenario planning interventions in organizations: An analysis of the causes of success and failure. Futures, 40(3): pp.218-236.

Yelle, L.E., 1979. The learning curve: Historical review and comprehensive survey. Decision sciences, 10(2), pp.302-328.

Figure 1: Number of companies based on number of employees and turnover

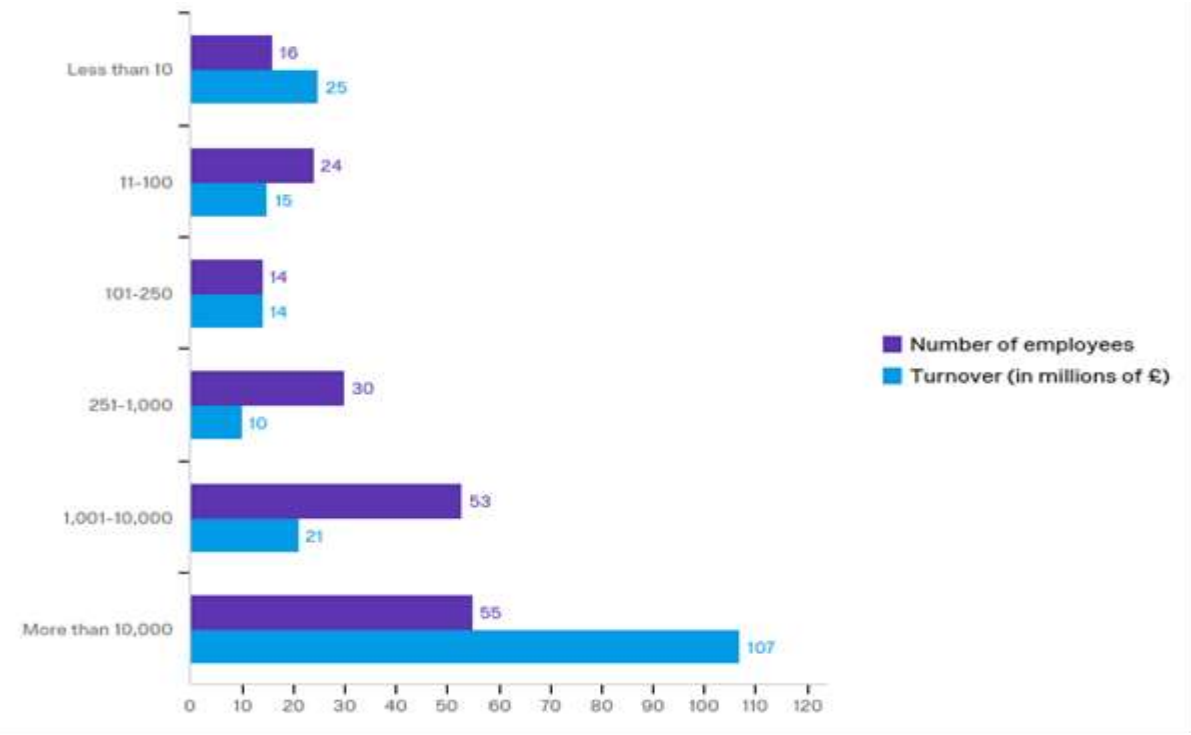

Figure 2: Sector representation – where respondents work

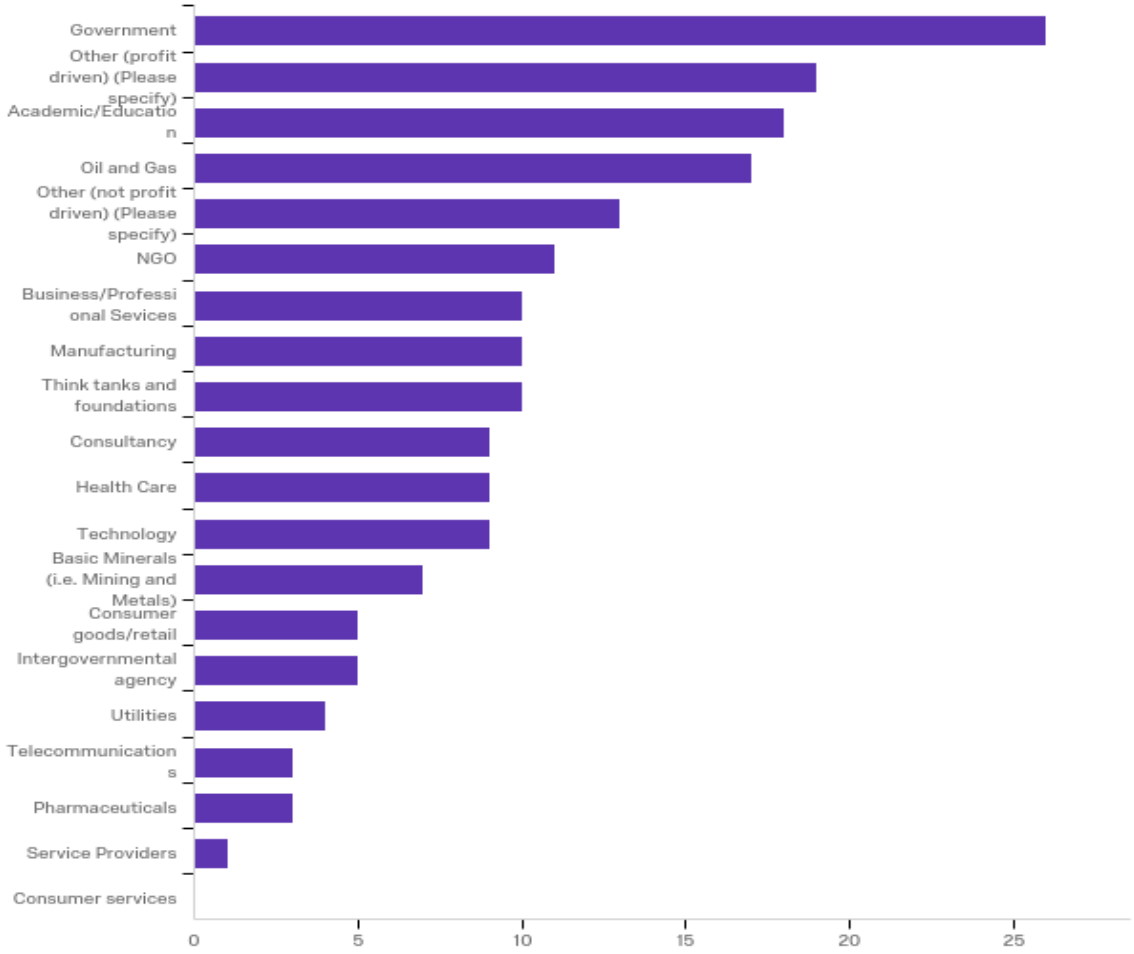

Table 1: Descriptive statistics

	Organization-level variables					Task-level variables					Individual-level variables			Dependent variable(s)	
	Number of employees	Turnover (in millions of GBP)	Geographic scale of your organisation	Diversity of your organisation's portfolio	Amount of scenario planning undertaken in your organisation	Clarity of purpose for the scenario planning intervention	A one-off initiative or regular, repeated process	Your own evaluation of the quality/level at which scenario planning is practiced	Duration of intervention	If you followed a structured approach for scenarios development, which approach did you use?	