JUDGMENTAL FORECASTS WITH SCENARIOS AND RISKS

A Ph.D. Dissertation

by

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June 2017

To My Family, Now and Then

JUDGMENTAL FORECASTS WITH SCENARIOS AND RISKS

The Graduate School of Economics and Social Sciences
of
İhsan Doğramacı Bilkent University

by

ESRA ÖZ

In Partial Fulfillment of the Requirements for the Degree of
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in

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June 2017

I certify that I have read this thesis and have found that it is fully adequate, in scope and in quality, as a thesis for the degree of Doctor of Philosophy in Business Administration.

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ABSTRACT

JUDGMENTAL FORECASTS WITH SCENARIOS AND RISKS

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June 2017

The purpose of this thesis is to investigate how scenarios and risks influence judgmental forecasts, forecaster's confidence, and assessments of likelihood of occurrence. In its attempt to identify the impact of scenarios and risks as channels of forecast advice, this research reports the findings on the use of advice from six experimental groups with business practitioners as participants. Goal was to collect evidence and interpret the reasons and motivations behind judgmental forecasts from actual business life, as well as to identify the possible biases of forecasters after reviewing certain scenarios and risks. This thesis also presents analyses on the use of advice corresponding to the credibility attributes of advisors, i.e., "experienced credibility" and "presumed credibility". Following a discussion of the results, future research directions are provided.

Keywords: Credibility, Forecast Bias, Judgment, Likelihood Assessment, Scenarios

ÖZET

SENARYO VE RİSK DESTEKLİ YARGISAL TAHMİNLER

Öz, Esra

Doktora, İşletme Bölümü

Tez Yöneticisi: Prof. Dr. Dilek Önkal

Haziran 2017

Bu çalışmada temel amaç, senaryo ve risklerin yargısal tahminlere, tahmin yapıcıların özgüvenine ve olasılık değerlendirmelerine etkilerini incelemektir. Senaryo ve risklerin tahmin tavsiyesi olarak etkisinin tespit edilmesi kapsamında, bu çalışma altı deney grubu ile çalışanlardan tavsiye kullanımı konusunda elde edilen bulguları sunmaktadır. Araştırma; gerçek iş dünyasından kanıtlar toplamak, yargısal tahminlemelerin ardında yatan nedenleri ve motivasyonları yorumlamak, tahmin yapıcıların muhtemel eğilimlerini tespit etmek amacını taşımaktadır. Bu tez ayrıca tavsiye kaynağına ait nitelikler olan "deneyimlenmiş güvenilirlik" ve "kabul edilmiş güvenilirlik"in belirtilmesi ile ortaya çıkan tavsiye kullanımına dair analizleri sunmaktadır. Araştırmalardan çıkan sonuçlar tartışılmış ve gelecekteki araştırmalar için yeni fikirlere yer verilmiştir.

Anahtar kelimeler: Güvenilirlik, Muhakeme, Olasılık Değerlendirmesi, Senaryolar, Tahmin Eğilimi

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CHAPTER-1: INTRODUCTION

Research on advice giving and advice taking offers insight into how people learn from others and how open they are to receiving others' wisdom. Forecasting decisions, in particular, are often made by individuals after consulting with, and being influenced by others (Bonaccio & Dalal, 2006). Considering other perspectives takes attention and energy because it requires individuals to move from the comfortable familiarity of how they are used to seeing things (Epley, Keysar, Van Boven, & Gilovich, 2004) to the unfamiliar position of an outside point of view. Research findings on the use of advice are likely to guide advisors on "becoming more influential" and raise advisees' awareness on "their vulnerabilities" during the use of advice. To be specific, this dissertation examines how forecasts and forecasters' confidence are affected by forecast advice in the form of scenarios and risks, how exposure to various scenarios influences individuals while making assessments of likelihood of occurrence and how forecasts are impacted by the use of

advice from sources differing in presumed and experienced credibility. Specifically, it aims to explore whether scenario content has any influence over forecasts and confidence, what kind of tendencies may arise based on various scenario contents in an intuitive logics scenario framework with a focus on individuals' biases, and whether two levels (i.e., high and low) of two credibility attributes (i.e., presumed and experienced credibility) pertaining to the advisor influence forecasters to use that advice.

This chapter provides an overview of the research and articulates the questions that inspired and guided the entire research process. I set this inquiry in the context of seven distinct bodies of literature: scenarios; risk perception; assessment of the likelihood of occurrence; heuristics and biases; forecasting, expert advice and credibility. I then describe the dissertation's method and data analysis, concluding with a discussion of the contribution this research intends to make to the field.

A restrictive definition describes advice as a specific recommendation concerning what the decision maker should do. (e.g. Harvey & Fischer, 1997). Several researchers have begun calling this definition into question. Dalal and Bonaccio (2010) categorized advice under four types. The general definition of advice imposes a recommendation in favor of a particular course of action and it is "*Recommend For*" whereas a recommendation against a particular course of action is categorized under "*Recommend Against*". Information advice concerning one or more alternatives without explicit endorsement of any alternative is "*Information*" type advice. If the aforementioned type of advice is accompanied by another form of interpersonal assistance, such as socio-emotional support, it can be studied under "*Social Support*" (Dalal & Bonaccio, 2010). Each advice type may generate different

reactions in decision makers. Research findings on the use of advice should recognize this. In their work, Dalal and Bonaccio (2010) present findings which show that the motive to maintain autonomy, (i.e. *Information* type advice) is likely to relate to the acceptance of advice. In this respect, *Information* type advice deserves a detailed investigation. Study-1 in this dissertation focuses on scenarios as they are deemed as good representatives of *Information* type advice.

We do not yet fully understand decision makers' reactions while dealing with scenarios. Once we know more, it will be possible to improve on existing scenario practices and derive greater benefit from scenario methodology. Study-1 of this dissertation is split into two parts: Study-1a and Study-1b. Study-1a compares scenarios with different contents and evaluates whether the scenario contents change forecasters' predictions and confidence. Study-1b focuses on incorporating the treatment of the assessment of likelihood occurrence to scenarios. In doing so, this work would like to identify any vulnerabilities and pitfalls decision makers may face in their attempt to benefit from the intuitive logics method, which has become the default scenario technique since Schwartz (1991) published his best-seller, The Art of the Long View. The method selects two primary dimensions of uncertainty, creates a 2X2 matrix and elaborates. The four quadrants represent the four alternative combinations of these two uncertainties, each of which contains a kernel or logic of a plausible future. Each kernel is then elaborated into a narrative, and the implications for the focal issue or decision are discussed (Bishop, Hines & Collins, 2007).

How can scenario methodology be improved and where might it still fall short due to some decision making biases? This dissertation attempts to identify any

biases that occur while using scenarios as channels of forecast advice. It focuses on some of the methodological and practical concerns of scenarios for forecasting. It discusses possible improvements to scenario content, debiasing recommendations with special consideration of their useful implications as a business planning tool.

Debiasing refers to the procedure of reducing or eliminating the biases in the decision making strategies of the decision maker. Fischhoff (1982) proposed four steps that decision making teachers or trainers can follow to encourage their students to make wiser judgments: (1) offer warnings about the possibility of bias, (2) describe the direction of the bias, (3) provide a dose of feedback, and (4) offer an extended program of training with feedback, coaching, and anything else it takes to improve judgment. This work attempts to identify any vulnerabilities and biases decision makers may be influenced by as they are using scenarios. It should be noted that one can offer warnings about the possibility of bias only after the bias is described. Fischhoff (1982) also argues that debiasing is an extremely difficult process that must be closely monitored and guided by a psychological framework for change. This work may pave the way for developing debiasing recommendations for forecast advice takers after examining their perceptions of varying scenario contents.

With the proverbial clock ticking faster than ever in business, executive boards are always seeking a deeper and better understanding of the future. Companies update their strategy reports periodically in preparation for the future. These strategy reports cover supporting information such as forecast sales figures and market share for a medium term horizon. The forecasts become crucial reference points for action plans and investment plans. Forecasts initiated today are not limited

to the company's internal operations planning; they are also related to the perception of a company's present value. The perception of a company's present value is driven to a great extent by the future sales volume and market share, both of which are key determinants of a company's stock price, and are thus important indicators for the investors.

Since 1960, the scenario approach has been used intensively to integrate several possible futures into the planning process. Scenarios are not predictions or forecasts; rather, they seek to define uncertainty and make it explicit. Önkal, Sayım and Gönül (2013) studied the effectiveness of scenarios as channels of forecast advice. Their paper offered an exploratory attempt at using scenarios in forecast communication and advice taking processes by giving scenarios to forecasters as additional forecast information. The paper successfully illustrated the very first step in examining how scenarios could be used as channels of forecast advice. They explain that storytelling promises to facilitate a rich platform where scenarios can play an important role to improve forecast communication and predictive accuracy within organizations. While using scenarios as channels of forecast advice, having consistency checks to alleviate biases, enriching the content of scenarios, enhancing the credibility of scenarios, fostering trust via scenario-sharing would ensure forecasters derive maximum benefit from scenarios.