How many years of scenario experience did you have before attending OSP?	How many years of scenario experience have you had since attending OSP, including part time scenario planning?	How many times have you been involved in scenario planning activities since attending OSP?	At the time of the intervention, what percentage of your time did you want to devote to scenario planning activities (during the time when scenario planning was 'active' in the organisation)?	At the time of the intervention, what percentage of your time did you devote to scenario planning activities (during the time when scenario planning was 'active' in the organisation)?
Type	Ordinal	Ordinal	Ordinal	Ordinal	Ordinal	Ordinal	Ordinal	Ordinal	Ordinal	Ordinal	Scale	Scale	Ordinal	Ordinal	Ordinal
N, Valid	128	128	128	128	128	127	128	128	126	126	127	126	128	128	128
Missing	0	0	0	0	0	1	0	0	2	2	1	2	0	0	0
Mean	4.39	3.98	2.90	3.13	2.33	3.87	2.59	3.80	4.45	3.88	3.01	3.13	2.08	2.68	2.09
Median	5.00	5.00	3.00	3.00	2.00	4.00	2.00	4.00	5.00	4.00	1.00	2.00	2.00	3.00	2.00
Minimum	1	1	1	1	1	1	1	1	1	1	.0	.00	1	1	1
Maximum	6	5	5	5	5	5	5	5	5	5	40	12	3	5	5

Additional Scenario planning-based variables

Binomial data questions	Did you express the scenarios with narratives?	Did you express the scenarios with systems diagrams?	Were decision-makers included in the initial definition/ description of the scenarios?	Were intended users included in the initial definition/ description of the scenarios?
Valid	126	126	126	126
Missing	2	2	2	2
Yes (frequency)	105	67	88	96
No (frequency)	21	59	38	30
Yes (Percentage)	82%	52.3%	68.8%	75%
No (Percentage)	16.4%	46.1%	29.7%	23.4%

Table 2a: Factor Analysis (Component Matrix with Factor Loadings)

	1	2	3	4
At the time of the intervention, what percentage of your time did you devote to scenario planning activities (during the time when scenario planning was 'active' in the organisation)?	.447	.456	.497	-.356
At the time of the intervention, what percentage of your time did you want to devote to scenario planning activities (during the time when scenario planning was 'active' in the organisation)?	.423	.457	.553	
How many years of scenario experience did you have before attending OSP?	.316			
How many years of scenario experience have you had since attending OSP, including part time scenario planning?		.301	-.586	
How many times have you been involved in scenario planning activities since attending OSP?	.465	.358	-.389	-.357
Amount of scenario planning undertaken in your organisation	.581			
Number of employees	.536	-.585		
Turnover (in millions of GBP)	.554	-.594		
Geographic scale of your organisation	.496	-.495		
Diversity of your organisation's portfolio	.458			
A one-off initiative or a regular, repeated process	.657			
Your own evaluation of the quality/level at which scenario planning is practiced	.371			.450
Duration of intervention				.491
Clarity of purpose for the scenario planning intervention				
If you followed a structured approach for scenarios development, which approach did you use?	.309			
Did you express the scenarios with narratives?				
Did you express the scenarios with systems diagrams?			.400	
Were decision-makers included in the initial definition/ description of the scenarios?		.453		.395
Were intended users included in the initial definition/ description of the scenarios?				.565

Extraction Method: Principal Component Analysis.

a. 4 components extracted.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy. .582

Bartlett's Test of Sphericity Approx. Chi-Square=450.164, df=171, Sig. 0.000

Table 2b: Factor Analysis (Rotated Component Matrix)

	1: Organization -level factor	2: Task-based factor	3: Individual-level factor	4: Dependent variable(s)
At the time of the intervention, what percentage of your time did you devote to scenario planning activities (during the time when scenario planning was 'active' in the organisation)?				.860
At the time of the intervention, what percentage of your time did you want to devote to scenario planning activities (during the time when scenario planning was 'active' in the organisation)?				.853
How many years of scenario experience did you have before attending OSP?			<0.3	
How many years of scenario experience have you had since attending OSP, including part time scenario planning?			.700	
How many times have you been involved in scenario planning activities since attending OSP?			.751	
Amount of scenario planning undertaken in your organisation			.644	
Number of employees	.797			
Turnover (in millions of GBP)	.803			
Geographic scale of your organisation	.705			
Diversity of your organisation's portfolio	.430			
A one-off initiative or a regular, repeated process	.359	.349	.481	
Your own evaluation of the quality/level at which scenario planning is practiced		.530		
Duration of intervention		.512		
Clarity of purpose for the scenario planning intervention	.315			
If you followed a structured approach for scenarios development, which approach did you use?				
Did you express the scenarios with narratives?		< 0.3		
Did you express the scenarios with systems diagrams?		.349		.356
Were decision-makers included in the initial definition/ description of the scenarios?		.481	.305	
Were intended users included in the initial definition/ description of the scenarios?		.608		

Extraction Method: Principal Component Analysis. / Rotation Method: Varimax with Kaiser Normalization. / Rotation converged in 5 iterations.