Peter Drucker has emphasized that long range planning does not deal with future decisions (1959). Rather it deals with the "futurity" of present decisions. The scenario technique is a useful way of obtaining a clear image of future alternatives and events. Using various types of proven scenario methods, it is possible to see the

interactions between driving forces and uncertain events, which illustrate possible futures in a structured way, thereby enabling quantitative predictions to be made with deeper understanding. While the technique may not be able to offer final answers to strategic decisions, it certainly enhances a decision maker's understanding and challenges conventional thinking (Wright, Bradfield & Cairns, 2013).

In many organizations, human judgment plays the primary role in forecasting (e.g. Klein & Linneman, 1984). Even when quantitative methods are used, results often require adjustment with expert judgments (Bunn & Wright, 1991). Understanding how these judgments are formed is essential. Fischhoff and MacGregor emphasize that a forecast must not only predict the future, but also give some indication of how much confidence to place in that prediction (Fischhoff & MacGregor, 1982). In this respect, it is important to know how forecasters' confidence gets affected by either content or treatment of scenario planning in an organization. This study is an initial attempt to address this gap in the literature.

The quality and evaluation of scenario techniques have been discussed in great length in the literature. However, judgmental decision making on enriched scenario content has not. To date, the influence of different contents; i.e., scenario narratives and risk implications on forecasts and confidence, has not been investigated. Scenario development is not an everyday task; the process requires long hours of rigorous work and is usually exclusive to a small group of senior decision makers. An investigation on different scenario contents appears as a challenging and time consuming mission, from its relevant scenario development stage onwards. In addition, such an investigation calls for the involvement of a large sample

comprising a broad and diverse group of respondents. The difficulty of scenario development in compliance with research methodologies inevitably makes such a study a challenge, as well.

Study-2 of this dissertation takes a close look at expert knowledge elicitation through labels of credibility. As Swol and Sniezek (2005) listed five factors that affect the acceptance of advice; namely advisor confidence, advisor accuracy, the advisee's trust in the advisor, the advisee's prior relationship with the advisor, and the advisee's power to pay for the advisor's recommendations, this study examines the credibility issue with an emphasis on its different types. In this work, the credibility level of the advice source can be viewed from the perspectives of "presumption" which is based on the title, status of the advice source and "experience" which is based on the track record of the advice source. Presumed credibility represents social acknowledgment and experienced credibility represents the observed accuracy in the advisor's forecasts. The goal of Study-2 is to examine how forecasters adjust their forecasts after reviewing forecasts from sources labeled by the level of presumed credibility or experienced credibility.

1.1. Contribution of the Dissertation

In terms of the first contribution; the relative influence of scenario content on judgmental forecasts and forecasters' confidence will be investigated in this thesis. Past research is sorely lacking in this area. The empirical results will present contributions towards scenario methodology.

At this point, it will be useful to provide more information on the vocabulary used in this work. Here, the term "intuitive logics scenario framework" (hereafter

"ILS framework") denotes a 2X2 matrix where conditions are presented around two driving forces. The ILS framework displays four quadrants which supply alternatives of the future in the form of narratives or risk implications. "Scenario narratives" denote stories expressed in one of the four "quadrants" of this ILS framework. "Risk implications" denote negative outcomes caused by exposure to a specific scenario condition.

As this work draws attention to scenario content, it has chosen to contextualize the research on sales volume and market share forecasts. These variables can be listed under "gains" rather than "costs". Although business scenarios have proven themselves as irresistible to organizations since the 1960s, business literature has not yet clarified to what extent judgmental forecasts change when risks are incorporated into the ILS framework. Perceived differences based on a change in the "framed" wording of alternatives can dramatically affect how people make decisions (Kahneman & Tversky, 1979). While a future condition can bring risks and opportunities at the same time, an expert can provide that condition in frames; i.e., representing only the resultant "risks". Reviewing only risks in each scenario quadrant as forecast advice has the potential to impact the forecasters' confidence. This study is the first attempt to address this gap in the literature.

In extant literature, there is a lack of quantitative findings on how forecasts change with positive-state and negative-state scenarios. Going one step further; how forecasters' confidence is shaped while using scenario narrative based advice or risk based advice in an intuitive logics framework (i.e., which serves as an effective tool considering the limited time and judgmental power of humans) has not been

examined. Comparing forecasters' confidence "with scenario narratives and/or risks" to "without any scenario narratives/risks" stands as a promising investigative opportunity.

In terms of the second contribution, this work uses intuitive logic scenarios, which provides four mutually exclusive and collectively exhaustive scenarios for describing the future. Scholars have not focused on this distinctive characteristic so far. Extant literature has only studied best and worst case scenarios without much attention to moderate scenarios. Researchers have discussed general findings on decision makers' attitudes after reviewing scenarios. This work will present case-specific findings pertaining to four mutually exclusive and collectively exhaustive scenarios. This is going to be a theoretical contribution to the general findings on decision making with scenarios and biases as the study collects data through participants.

It should be noted that both academics and practitioners doubt whether using any scenario content has any significant impact on the assessment of likelihood of occurrence. As a third contribution, this work may find out whether the incorporation of an additional treatment during scenario analysis, i.e., the assessment of likelihood of occurrence, influences forecasters' confidence while using scenarios offered as forecast advice.

If reference historic frequencies are not obvious, possibly because the event to be forecast is truly unique, the only way to assess the likelihood of the event is to use a subjective probability produced by judgmental techniques. Perceived likelihood of occurrence for each quadrant may change if the quadrants present narratives.

Within the scope of the fourth contribution, decision making biases that arise during assessment of likelihood of occurrence could be identified.

As the fifth contribution, this work will try to interpret how forecasts, forecasters' confidence and likelihood of occurrence assessments are shaped among the four quadrants of the intuitive logic scenarios. One of the four quadrants may surpass the others as a reference point for forecasters during the use of scenario advice. This is going to be a theoretical contribution differentiating the four separate quadrants by negativity amount (i.e., intuitive logic scenarios involve four quadrants which represent either zero, one or two negative directions).

Study-1 of this dissertation explores the ILS framework which is offered to forecasters as *Information* type advice while they work on their predictions for the year 2021. The context of the Study-1 is based on the wearable technology market. This market is new and rapidly growing, with only several years of history. Many people wonder how dominant wearable technology products will be in 2021. While many market researchers have been brainstorming the possible futures in different forms, this work formulates the future on 2X2 scenarios in compliance with experimental research methodologies and presents sales volume and market share forecasts as variables. For the study, first the participants are informed about the company's sales and market share for the past two years as the market is only two years old and older data is not available. In this case, computerized forecasting models (i.e., time series models) are obviously inapplicable. Decision makers require judgmental forecasting methods. With different types of information treatments, they make forecasts for the year 2021 and indicate their confidence. Going back to the

substantial purpose of this set of studies, if we can understand the judgment processes with scenarios, we might be able to discuss any improvements as the next step.

Forecasters may exploit many types of inputs and tools during their studies. This could be "*Information*" type advice such as a set of future scenarios supplied in Study-1 or this could be unidirectional "*Recommend For*" type advice such as the future value of a certain stock supplied in Study-2 of this dissertation. Advice can be described with its source possessing high or low experienced credibility, high or low presumed credibility.

Study-2 of this dissertation explores an important issue on the advisor credibility: What happens when the two attributes of experts (i.e., track record of accuracy (experienced credibility) and their apparent status (presumed credibility) yield conflicting indications of credibility? As the sixth contribution, this work compares forecasters' adjustments after reviewing presumed and experienced credibility sources and attempts to figure out whether one of these attributes is more influential on forecasters to make an adjustment on their forecasts and to use that advice.

Study-2 of the dissertation uses a different forecasting task in its attempt to analyze users' reactions to the credibility attribute. Forecasters review 12 time series plots of weekly closing stock prices for a 30 week period and generate a point forecast and an interval forecast for the 31st week. Advisors are presented to the forecast advice takers with either high or low presumed / experienced credibility attributes. In the second stage, the forecasters review forecasts generated by these

advisors and they make forecasts after having access to the advisor's "*Recommend For*" type advice. This work attempts to analyze the strategies of forecasters in taking advice under the credibility framework. The findings will shed light on forecasters' willingness to use forecast advice when they have information regarding the credibility attribute of the source of the advice.

This dissertation aims to make a sound contribution to the business scenario and expert credibility literature with a data set collected from business professionals. Many researchers in management have drawn attention to the increasing gap between academia and business, despite being two sides of the same coin (Petropoulos & Kourentzes, 2016). After checking a wide range of relevant databases and journals, it appears that, so far, the literature has not hosted a study where judgmental data derived of scenarios is collected from practitioners. This work is an attempt at producing and disseminating findings directly applicable to practice by business people.

1.2. Structure of the Dissertation

This dissertation mainly has seven chapters. This chapter presents an introductory discussion of the purpose of the research and the structure of the dissertation. In Chapter-2, literature review on scenarios, advice taking, subjective probability assessments, potential biases influential on both forecasting and likelihood assessments is provided with their implications for this dissertation. Following this, Chapter-3 presents the research questions being addressed in this dissertation. Chapter-4 explains the experimental design and the methodology. Chapter-5 elaborates on the data analyses and findings of this research. Chapter-6

integrates the findings into a discussion framework. Each finding focuses on the grounding literature of the topic at hand and how these new findings matched, challenged or contributed to them. It also presents the limitations in this work and addresses new directions for future research. Finally in Chapter-7, the dissertation is concluded by addressing some recommendations that could improve on the use of advice based on general discussions.