Table 3: Wilcoxon Signed Ranks Test (n=128)

Ranks		N	Mean Rank	Sum of Ranks
1. At the time of the intervention, what percentage of your time did you want to devote to scenario planning activities (during the time when scenario planning was 'active' in the organisation)? - 2. At the time of the intervention, what percentage of your time did you devote to scenario planning activities (during the time when scenario planning was 'active' in the organisation)?	Negative Ranks	5[a]	33.10	165.50
	Positive Ranks	62[b]	34.07	2112.50
	Ties	61[c]		
	Total	128		

a. 1 < 2; b. 1 > 2; c. 1 = 2

Z	-6.488[a]
Asymp. Sig. (2-tailed)	.000

a. Based on negative ranks.

Table 4: Correlation matrix

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1: Number of employees	1.000	.635**	.520**	.275**	.025	.104	.242**	.216*	.229**	.022	.078	-.100	0.012	.174*	.194*	.032	-.064	-.112	.090
2: Turnover (in millions of GBP)	.635**	1.000	.501**	.294**	.065	.187*	.184*	.127	.134	.101	-.005	-.078	.167	.039	.150	-.017	-.164	-.174	-.124
3: Geographic scale of your organisation	.520**	.501**	1.000	.348**	.010	.162	.198*	.082	.077	.028	.049	-.089	.100	.107	.112	.046	-.220*	-.018	-.064
4: Diversity of your organisation's portfolio	.275**	.294**	.348**	1.000	.235**	.091	.236**	.066	.078	-.005	.094	-.092	.161	.072	.130	.050	.081	-.026	-.029
5: Amount of scenario planning undertaken in your organisation	.025	.065	.010	.235**	1.000	.007	.512**	.098	.034	.058	.065	.296**	.294**	.123	.220*	.029	.023	.192*	-.004
6: Clarity of purpose for the scenario planning intervention	.104	.187*	.162	.091	.007	1.000	.082	.129	.016	.100	-.057	-.102	.066	.111	.103	-.011	-.044	-.188*	-.050
7: A one-off initiative or more regular, repeated process	.216*	.127	.082	.066	.098	.129	.158	1.000	.049	.015	-.071	.109	.202*	.148	.038	.126	.174	-.021	.097
8: Your own evaluation of the quality/level at which scenario planning is practiced	.229**	.134	.077	.078	.034	.016	.157	.049	1.000	.035	.157	.221*	.023	.005	-.020	.098	-.017	.031	.102
9: Duration of intervention	.242**	.184*	.198*	.236**	.512**	.082	1.000	.158	.157	.094	.232**	.150	-.045	.142	.161	.008	.075	.151	.065
10: If you followed a structured approach for scenarios development, which approach did you use?	.022	.101	.028	-.005	.058	.100	.094	.015	.035	1.000	.156	.124	.253**	.049	.053	.047	-.010	-.076	.151
11: How many years of scenario experience did you have before attending OSP?	.078	-.005	.049	.094	.065	-.057	.232**	-.071	.157	.156	1.000	.152	.133	.191*	.085	-.100	.051	.257**	.129

12: How many years of scenario experience have you had since attending OSP, including part time scenario planning?	-.100	-.078	-.089	-.092	.296**	-.102	.150	.109	.221*	.124	.152	1.000	.510**	.146	.040	.104	-.045	.176	.079
13: How many times have you been involved in scenario planning activities since attending OSP?	.012	.167	.100	.161	.294**	.066	-.045	.202*	0.023	.253**	.133	.510**	1.000	.196*	.262**	.103	-.011	.030	-.014
14: At the time of the intervention, what percentage of your time did you want to devote to scenario planning activities (during the time when scenario planning was 'active' in the organisation)?	.174*	.039	.107	.072	.123	.111	.142	.148	.005	.049	.191*	.146	.196*	1.000	.703**	.078	.138	.042	.050
15: At the time of the intervention, what percentage of your time did you devote to scenario planning activities (during the time when scenario planning was 'active' in the organisation)?	.194*	.150	.112	.130	.220*	.103	.161	.038	-.020	.053	.085	.040	.262**	.703**	1.000	.071	.101	.058	-.066
16: Did you express the scenarios with narratives?	.032	-.017	.046	.050	.029	-.011	.008	.126	.098	.047	-.100	.104	.103	.078	.071	1.000	.007	-.015	.100
17: Did you express the scenarios with systems diagrams?	-.064	-.164	-.220*	.081	.023	-.044	.075	.174	-.017	-.010	.051	-.045	-.011	.138	.101	.007	1.000	.042	.036
18: Were decision-makers included in the initial definition/ description of the scenarios?	-.112	-.174	-.018	-.026	.192*	-.188*	.151	-.021	.031	-.076	.257**	.176	.030	.042	.058	-.015	.042	1.000	.282**