CHAPTER-2: LITERATURE REVIEW

If one understands the judgment process, there is a good chance of improving it. If one can improve the judgment process, one should be able to improve the resulting judgments and decisions they imply (Brockhaus, 1975:127).

2.1. Introduction

This chapter firstly introduces the research topic within the context of scenarios and forecasting research to address Study-1. It presents how scenario studies have positioned themselves as complementary tools to forecasting and enhancing knowledge on what the future may unfold. Any attempt to clarify the unclear future helps forecasters. Scenario narratives and risk implications have come to play a role in this context.

Next, this chapter discusses heuristics and biases, confidence and risk perception in relation to intuitive logics methodology. These include the literature around scenario analysis, heuristics, risk assessment and likelihood of occurrence

assessments. It also mentions how literature on forecasting has developed in relation to these issues. Finally, it discussess the history and theory of scenario planning, reviewing the literature on how it became so useful with its strengths and limitations. This part ends with a discussion of how the research in this dissertation fits within the overall landscape of this literature.

The chapter secondly introduces the research topic on the expert knowledge elicitation models and credibility of the advice source. Information is given on the credibility attribute of forecast advice source, in particular on two attributes of credibility (i.e., presumed and experienced credibility) to address Study-2. The research inquires how forecasters' willingness to use forecast advice changes based on the advice type or attributes of the advisor. The next heading continues by elaborating more on the main theme: Advice taking, the use of advice and the type of advice.

2.2. Advice Taking

Many companies typically tend to focus on their immediate business environment. They spend most of their energy and resources keeping up with developments related to their familiar set of products, customers, competitors, technologies and stakeholders. Such focus may result in missed key signals from the peripheral environment. For many real-world decisions ranging from the smallest to the crucially important, organizations need to combine information from multiple sources before taking action (Wallsten, Budescu, Erev & Diederich, 1997). Advice could be one of these sources. In fact, greater uncertainty about a task is supposed to

lead forecasters to consider an expert advisor's advice (Swol & Sniezek, 2005); whether a scenario narrative or a risk implication.

In terms of differential information explanation, decision makers discount advice because they have limited access to the advisor's internal thought processes and the rationale behind their own opinions while having privileged access to their own reasons (Yaniv, 2004; Yaniv & Kleinberger, 2000). In other words, when any forecast is provided to a manager, the assumptions behind this forecast is generally not known by the manager. Or potentially, the assumptions may not reflect the unexpected factors valid in business (Önkal et al., 2013). A decision maker's initial estimate or choice serves as an "anchor" that s/he subsequently adjusts in response to received advice; such an adjustment is typically insufficient and this results in egocentric discounting of advice (Harvey & Fischer, 1997; Lim & O'Connor, 1995). This is also called asymmetric weighting, due to the asymmetry in access to the underlying justifications for the proposed opinion (Yaniv, 2004). All of these findings prove that it is in fact not so easy for a decision maker to shift away from his opinions. Decision makers are more likely to feel more confident with their own opinions. However, Grinyer (2000) asserts that an external facilitator is more likely to be accepted as an objective party. A scenario advisor can remain impartial throughout the proceedings and is therefore a suitable party positioned to challenge the usual and established views held by many decision makers. Acting as a facilitator who encourages broader and deeper thought on the business environment outside the company, a scenario advisor can contribute to an organization significantly. Then what happens if an advisor provides a structured rationale with narratives (i.e., ILS) when the forecaster on his own does not have such narratives? This work is curious

to know which, scenario narratives or risk implications, are more influential as advice on forecasters' confidence. This may provide a cue about decision makers' reference point as well. This work's goal is to investigate the potential of ILS with scenario narratives and risk implications to influence forecasts and forecasters' confidence. In addition, this work wants to examine what happens if an additional treatment during scenario studies (i.e., assessment of the likelihood of occurrence) contributes to the forecasters' confidence.

Van Swol and Sniezek (2005) emphasized five factors that affect the acceptance of advice: advisor confidence, advisor accuracy, the advisee's trust in the advisor, the advisee's prior relationship with the advisor, and the advisee's power to pay for the advisor's recommendations. The forthcoming titles elaborate more on the credibility of the advice source.

2.3. The Use of Advice and Type of Advice

The decision making literature on advice giving and taking has typically defined advice as a specific recommendation concerning what the decision maker should do (e.g., Harvey & Fischer, 1997). However, several researchers have begun calling this restrictive definition into question. Dalal and Bonaccio (2010) classified advice types in four groups based on their characteristics. The first type of advice is a recommendation in favor of a particular course of action (''*Recommend For*"). This represents only one facet of a broader advice construct. One additional type of advice is a recommendation against a particular course of action (''*Recommend Against*"). The third type of advice is the provision of information concerning one or more alternatives, without explicit endorsement of any alternative ("*Information*").

Information is typically presented in a factual or non-normative framework. In contrast to *Information*, *Recommend For* (and presumably *Recommend Against* as well) "has a normative, almost moral dimension describing certain courses of action" (Pilnick, 1999: 614). The fourth type of advice may supply support directed towards helping the decision maker decide how to decide ("*Decision Support").* In other words, the advice involves the process by which the decision is made (Gibbons, 2003). All these types of advice may in many cases be accompanied by another form of interpersonal assistance ("*Social Support*"). The provision of socio-emotional support acknowledging the importance and difficulty of the decision to be made is not a type of advice, but it is a form of the broader construct of interpersonal assistance. Upon this classification, Dalal and Bonaccio worked on what kind of advice decision makers prefer.

Several motives are influential on decision-makers' receptivity to assistance from an advisor. The literature mainly contains research on motives for maximizing decision accuracy. Despite the common expectation, Dalal and Bonaccio (2010) argue that decision makers' motivation to accept some advice usually does not relate to its accuracy; it is more about getting other factors satisfied such as the advisee's autonomy. They state that the motive to maintain autonomy is dominantly influential on the acceptance of advice. Many researchers (Caplan & Samter, 1999; Goldsmith, 2000; Goldsmith & Fitch, 1997) showed that people react less positively to interpersonal communications that violate their autonomy. One directional advice leads to a restriction of freedom. Dalal and Bonaccio (2010) claim that some types of advice maintain decision-makers' autonomy more than others. In particular, greater

autonomy is preserved via “Information advice”, as they do not explicitly prescribe an alternative (Pilnick, 1999; Dalal & Bonaccio, 2010).

Dalal and Bonaccio’s (2010) findings suggest that recommendations in favor of some alternatives are important, but they cannot be the primary preferred type of advice. Decision makers place great importance on information about alternatives, and in many contexts information proves to be the most important type of advice since decision makers look for “autonomy”. Their research results suggest that advisors should provide decision-makers with different combinations of assistance in different situations, but also that information about alternatives should typically be among the types of assistance they provide. Dalal and Bonaccio (2010) warn advisors to remember to provide information along with their recommendations. Besides, they point to the gap in literature: decision making literature has not systematically studied the provision of information by advisors, and thus different contexts should be tested.

In the Study-1 of this dissertation, scenarios which depict the year 2021 were provided to professionals as “*Information*” type of advice. In Study-2, advice source credibility tests were held with professionals where professionals received *Recommend For* advice and they were asked to make forecasts after reviewing this type of advice. In this work, they received only a recommended future value of a certain stock to forecasters. Forecasters performed their tasks after reviewing each type of forecast advice in each study. Finally, they rated their willingness to use that piece of forecast advice. This work aims to figure out forecasters’ willingness to use *Recommend For* advice based on the advisor’s presumed and experienced credibility

by comparing advisees' judgmental adjustments and advice utilization and by means of *Information* advice comprising intuitive logics scenarios.

2.4. Expert Knowledge Elicitation and Advice Credibility

People generally decide to trust others when they encounter situations involving uncertainty (Dasgupta, 1988; Kollock, 1994; Sniezek & Van Swol, 2001), which is an antecedent to the decision to trust another (Mayer, Davis & Schoorman, 1995). If one is certain about a situation, there is no need for trust and making oneself vulnerable to others. The motivation for trusting another person is the possibility of finding a way to reduce that uncertainty (Lewis & Weigert, 1985; Sniezek & Van Swol, 2001).

In expert knowledge elicitation (EKE), the perceived credibility of an expert is likely to affect the weight attached to their advice. Swol and Sniezek (2005) listed five factors that may affect the acceptance of advice: advisor confidence, advisor accuracy, the advisee's trust in the advisor, the advisee's prior relationship with the advisor, and the advisee's power to pay for the advisor's recommendations. In this work, the two attributes of experts are in focus:

- The track record of accuracy, which is categorized under "experienced credibility"
- Apparent status, which is categorized under "presumed credibility"

The literature presents five possible models predicting the influence of expert advice. Seer sucker theory suggests that people are motivated to pay large sums of money when forecasts are elicited from experts even when their forecasting accuracy

is poor (Armstrong, 1980). Armstrong's (1980) "seer sucker" theory suggests a "presumption-only" model. In this model, people are influenced by the advice of those whom they presume to have the status of expert, regardless of their track record. Frequently, feedback on advisor accuracy is not available. Stereotypes and assumptions about the source of advice (i.e., assuming that a financial advisor would better understand and analyze stock prices compared an artificial advisor.)

This study would like to investigate the extent to which two attributes of experts, their track record of accuracy and their apparent status, influence forecasters to adjust their forecasts and encourage them to purchase that advice. What happens when the two attributes of experts (i.e., track record of accuracy (experienced credibility) and their apparent status (presumed credibility)) yield conflicting indications of credibility? This work would like to check whether an advisor could be more influential when associated with presumed credibility rather than experienced credibility. The dominance of presumption may arise as advice takers are not usually motivated to examine the track record of their advisors. This activity takes processing time, and advisors may opt to avoid this effort.

At the other extreme is the "experience-only" model. In this model, presumed credibility has no influence on advisees when experience of the advice is available. Some researchers such as Brown, Venkatesh, Kuruzovich and Massey (2008) presented results supporting this model. They showed that expectations do not have any influence on users' satisfaction with the ease-of-use of information systems. Satisfaction only depended upon experience with the system. Similarly, Irving and Meyer (1994) proved that experiences determined levels of job satisfaction rather

than expectations. Brown et al. (2008) inform that the dominance of experience may be due to the recency effect because experience always follows expectations. In forecasting, the latest experience may appear particularly influential. A good reputation can be easily erased after only few inaccurate forecasts (Yaniv & Kleinberger, 2000).

Literature presents evidence that satisfaction with advice will depend upon whether the experience confirms the presumption or disconfirms it. Anderson (1973) examined the discrepancies between expectations and experiences in relation to satisfaction with products. Bhattacherjee (2001) held a similar study in the context of information systems. Both studies revealed similar findings. Bhattacherjee (2001) states that when experience is consistent with expectations, user satisfaction with an information system increases. This is true in the case of low expectations as well, although in these circumstances satisfaction levels are less than where high expectations are confirmed (Venkatesh & Goyal, 2010). Brown et al. (2008) suggest two possible models of how satisfaction is fostered when such discrepancies arise. In the "disconfirmation model" better-than-expected experiences lead to a positive influence on satisfaction, due to a "positive surprise" effect. However, worse-than-expected experiences lead to reduced satisfaction because there is a "disappointment effect". This model is in line with the "met expectations hypothesis". Porter and Steers (1973) show that satisfaction depends on the difference between experiences and expectations. In this model, high experienced credibility will always have more influence on the use of advice than low experienced credibility. The former will raise satisfaction if it is unexpected, while the latter will lower it.

The model also predicts that high presumed and high experienced credibility will be more influential on advisees than low presumed and low experienced credibility based on Venkatesh and Goyal (2010)'s findings. However, while a "positive surprise" may have a positive effect on variables such as job satisfaction, which are directly related to the happiness of an individual, the same may not prove to be true in case of forecast advice. A conflicting direction between presumption and experience may lead to psychological discomfort or cognitive dissonance (Festinger, 1957) irrespective of whether the experience was better or worse than expected. In this case, an "ideal point model" (Brown et al., 2008) may apply. This model assumes there is an ideal "point" of experience where differences between presumption and experience keep to a minimum. People do not like to be wrong, they avoid it in contrast to the "disconfirmation model". Even a better-than-presumed experience will lead to reduced satisfaction because the discomfort of thwarted presumption exceeds the satisfaction of a positive surprise (Carlsmith & Aronson, 1963; Oliver, 1977, 1980; Woodside & Parrish, 1972). The greatest influence on forecasters is observed when both presumed and experienced credibility are high, as there would be a synergistic effect. Each form of credibility enhances the influence of the other. Cognitive dissonance is absent because advisees do not experience any psychological discomfort (Elliot & Devine, 1994; Szajna & Scamell, 1993). High presumed credibility attribute may partially mitigate the reduced satisfaction arising from the discrepancy, but a better experience than the presumption will not serve to reduce this discomfort. Thus, its reducing effect on satisfaction will be even greater. In a practical context, this reduction in satisfaction may result from annoyance because a person described as an "expert" has exhibited

poor performance. Although advisees paid attention to his/her high presumed credibility, this poor performance may have catastrophic effects. Such a conflicting situation might push the advisees towards an exaggerated emotion. This seems unlikely, but it is likely to arise where there is a large amount of dissatisfaction from the discrepant experience.

This work aims to see how forecasters treat forecast advice labelled by joint attributes; i.e., presumed and experienced credibility, within the scope of adjusting forecasts, within the scope of willingness to use advice.

2.5. Scenarios and Forecasting

Russo, Schoemaker and Russo (1989) describe scenarios as script-like narratives that paint the future in vivid detail, and that show what may unfold in one direction or another. Wack (1985), Hamel and Prahalad (1996), Van der Heijden (2000), Fahey and Randall (1998) and Ringland and Schwartz (1998) describe scenario planning as a powerful tool to develop organizational foresight and facilitate organizational adaptation by increased communication. Aligica (2005) remarks the epistemic nature of scenarios and the growth of knowledge with scenarios. Intuitive logics scenario development methodology facilitates equal consideration of multiple scenarios. On the other hand, this work questions what kind of systematic biases may still be at stake.

This work facilitates an ILS framework with equal consideration of four mutually exclusive and collectively exhaustive scenarios. As Hodgkinson and Starbuck (2008), Goodwin and Wright (2001) emphasize in their work, evaluating scenarios systematically helps build the attention paid to multiple scenarios. They

also highlight that using scenarios in judgmental decision making help mitigating imbalanced consideration for the future. Hodgkinson and Starbuck (2008) list "managing the effects of scenarios on uncertainty and (over)confidence" as one of the five major challenges that organizations may confront.

Forecasters might best use scenarios to stimulate the use of more information when planning forecasts or to make a forecast accepted. Schoemaker (1991, 1993) advocates using scenarios to depict the range of possibilities. Scenarios decompose complexity into distinct states and present several alternative models.

Schoemaker, believing that scenarios enable a better understanding of future uncertainties (1991) envisions their use as a complement to traditional forecasting methods. Schoemaker proposes that when uncertainty is high, relative to an individual's or organization's ability to predict, forecasters can use scenarios to stimulate more complete searches for information relevant to the forecast. Schoemaker (1991) points out that the value of scenarios is that they make managers more aware. We live in a highly uncertain world and it is not always easy to think about the uncertainties in structured ways. Schoemaker believes scenarios might be a remedy to reduce overconfidence bias, overcome availability bias, shifting the anchor or basis from which people view the future (1991). He suggests that developing scenarios can be used to enhance the quality of forecasts or their acceptance. This work aims to check these in concrete terms through ILS framework.

As an improvement to the scenario technique, Schoemaker (1993) recommends putting verbs in the past tense in scenarios. He provides the justification

as well past tense implies certainty. This work followed this advice and prepared the scenario narratives in the past tense.

Bunn and Salo (1993) categorize scenarios based on their objectives. Scenarios can fall into three types: (a) strategic planning and decision analysis, (b) risk and sensitivity analysis and (c) organizational learning.

Varum and Melo (2010) put forward in their paper that there is a consensus in the literature on three benefits of using scenarios, improvement of the learning process, improvement of the decision making process, and identification of new issues and problems (Varum & Melo, 2010). Other than telling what lies in the future, scenarios emphasize how that future might evolve (Goodwin & Wright, 2010). In line with this; Wright, Bradfield and Cairns (2013) point out that scenario methods are designed to enhance understanding and challenge conventional thinking. In this direction, the ability to learn faster than your competitors may be the only sustainable competitive advantage (De Geus, 1988). Scenarios give managers a precious opportunity: the ability to re-perceive reality (Wack, 1985). This dissertation mainly encompasses “decision analysis scenarios”.

Extant literature appreciates the power of scenarios because scenarios have been employed as helpful tools to generate ideas in a systematic fashion and enable better perception and better engagement to brainstorm different versions of the future. People from the business world and academia accept that scenarios provide a setting rich enough to trigger thought and further judgments. Using scenarios in order to make forecasts makes a great deal of sense when the degree of uncertainty and complexity in the external environment is high, when organizational difficulties have

been encountered in the past, especially at times when the company has experienced troublesome outcomes (Önkal, Sayım & Gönül, 2013). The sales volume of a new technology product line is a good forecasting variable for an uncertain and complex environment i.e., replenishing the retail and online shelves with a new, more up-to-date design and attracting customers emerge as natural obligations for technology companies wishing to remain in the market.

Gregory, Cialdini and Carpenter (1982) already presented findings that users are more likely to assign higher likelihoods to events presented with scenarios in comparison to events presented without scenarios. This work aims to examine this in an intuitive logics scenario framework where the total likelihood of occurrence assessment cannot exceed 100% every time. That means that if the likelihood assessment of several conditions goes up, that of the remaining conditions has to go down. Although experiments have been conducted to compare forecasts with and without scenarios, no work in the literature mentions results obtained from an ILS context. For instance, Önkal et al. (2013) worked with best case and worst case scenarios. They compared forecasts made with and without scenarios for each of the forecast formats (i.e., point forecast, best case forecast, worst case forecast, and surprise probability) to explore the potential effects of providing scenarios as forecast advice. Meissner and Wulf (2013) showed that the use of scenarios reduces framing bias and improves self-reported decision quality. The effectiveness of the scenario technique, in that it increases decision quality in strategy processes and improves performance has been empirically proven (Meissner & Wulf, 2013; Phelps, Chan & Kapsalis, 2001). While the scenario technique appears as an effective decision support tool, Kuhn and Sniezek (1996) point out that more work is needed to

investigate scenarios with forecasting. This dissertation takes an active role to meet this need.