19: Were intended users included in the initial definition/ description of the scenarios?	.090	-.124	-.064	-.029	-.004	-.050	.065	.097	.102	.151	.129	.079	-.014	.050	-.066	.100	.036	.282**	1.000

Table 5: Hierarchical ordinal regression modelling

	Model Fit			Goodness of Fit			R Square	Test of Parallel Lines	
Model	**Chi Square**	**df**	**Sig**	**df**	**Pearson Sig.**	**Deviance Sig.**		**df**	**Sig.**
1	33.554	21	0.040	407	0.592	1.000	0.247	63	1.000
2	58.935	40	0.027	452	0.000	1.000	0.405	120	1.000
3	75.402	44	0.002	436	0.000	1.000	0.497	132	1.000
4	77.473	48	0.004	432	0.000	1.000	0.507	144	1.000

Dependent variable: At the time of the intervention, what percentage of your time did you devote to scenario planning activities (during the time when scenario planning was 'active' in the organisation)?

1: Predictors: (Constant), Organizational factors

2: Predictors: (Constant), Organizational + Task-based factors

3: Predictors: (Constant), Organizational + Task-based + Individual factors

4: Predictors: (Constant), Organizational + Task-based + Individual + Additional Scenario Planning factors

Table 6: Ordinal regression model 4

		Coefficient	Odds ratio	Std. Error	p	95% Confidence Interval	
						Lower Bound	Upper Bound
Dependent variable	[Percentage of time devoted = 1]	-4.239	0.01	1.455	.004	-7.092	-1.387
	[Percentage of time devoted = 2]	-2.193	0.11	1.425	.124	-4.986	.601
	[Percentage of time devoted = 3]	-.174	0.84	1.413	.902	-2.944	2.596
	[Percentage of time devoted = 4]	1.317	3.73	1.448	.363	-1.521	4.155
Independent variables	[Number of employees =1]	.075	1.08	1.502	.960	-2.868	3.018
	[Number of employees =2]	-1.766	0.17	1.048	.092	-3.819	.287
	[Number of employees =3]	-.809	0.45	1.085	.456	-2.936	1.318
	[Number of employees =4]	**-2.626**	**0.07**	.879	**.003****	-4.348	-.904
	[Number of employees =5]	**-2.163**	**0.11**	.715	**.002****	-3.566	-.761
	[Number of employees =6]	0[a]	1.00	.	.	.	.
	[Turnover =1]	-.645	0.52	1.140	.571	-2.879	1.588
	[Turnover =2]	**-2.299**	**0.10**	1.037	**.027***	-4.332	-.267
	[Turnover =3]	-.498	0.61	.924	.590	-2.310	1.313
	[Turnover =4]	-1.126	0.32	.765	.141	-2.626	.373
	[Turnover =5]	0[a]	1.00	.	.	.	.
	[Geographic scale =1]	1.105	3.02	.871	.205	-.603	2.813
	[Geographic scale =2]	.425	1.53	.820	.605	-1.182	2.031
	[Geographic scale =3]	-.286	0.75	1.053	.786	-2.350	1.777
	[Geographic scale =4]	.666	1.95	.913	.466	-1.124	2.455
	[Geographic scale =5]	0[a]	1.00	.	.	.	.
	[Diversity of portfolio =1]	**1.857**	**6.40**	.849	**.029***	.193	3.521
	[Diversity of portfolio =2]	1.388	4.01	.719	.053	-.021	2.797
	[Diversity of portfolio =3]	-3.175E-5	1.00	.740	1.000	-1.450	1.450
	[Diversity of portfolio =4]	.463	1.59	.731	.526	-.970	1.896
	[Diversity of portfolio =5]	0[a]	1.00	.	.	.	.
	[Amount of SP undertaken =1]	**-3.203**	**0.04**	1.139	**.005****	-5.436	-.970
	[Amount of SP undertaken =2]	**-3.800**	**0.02**	1.169	**.001****	-6.092	-1.508
	[Amount of SP undertaken =3]	**-3.415**	**0.03**	1.116	**.002****	-5.603	-1.228
	[Amount of SP undertaken =4]	-1.571	0.21	1.191	.187	-3.904	.762
	[Amount of SP undertaken =5]	0[a]	1.00	.	.	.	.
	[Clarity of purpose =1]	-20.134	0.00	.000	.	-20.134	-20.134
	[Clarity of purpose =2]	-.237	0.79	1.401	.865	-2.983	2.508
	[Clarity of purpose =3]	.698	2.01	.686	.309	-.646	2.041
	[Clarity of purpose =4]	.722	2.06	.626	.248	-.504	1.949
	[Clarity of purpose =5]	0[a]	1.00	.	.	.	.
	[Duration of intervention =1]	1.461	4.31	1.070	.172	-.636	3.557
	[Duration of intervention =2]	-1.012	0.36	1.100	.358	-3.169	1.145