It bears mentioning that there is not one specific scenario method. Bishop, Hines & Collins (2007) as well as Börjeson et al. (2006) illustrate scenario types, techniques and underlying theories. A total of 23 techniques can be listed for developing scenarios (Bishop et al., 2007). One feature that these scenarios share is that they try to develop multiple scenarios for the future, usually between two and four (O'Brien, 2004). Based on Börjeson's categorization (2016), the scenario model this dissertation aims to utilize can be categorized under predictive scenarios. Predictive scenarios are forecasts of the future and answer the question "what will happen". The findings from this dissertation will apply to predictive scenarios as a limitation of generalizability.

Various scenario reviews highlight the popularity of intuitive logics scenarios. For example, in a review of 35 sets of scenarios, over 24 (68%) are noted as having been developed using intuitive logics scenarios (Natural England Commissioned Report NECR031, 2009). Van Asselt, Van't Klooster, Van Notten and Smits (2010) emphasize that this type is widely referred to as the "standard" by practitioners and scholars. The driving forces are ranked to represent high uncertainty and greatest potential impact over the time horizon, and they are used to construct the scenarios (Schwartz, 1991). The two primary high impact, high uncertainty and independent factors are combined to create a 2X2 scenario matrix. Among all scenario techniques, the ''intuitive logics method'', in other words, the Shell/GBN method, dominates scenario development in the USA and many other

countries (Bishop et al., 2007; Ringland & Schwartz, 1998; Bradfield, Wright, Burt, Cairns & Van Der Heijden, 2005). The GBN technique proposes selecting two most important and most uncertain external forces, create a 2X2 matrix based on these forces, to entitle and to elaborate. Four mutually exclusive and collectively exhaustive scenarios are obtained. More than four scenarios are found to be too complex to build and use for decision making. The GBN technique has a basis of judgment and its perspective is forward. The use of a computer is not compulsory. It can be categorized inside one of the medium level difficult scenario techniques (Bishop et al., 2007). This study chooses to work with the GBN method because it is easy to communicate with business professionals as well. Not to confuse, this work consistently uses ILS to refer to GBN method.

In addition, this dissertation may shed light on the implications of working with the "intuitive logics method''. One of the most frequently used scenario construction methods, the intuitive logics method, has always been under criticism for the limited number of driving forces it takes into account. Despite their limited cognitive perceptions, practitioners always dream about employing multiple dimensions to generate scenarios. This work aims to investigate differences in sales volume forecast and market share forecast when scenarios are provided with different types and amounts of information around two driving forces.

O'Brien claims that good scenarios are multidimensional and they capture a broad range of uncertain factors (O'Brien, 2004). Laying out all driving forces on the table may sound great, yet we don't know whether having a lot of driving forces effectively contributes to enhanced understanding. Cognitive overload is inevitable

when there are too many tasks competing for finite cognitive resources (Ratner, Soman, Zauberman, Ariely, Carmon, Keller & Wertenbroch, 2008). Research has shown that humans cannot grasp and cannot work with more than three pieces of information at the same time by reason of their limited working memory (Rouder, Morey, Cowan, Zwilling, Morey **&** Pratte, 2008). As a supporting remark, Mercer (1995) indicates that managers who will be asked to use the final scenarios can only cope effectively with a maximum of three scenarios. Thus, the 2X2 scenarios used in this study seem to be sufficient. Meissner and Wulf (2013) emphasize that a multitude of cognitive benefits have been presented in the literature related to the scenario method. As a matter of fact, scenario techniques are good for overcoming the fundamental challenge of reducing complexity sufficiently and allowing a process of "synthesis". Their purpose, after all, is to keep numerous different factors at once in order to 1) observe their interactions and 2) be able to develop an overall image of the future. However, the process of synthesis is usually limited by decision makers' cognitive abilities; both the developer and the user. This implies that scenarios cannot include hundreds of key factors because processing them in an effective cognition is impossible with decision makers' judgment capabilities.

During the construction of scenarios in this work, great care was taken to formulate high quality scenarios. The characteristics of a good scenario are under review by a number of researchers and futurists. According to Greeuw et al. (2000), a good scenario should have consistency, plausibility and sustainability. Kreibich (2007) names the following general criteria of quality in futurology: logical consistency, openness to evaluation, terminological clarity, simplicity, definition of range, explanation of premises and boundary conditions, transparency, relevance,

practical manageability and fruitfulness (i.e., does it foster knowledge acquisition, orientation, innovation, motivation and so on). According to Wilson (1998), a good scenario should possess the following: plausibility, differentiation, consistency, decision making utility and challenge. Heinecke and Schwager (1995) name the following for a good scenario: tangibility (clarity, cohesion with the object of investigation, suitability, transparency), closeness of the content (flawlessness: no invalid assumptions, plausibility, completeness, finding of cohesion, description of development, information content: precision, universality, utility), relevance (function of decision, function of orientation, relevance in different planning processes and analysis of problems, forecast, assessment and decision); constitution and proportion of scenarios among themselves (dissimilarity, registration of all future situations, homogeneous forms and statements, stability). While this work took these criteria into account, the users of the scenarios stated that they prefer having access to concise narratives which present enlightening take-away information.

O'Brien criticizes the general practice and says that scenario participants heavily adhere to economic factors such as exchange rates, interest rates and the country's other economic attributes (O'Brien, 2004). This research plans to collect various driving forces from a large group of people and choose the most influential ones before developing scenarios with these driving forces. On the other hand, the economy always proves to figure prominently in business-related decisions. Thinking through scenarios is a useful exercise to examine how the competition may evolve under different macroeconomic environments.

From a company perspective, scenarios are considered to reveal invaluable

knowledge for managers. This dissertation will take judgmental forecasts in hand and conduct experiments without any scenario narratives, with scenario narratives or risk implications, with and without including the treatment of likelihood of occurrence assessments. Since scenarios may be seen as credible cues for decision makers, it is not hard to envisage scenarios to influence judgments (Schnaars & Topol, 1987; Taylor, 1982). Phadnis, Caplice, Sheffi and Singh (2015) observed systematic changes in expert judgments after the use of a single scenario. Previous researchers emphasize that management literature is devoid of rigorous studies that test the effect of scenarios on field experts' judgment (Schoemaker, 2004; Wilkinson, 2009; Phadnis et al., 2015). Pointing to this gap, one objective of this dissertation is test whether having access to scenarios change judgments in forecasting. The second objective of this dissertation is to test the tone effect of scenarios on judgmental forecasts. Does any of the scenarios draw one or a few of the remaining scenarios towards itself within a study group?

Bunn and Solo (1993) state that by studying scenarios, managers learn to understand the role of uncertainties better. While working with scenarios, multiple views of the future are used to envisage and prepare decision makers for different environments (Phadnis et al., 2015). With scenarios, managers are likely to make informed decisions by taking possible developments into account (Bunn & Solo, 1993). As for other merits of scenarios; Durance and Godet (2010) state that scenarios serve as effective means of vitalizing employees and the existing communication strategy across the organization. Although the literature is a veritable treasure when it comes to scenarios, evidence of scenarios on managerial cognition is very small (a fact supported by Phadnis et al., 2015). As a specific example, the

literature has not examined scenarios enriched with “risk implications” as a type of scenario content.

The extant scenario literature needs more studies that collect and analyze data from professionals. In general, scenario contents are not deemed suitable for public knowledge due to the fact that commercial organizations do not feel safe disclosing their strategy related practices. Organizational confidentiality is one of the reasons that scenario themed, practitioner involving experiments are not frequently seen in academic work. In this work, scenarios are carefully developed in an elaborative agenda and they have taken approval from experts.

Managers will only accept scenarios when their predetermined elements enter and spread out in their minds (Wack, 1985). This work did not forget to invite managers in the driving force selection session. Wack underlines the value of scenarios (1985) stating that value of scenarios is understood as they warn for important incoming events, and they prompt to an action. Thus, it seemed a good idea to include risk implications in the scenarios. This work aims to help decision makers sharpen their minds for futures where sharpening minds should imply warning for important events and triggering action. This work plans to study and analyze a particularly up-to-date, dynamic business: Wearable technology products.

One other merit of scenario exercise is that it forces decision makers to consider views other than the “official view” (Damodaran, 2007). On the other hand, individuals have limited cognitive capacity and cognitive overload is inevitable when there are too many tasks competing for finite cognitive resources (Ratner et al., 2008). Decision makers may not be able to cope with a great number of scenarios at

once but should try to get maximum benefit from the scenarios they do have as they provide a structured visualization.

As emphasized above, thinking through scenarios is a useful exercise to examine how the competition may evolve under different external environments. Discussions on the basis of scenarios may trigger deeper, more organized idea exchanges on what can be done to minimize the effect of risks or maximize the exploit from upward moves.

2.6. Scenarios as Forecast Advice

Kahneman and Lovallo (1993) explain that we all have two perspectives on decision making: an insider view and an outsider view. The insider is the biased decision maker who looks at each situation as unique. The outsider, on the other hand, is more capable of generalizing across situations and identifying similarities. These two viewpoints exist simultaneously. Kahneman and Lovallo provide convincing evidence that the outsider makes better estimates and decisions than the insider (1993). The insider-outsider distinction suggests another strategy to reduce bias: When making an important decision, inviting an outsider to share insight with is always a good idea. This may mean conferring with an expert who has experience with similar contexts.

Forecasters often need to estimate uncertain quantities, within restricted resources. Decomposition is a method for dealing with such problems. By breaking down (decomposing) the estimation task into several components, one can more readily estimate the components, and then combine the component estimates to reach the target estimate (Armstrong, 2001). Breaking the estimation problem down into

more manageable or trackable sub-estimates, one can make estimates on more accurate grounds. As Raiffa (1968) underlines in his study, “decompose a complex problem into simpler problems, get one's thinking straight in these simpler problems, paste these analyses together with a logical glue, and come out with a program for action for the complex problem”. It doesn’t have to be a problem, but an issue to be dealt with. Scenario analysis (decomposition of the future into alternatives) is in keeping with this idea.

The field of judgment and decision making has proven to do better than intuition even if it is not the best (e.g., Slovic & Lichtenstein, 1971; Dawes, 1975, 1979). As general advice, Armstrong (2001) informs us that decomposition is an effective strategy for improving the quality of judgmental forecasts. Forecasters who need to use their judgment skills to produce forecasts should generally proceed by decomposing the future into alternatives.

MacGregor (2001) indicates that decomposition leads to more accurate estimates than direct or holistic estimations, particularly when uncertainty about the target quantity is high and uncertainty about its component quantities is comparatively lower. Under these conditions, the estimator is generally better off using decomposition than not using decomposition (MacGregor, 2001). As to how to decompose the issue, estimators are left to their own imaginations and creativity. Extant research held on the efficacy of decomposition has been guided by no explicit decomposition theory. There is not a complete recipe, and academics continuously seek improvements in the process. In this work, ILS is reviewed as one of the useful decomposition techniques. This decomposition technique is a descriptive sketch

intended to produce a more or less holistic view of future states. The scenario set in ILS encompasses the plausible range of possibilities for some aspect of the future (Porter & Roper, 1991). Scenarios can be used to integrate, communicate and/or present whatever information is available to the forecast users in a non-technical, literary manner.

As a channel of forecast advice, scenarios incorporate aspects of the world that may evolve in time. By imaginatively presenting stories of the future, scenario authors encourage their readers to open their minds and understand environments that may appear alien or far out, but possible after some time. Uncertainty entails making completely accurate predictions impossible. Then the goal becomes making one's best effort to minimize "what is uncertain" as much as possible. Scenario advice enables forecasters to take full advantage of the strength of scenarios and decrease the uncertainty of the perceived state/effect as much as possible.

Bunn and Salo (1993) state that scenarios may work well with other forecast techniques while generating forecasts. Scenarios play a useful role to band the insider view and the outsider view together where scenario developers represent the outsider view and forecasters represent the insider view. Önkal et al. (2013) highlight in their paper that so far the literature hosts very little empirical work on providing scenarios as forecast support. Scenario analysis facilitates rich and complex portraits of possible futures. It, however, never aims to reach accurate, final, quantifiable forecasting results. Thus, Porter et al. (1991) recommend using different scenarios to integrate the qualitative and the quantitative.

A good set of scenarios is always customized to a particular context. Incorporating scenario methods can relieve the lack of structure in expert knowledge elicitation. The method simply offers integrated information from diverse sources woven into a structured outlook.

2.7. Unpacking the Scenario Content: State and Effect

The scenario method offers a set of plausible alternatives in a structured way. While the method tries to illuminate what may occur in the future, uncertainty still remains present. The type of the uncertainty at hand matters for decision makers (McKelvie, Haynie & Gustavsson, 2011). Milliken (1987) reexamines the environmental uncertainty and differentiates between state, effect and response uncertainty. State uncertainty is experienced when the organizational environment or a particular component of that environment is perceived as "unpredictable". The experience of uncertainty about the state of the environment is likely to be partially a function of the characteristics of the environment in which the organization is operating. Scenario conditions and narratives can be classified under "state uncertainty". Effect uncertainty relates to an individual's ability to predict what the impact of environmental events or changes will be on their organization. It is defined as an inability to foresee how a future state of the environment or environmental change will affect the organization. Risk implications in any scenario represent "effect uncertainty". Decision theory suggests that people must firstly engage in a decision making process by assessing potential risks (Glöckner & Betsch, 2008; Tversky & Kahneman, 1992). The next titles will elaborate more on scenario narratives and risk implications.

2.8. Scenario Narratives and Resultant Risk Implications

The scenario method maintains its popularity amongst contemporary organizations. Many companies state that the scenario methodology prevails amongst the eight most popular tools including SWOT analysis, Delphi polling, Michael Porter's five forces of competitive position, and other well-known planning methods such as situation of war gaming, value chain analysis, brainstorming or visioning exercises. The number of experienced scenario practitioners is increasing and they have a strong appetite to get word of the best practices.

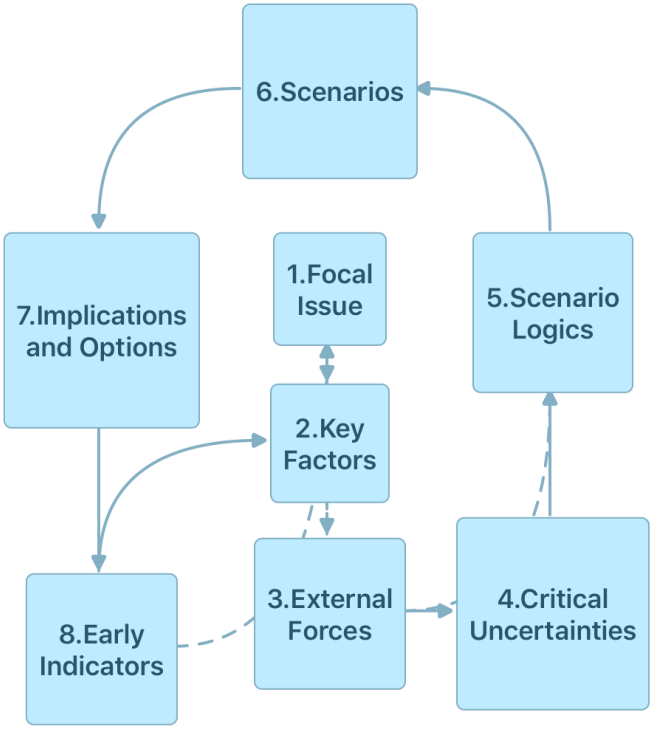


Figure 1. Schwartz's eight step scenario planning process

Schwartz (1991) offers a conceptual view of the scenario process in his book the Art of the Long View. His eight-step scenario planning process presents

"implications and options" in the seventh step. Figure-1 illustrates the process based on his explanations.

After developing the scenario narratives, the next step should be to figure out the implications of each scenario. "Risks" may be one set of the primary implications. This is how this work gets from narratives to risks. The work takes one scenario and uses it as the playing field. The work brainstorms the list of risk implications for each scenario. Keeping a very close ear to the ground and looking for states that suggest movement in one direction helps the discovery of the threats that would show up in that direction. While scenarios facilitate enhanced understanding, risk implications foster required actions.

Ogilvy, current Stratfor member and prior cofounder of Global Business Network, mentions that alternate scenarios can serve as relatively low-cost insurance policies (Scenario Planning and Strategic Forecasting, January 1, 2015). One is less likely to be blindsided if s/he has worked on some unwelcome surprises. And on the upside, scenarios can enable their users to identify white-space opportunities that remain unfilled until a first mover occupies the space. This is a remarkable capability when less imaginative competitors never knew such an opportunity existed.

Zanoli, Gambelli and Vairo (2000) criticize intuitive scenarios saying they have low methodological formalization. Enriching the scenario content with relevant information will strengthen the methodology and enable more improved and consequently formalized implementation, making it rank among good practices.

Scenarios allow more system-oriented approaches than other approaches (Barré & David, 2004). A combination of qualitative and quantitative elements can

make a scenario more consistent and robust (De Jong, 1998; Dobbinga, 2001; Greeuw et al., 2000; Rotmans et al., 2000). More strikingly, when scenarios take on the task of forecast advice, forecasters simply attain a bridge between the qualitative (i.e., scenario content) and the quantitative (i.e., consequent numerical forecast). Scenarios as forecast advice basically build a systematic bridge between the qualitative and the quantitative. *Information* type advice, i.e., scenarios, can be enriched and their communicability can be used to produce quantitative information: Numerical forecasts.