	[Duration of intervention =3]	2.967	19.43	1.660	.074	-.287	6.220
	[Duration of intervention =4]	**2.387**	**10.88**	1.038	**.021***	.353	4.420
	[Duration of intervention =5]	0[a]	1.00	.	.	.	.
	[One-off initiative or repeated =1]	.669	1.95	.903	.459	-1.101	2.438
	[One-off initiative or repeated =2]	1.492	4.45	.866	.085	-.205	3.189
	[One-off initiative or repeated =3]	1.293	3.64	.876	.140	-.424	3.010
	[One-off initiative or repeated =4]	.904	2.47	.920	.326	-.899	2.707
	[One-off initiative or repeated =5]	0[a]	1.00	.	.	.	.
	[Quality of SP =1]	**-3.232**	**0.04**	1.356	**.017***	-5.890	-.573
	[Quality of SP =2]	.494	1.64	1.034	.633	-1.532	2.520
	[Quality of SP =3]	**1.528**	**4.61**	.683	**.025***	.189	2.867
	[Quality of SP =4]	.907	2.48	.636	.153	-.338	2.153
	[Quality of SP =5]	0[a]	1.00	.	.	.	.
	[Structured approach =1]	-1.909	0.15	1.160	.100	-4.182	.363
	[Structured approach =3]	1.280	3.60	.691	.064	-.074	2.635
	[Structured approach =4]	.708	2.03	.590	.230	-.449	1.865
	[Structured approach =5]	0[a]	1.00	.	.	.	.
	No. of years of prior SP experience	.041	1.04	.043	.337	-.043	.125
	No. of years of post SP experience	**-.285**	**0.75**	.115	**.013***	-.511	-.059
	[No. of times involved in SP =1]	**-2.579**	**0.08**	.862	**.003****	-4.269	-.889
	[No. of times involved in SP =2]	**-2.193**	**0.11**	.669	**.001****	-3.505	-.882
	[No. of times involved in SP =3]	0[a]	1.00	.	.	.	.
	[Scenarios as narratives =1]	.093	1.10	.628	.882	-1.138	1.324
	[Scenarios as narratives =2]	0[a]	1.00	.	.	.	.
	[Scenarios as systems diags =1]	.057	1.06	.513	.912	-.948	1.062
	[Scenarios as systems diags =2]	0[a]	1.00	.	.	.	.
	[Included decision-makers =1]	-.317	0.73	.503	.528	-1.302	.668
	[Included decision-makers =2]	0[a]	1.00	.	.	.	.
	[Included intended users =1]	.844	2.33	.602	.161	-.335	2.024
	[Included intended users =2]	0[a]	1.00	.	.	.	.