Kosow and Gassner (2008), in the German Development Institute Research Project, emphasize that quantitative scenarios make it necessary to arrive at a firm definition of a reduced number of factors, whereas qualitative scenarios make it possible to achieve an intrinsically more meaningful observation of details and nuances without the need for definitively including or excluding key factors. Another difference between these approaches is the chronological horizon which they are capable of describing meaningfully. Quantitative approaches can be used above all for short, at most medium-term perspectives; on the other hand fully qualitative approaches can be employed especially when allegedly "hard" quantitative knowledge suffers a loss of plausibility during the course of longer-term observation.

In this work, the scenarios were used to assist the forecasters while they made numerical forecasts with the help of this *Information* type advice. The following section expands how the extant literature describes the risk and risk perception.

2.9. Risk and Risk Perception

Risk has become a common concept used in diverse situations as an all-encompassing but nebulous concept applicable to many facets of life. Risks are everywhere but nowhere to be seen unless they are listed. What truly is a risk is debatable in many settings and depends on the context. Risk is an everyday concern, referring to real and perceived situations that can be seen as dangerous. Risk perception measures people's emotional response to an anticipated risk, and their subjective experience of being or living in a risk prone environment (Beck, 1997a, 1992; Douglas & Wildavsky, 1982; Ewald, 1991; Slovic, 1987). Thus, there is often a disconnection between the perception of risk and actual risk pertaining to any variables forecasted.

There is a rich set of definitions for "risk". Risk can be expressed in general terms as the probability that the threat will cause damage, injury, loss or any other negative occurrence caused by external or internal vulnerabilities. The risk situation may be avoided through preemptive action or management of the situation (Beck-Gernsheim, 1996; Beck & Beck-Gernsheim, 2009).

Extant literature presents a differentiation between "risk" and "hazard". "Hazard" is mostly described in terms of the source of an adverse effect while "risk" refers to the possibility and probability of an adverse effect (Kaplan & Garrick, 1981). Whereas hazard is supposed to have an external cause, risk is internally produced by the acts and omissions of individuals (Ulbig, Hertel & Böl, 2010). In a similar way, the sociologist Niklas Luhmann differentiated between "danger" and "risk". Whereas "danger" is attributed to an external cause, "risk" is produced inherently in the system itself (Luhmann, 1993). However, for Luhmann, the concept

of risk entails a distinction between decision makers (those who take risks) and those who are affected by the decisions of others (Japp & Kusche, 2008). Furthermore, the concept of probability entails aspects of insecurity and uncertainty that are strongly linked to risk (Schütz, Wiedemann, Hennings, Mertens & Clauberg, 2006). Taking uncertainty into account, Rosa (2003: 56) defines risk as "a situation or event where something of human value (including humans themselves) is at stake and where the outcome is uncertain." Perception of risk appears a good environment to explore heuristics and biases.

It has been found that there are different motivations for people to developing their judgments about business risks. Since the 1960s, some research in diverse scientific disciplines such as psychology and sociology has focused on factors underlying risk perception, mainly concerning technological and environmental risks. Scholars have made attempts to explain differences in perception and judgment between different groups of people (Bieberstein, 2012).

Risk and risk perception with regard to a changing business environment is not a new phenomenon in business. One objective in this dissertation is to investigate the differences and similarities in forecasts after reviewing a scenario or risk related advice in an ILS framework. This will allow a deeper understanding of the relative influence of scenario contents. The work is interested in examining the following: Do some scenario contents make forecasters feel less confident? Do forecasters have a tendency to significantly base their forecasts on the scenario content they have accessed?

Scenario setting may contribute to a better understanding of people's risk perceptions of mutually collective and collectively exhaustive conditions in general.

Getting a sense of the forecasters' cognition of risky conditions is important for understanding their risk evaluations. Forecasters' risk constructs are also an interesting start to risk communication strategies.

It has been found that lay people judge risks using various attributes. Tversky and Kahneman (1974) showed that people encounter cognitive limitations in dealing with probabilities and therefore deviate from the assumed rational behavior. They also found that people use a "limited number of heuristic principles which reduce the complex tasks of assessing probabilities and predicting values to simpler judgmental operations" (Tversky & Kahneman, 1974:35). Research into risk perception is interested in people's subjective judgments and seeks to find out why people differ in their risk assessments (Slovic, 1987). Cognitions and affect are also influential in the assessments of risks. Affects and cognitions are produced by the affective and cognitive system where each of them can react independently to stimuli from the environment, but the two systems are strongly interconnected and influence each other most of the time (Bänsch, 2002; Kroeber-Riel, Weinberg & Gröppel-Klein, 2009).

Dual-process theories of thinking distinguish two different modes by which information is processed (Chaiken, 1980; Chaiken & Trope, 1999; Epstein, 1994; Petty & Cacioppo, 1984; Sloman, 1996, 2003): A "deliberative" and an "experiential" style of reasoning. The deliberative, also called rule-based processing (Sloman, 1996) is an analytical, formal and verbal style of thinking (see e.g. Epstein, 1994). It is a relatively controlled form of information processing and refers to the conscious, cognitive processing of information. Sloman refers to the experiential style of processing also as associative processing (1996). Associative processing is

characterized as intuitive, automatic, natural, and nonverbal. In contrast to the deliberative system of thinking that is based on conscious logic, the experiential system is supposed to operate according to the principle of similarity and context. This makes it quicker and more efficient (Sloman, 1996). According to the principle of similarity, the similarity or strength of association between the concepts determines the strength of activation from one concept to another. Therefore, the stronger the association between two concepts, the more activation is supposed to flow between the concepts. This activation is further dependent on situational context factors (Loewenstein, Weber, Hsee & Welch, 2001). The "experiential" system further encodes reality in the form of images, narratives and metaphors to which affect is attached. The "deliberative" system results in cognitive processing, whereas the "experiential" system results in an affective processing of information. Cognitive structures, in other words the knowledge structures, define the already memorized knowledge which is the result of past experiences and past information. They represent the forecasters' beliefs and values but also feelings. These knowledge structures are stored in long term memory and are called "schemata". Schemata organize knowledge and channel the perception and processing of information. They are linked with verbal and visual concepts in memory and can be applied to persons (schemata regarding another person or self-schemata), issues and events (Kroeber-Riel et al, 2009). Cognitive structures strongly influence people with the new information they process (Olson & Reynolds, 1983). Also, cognitive processes such as risk perception/evaluation are influenced by knowledge that is stored in the long term memory (Slovic, 1987).

Fischhoff draws attention to multiple exposures in his book "Risk

Perception and Communication" (2009). Fischhoff shows that decision makers have a tendency to overestimate risk probability for one occasion. When decision makers are re-asked in a multiple occasion frame, the risk probability they grant for multiple exposures is not consistently as high as those granted for one occasion. This can be considered as a "risk thermostat". Although the intensity of risks rises (i.e., some risks may become more probable, the number of risks exposed may increase), decision makers cannot react comparatively more since they have overestimated the single risk.

People care about being subject to a loss than obtaining a gain. They consequently allocate more resources to a single risk to hedge it. Losses matter more than gains (Kahneman & Tversky, 1979).

According to social perception theories, perception is a process in which the reality is constructed by the perceiver by performing cognitive operations on cues derived from the environment (Brunswick, 1952; Heider, 1958; Kelley, 1973). During any decision, an individual has at his disposal a number of cues or indicators which s/he may or may not use as an aid in the process. There are a wide variety of decision variables which can be potentially utilized. If a cue is not apparently at decision maker's disposal, then s/he is likely to neglect it. An insufficient consideration of risk will lead to deviations between anticipated and actual forecasts, which results in higher losses. Many brands may fail in the market as a result of risks being insufficiently considered by managers, as they are led to make overwhelmingly positive projections.

Management literature highlights that risks may have positive or negative effects on a project's or company's objectives (Bryde & Volm, 2009; Maguire & Hardy, 2013; PMI 2013). Therefore risks not necessarily act as a threat to project/company success, but also create opportunities (Teller, Kock & Gemünden, 2014).

2.10. Subjective Probability Assessments: Likelihood of Occurrence

Wallsten, Budescu, Erev and Diederich (1997) discuss criteria for assessing the quality of probability estimates and provide a brief review of the relevant theoretical and empirical literature. Wallsten et al. (1997) showed that probability estimates simply depend on individual knowledge bases and strategies. When it comes to probability assessment, as De Finetti (1974) and others pointed out, probability does not belong to the external world, but the representation of a coherent decision maker's opinions about a set of events (De Finetti, 1974). Subjective probability is a highly individual matter (Wallsten & Budescu, 1983).

Wallsten et al. present an approach that derive**s** from two items: First a weak cognitive model of the individual that assumes subjective estimates as a function of underlying judgment perturbed by some random error, and second, a classification of judgment contexts taking reference the underlying information structure (Wallsten et al, 1997). In 1994, Erev, Wallsten and Budescu published another study which summarizes a number of empirical trends in the subjective probability literature. Similarly, they say that individuals' probability estimates reflect their personal opinions perturbed by a random error. Random error is involved at any confidence level (Erev et al., 1994).