Appendix

Survey questionnaire (Note this a condensed version of a larger survey)

Purpose & Background: The purpose of this research is to investigate how (REMOVED FOR REVIEW) alumni have used scenario planning and which outcomes/benefits they have experienced from scenario planning. We are also investigating those who have chosen not to do scenario planning. Since 2004 the programme has educated over 600 participants from a large number of countries and an extensive range of fields of practice. Upon completion of our analysis, participants of the survey will receive a copy of the findings. The findings from this research will be submitted for use in scholarly literature, and it will also help to improve the (removed for review) Scenarios Programme.

Proposed Activity: We therefore invite you to share your experience of a scenario planning intervention after your participation at the (REMOVED FOR REVIEW) by completing this online survey. The survey is voluntary and – as pretested – is most likely to take about 20 minutes to complete and may be a useful opportunity for reflection.

Questions	Options
1: Please tell us about the size of the organisation in terms of number of employees	1: Less than 10 2: 11-100 3: 101-250 4: 251 – 1000 5: 1001 – 10000 6: More than 10000
2a: Please tell us about the size of the organisation in terms of turnover (in millions of GBP)	1: 1m – 5m 2: 6m – 20 m 3: 21m – 50m 4: 51m – 100m 5: More than 100m
2b. Please select the sector/industry of the organisation in which the SP took place.	Several and 'Other' options
3: How international is the organisation? Please rate on a scale of 1 to 5, where 1 is operating only in one country, and 5 is operating worldwide.	1, 2, 3, 4, 5
4: How diverse is the organisation's portfolio? Please rate on a scale of 1 to 5, where 1 is operating in a single activity only and 5 is a very diverse portfolio with very diverse activities.	1, 2, 3, 4, 5
5: Please indicate how much scenario planning is undertaken at the organisation, where 1 is very little and 5 is a lot.	1, 2, 3, 4, 5
6: How clear was the purpose for the scenario planning intervention? Please rate on a scale of 1 to 5, where 1 is no clear purpose and 5 is a well-defined and understood purpose.	1, 2, 3, 4, 5
7: Please select on a scale from 1 to 5, scenario planning in the organisation was…. 1 where it was a one-off initiative and 5 is a more regular, repeated process	1, 2, 3, 4, 5
8: Did your participation in (REMOVED FOR REVIEW) change the following? Please rate on a	1, 2, 3, 4, 5

scale of 1 to 5, where 1 is low or no change and 5 is very high change: - Your own evaluation of the quality/level at which scenario planning is practiced	
9a: How long did the scenario planning intervention last?	Less than one month Over 1 month
9b: If this scenario planning intervention lasted less than 1 month, please specify:	1: 1 full day, or less 2: 2 full days 3: 3-4 full days 4: More than 5 full days 5: More than 1 month
10: If you followed a structured approach for scenarios development, which approach did you use?	1: Did not use a structured approach 3: Inductive (started from the scenario themes first) 4: A combination of deductive and inductive approaches 5: Deductive (reduced number of uncertainties, built 2x2 matrix)
11: How many years of scenario experience did you have before attending SP?	Whole integers
12: How many years of scenario experience have you had since attending OSP, including part time scenario planning?	Whole integers
13: How many times have you been involved in scenario planning activities since attending SP?	1: Only once 2: 2-3 times 3: More than 3 times
14: At the time of the intervention, what percentage of your time did you **want** to devote to scenario planning activities (during the time when scenario planning was 'active' in the organisation)?	1: Less than 20% 2: 20-40% 3: 41-60% 4: 61%-80% 5: 81%-100%
15: At the time of the intervention, what percentage of your time did you devote to scenario planning activities (during the time when scenario planning was 'active' in the organisation)?	1: less than 20% 2: 20-40% 3: 41%-60% 4: 61%-80% 5: 81%-100%
16: Did you express the scenarios with narratives?	Yes / No
17: Did you express the scenarios with systems diagrams?	Yes / No
18: Were decision-makers included in the initial definition/ description of the scenarios?	Yes / No
19: Were intended users included in the initial definition/ description of the scenarios?	Yes / No