Heath and Tversky (1991) categorize two types of uncertainty: First as aleatory (uncertainty associated with external chance factors) and second as epistemic (uncertainty associated with internal lack of knowledge). Many other researchers such as Budescu and Wallsten (1987), Howell (1971), Kahneman and Tversky (1982), Vesely and Rasmuson (1984), Wallsten (1990), and Whitfield and Wallsten (1989) present similar approaches to categorizing uncertainty. This work involves uncertainty with the provision of the least information and also with the positive and negative sides of the external driving factors. In this respect, this work collected assessments of likelihood of occurrence from participants with the competency to evaluate futures and the possibility that they may occur.

To a great extent, extant literature assumes that the diagnosticity of a set of estimates is limited by the judge's level of knowledge. Correspondingly, Winkler and Poses (1993) point out the practitioner's standpoint. The practical standpoint should care more for how forecasters discriminate the probabilities. They state that even the calibration attribute becomes less important that time (Winkler & Poses, 1993).

Intuitive logics scenario development methodology has as its goal the depiction of the future in four possibilities around two driving forces. A critical individual is likely to ask the question, "How does likelihood of occurrence assessment shape in four mutually exclusive and collectively exhaustive quadrants? Is an assessment likely to be different if it is performed after reviewing scenario narratives? Literature has discussed assessment of likelihood of occurrence to scenarios to a certain extent. This topic remains as an under-researched area with potential for theoretical contributions.

2.11. Assessment of Likelihood of Occurrence of Scenarios

It has been long argued that all scenarios should represent possible, not likely, futures and should not be assigned any probabilities (Millett, 2009). Holding a practitioner identity and a researcher background, Millett reviews arguments for and against the use of probabilities with scenarios in his work dated 2009. Scenarios encourage managers to think about mutable situations rather than go for deterministic planning. Millett (2009) criticizes those who assign probabilities to scenarios, with the claim that scenarios should only be used for identifying possible and preferred futures, not likely ones. Millett (2009) claims that when experts assign probabilities to scenarios, they tend to narrow down the alternatives after constructing them. Specifically, assigning probabilities to scenarios with a purpose of choosing and focusing on the most likely one and eliminating the remaining alternatives would be a catastrophic mistake. This would directly eliminate the probable alternatives when the actual aim is to discuss as many alternatives as possible. Having low probability does not mean an alternative is impossible. In this respect, Önkal et al. (2013) highlight that the presentation of alternative scenarios needs to be carefully planned. This dissertation aims to analyze the subjective likelihood of occurrence appointed to each scenario in an ILS framework. This makes sense to ensure the scenarios cover the full spectrum of possibilities, a 2X2 matrix including mutually exclusive and collectively exhaustive scenarios. Only then can the total likelihood add up to 100%.

Scenario narratives articulate a combination of consistent events. Thus, while assessing a subjective probability for each quadrant, the participants in the study were reminded to digest each scenario narrative fully and assess the likelihood that each one might occur.

Bradfield et al. (2005) claim that all scenarios generated with the Intuitive Logics Scenarios (ILS) must be equally probable, whereas Millett (2009) argues that in reality all scenarios cannot be equally probable. As a practical fact, scenario generating teams and executives gravitate towards the scenarios that they find to be "most interesting". This is a typical reflection of corporate cultural biases and wishful thinking (Ramirez & Selin, 2014). The array of scenarios resulting from an assessment maker's a posteriori probabilities of occurrence provides them the map of likely and desirable futures. There may be a distinct difference between the most likely (futuring) and the most desirable (visioning) scenario.

Carroll (1978) argued that having people imagine the occurrence of an event via a scripted scenario makes images of the event subsequently more available to them. Carroll argues that consequently, the event appears more probable.

Future likelihood of occurrence can be assigned to each scenario. As anticipated, this makes more sense if the scenarios are realistic and they are written to cover the full spectrum of possibilities. In addition, analysts and researchers should not miss this key point: A low likelihood of occurrence assessment does not necessarily make a scenario less significant.

Questioning the likelihood of each scenario may enable the management to determine the likelihood with a cognitive analysis and notice the most highly probable scenario. In case of limited resources, the management may make decisions such as opting to devote more resources to some operations or to get prepared for more aggressive strategies such as "launching mediocre quality, low price" products. For instance, diversifying the sales base or (and) planning to sell more in the

international market may be the emerging options to reduce the influence of a potential risk in local economic conjecture. Taking decisions and consecutive proactive steps to minimize the damage of the worst case scenarios becomes easy when the management is able to gauge a likelihood of occurrence. On the other hand, forecasters may have based their likelihood of occurrence judgments entirely on heuristics. Having a careful look will be crucially important in that sense.

2.12. Confidence

Constructing an explanatory framework to support one's prediction is often easy, and thinking about a subsequent explanation escalates one's confidence in that prediction (Koehler, 1991). This could be referred to as an “ex-post explanation”. Sherman, Zehner, Johnson and Hirt (1983) performed a study demonstrating this "explanation effect." They asked the participants in the control group to predict the outcomes of sporting events, whereas they asked the participants in the experimental group to make predictions and also explain their predictions. Compared to the control group, the experimental group assigned significantly higher probability that their predictions would come true. Similarly, Gregory, Cialdini and Carpenter (1982) asked participants to imagine outcomes such as winning a lottery or being arrested for shoplifting. Imagining a future event was sufficient to increase its perceived likelihood.

Two closely related explanations have been offered for the explanation effect. The first is based upon the availability heuristic (Tversky & Kahneman, 1973). According to this heuristic, as mentioned before, people judge the likelihood of events by how easily they can bring instances of such events to mind. If people are

asked to imagine or explain an event, such as an upcoming victory by Team A over Team B, they consider evidence and information consistent with this outcome. When they are asked to forecast the event, they have information in mind consistent with the just-explained outcome, so they deem the event to be quite likely. Because information inconsistent with the outcome is far less available, it plays a diminished role in their consideration. Koehler (1991) provides a second explanation of the explanation effect. His work explained the view of the mechanism responsible for increases in confidence (as Sherman et al. studied in 1983) or the probability of occurrence (as Gregory, Cialdini and Carpenter studied in 1982) as follows: First, a person tentatively considers a hypothesis. Second, the person adopts a conditional frame of reference, temporarily assuming the focal hypothesis to be true. Third, the person then evaluates and reorganizes all the relevant evidence. However, by adopting a conditional frame of reference the person biases the search for evidence and its evaluation in such a way that the evidence is likely to support the focal hypothesis.

Wright, Bradfield and Cairns underline that the act of generating scenarios has the potential to increase confidence in the likelihood of a scenario occurring (Wright, Bradfield & Cairns, 2013). That is, the participants could be predicted to be more confident with their likelihood estimates when the related quadrant is full of narratives. As an extension, this work will check whether forecasters could be more confident with their forecasts when they review scenario narratives.

Both the availability heuristic (Tversky & Kahneman, 1973) and the conditional frame of reference (Koehler, 1991) produce their effects because they

enhance the person's access to information consistent with the outcome being explained. Koehler's explanation, in particular, has several important implications for forecasters. First, Koehler is proposing something akin to the Heisenberg principle: The observation of an event changes the event. In the context of forecasting, it seems that just considering the likelihood of a future event makes the event seem more probable and thus may increase the forecaster's confidence in his predictions. This will be examined in an ILS setting. In this research context, we have four mutually exclusive and collectively exhaustive scenarios. This work aims to explore how the expectations will be shaped around positive and negative tones of driving forces with the presence of scenario narratives or with a task of likelihood of occurrence assessment.

As mentioned before, Koehler's (1991) view is that merely imagining or explaining an event's occurrence inflates confidence in one's prediction that the event will occur. Explaining an event’s occurrence may be taken as a “defect”, Schoemaker (1993) has argued that in the context of multiple scenario presentation, these supposed defects of scenarios actually work to debias the decision maker. In other words, if people are forced to consider more than one possible future, with each rendered plausible by a supporting scenario, they will be unable to place too much confidence in any one particular prediction. Hirt and Markman (1995) made the same point in a more dramatic fashion. They suggest that considering any plausible alternate outcome, even if it is not the opposite of the outcome initially considered, will decrease confidence to more appropriate levels. Hirt and Markman (1995) suggested that thinking of reasons why any alternate outcome might occur makes people realize that the outcome is not as predictable as they initially thought. They

also explain that requiring people to consider any alternative encourages them to mentally "run" simulations of even more potential outcomes as Kahneman and Tversky pointed out in 1982. Therefore, asking subjects to consider the possibility that one case might lead them to think about other possible outcomes as well. The effect of "running" all of these simulations could reduce confidence to more appropriate levels.

In contrast to Schoemaker's and Hirt and Markman's claim, Kuhn and Sniezek (1996) demonstrated that analyzing multiple scenarios can increase subjective confidence in predictions. Receiving more information may have a reinforcing effect. On the other hand, they (1996) showed that the presentation of multiple scenarios did not reduce confidence compared to presentation of only one scenario. Kuhn and Sniezek also found that participants' uncertainty increased when they read either two conflicting scenarios or two hybrid scenarios (1996). With their different findings for confidence and uncertainty, Kuhn and Sniezek underline an important dilemma for practitioners: If the advisor presents multiple scenarios (with conflicting information or outcomes) to a client, will it cause a client to increase allocation of resources to the development of contingency plans (due to the client's increased uncertainty), or will it cause a decrease in the allocation of resources to the development of contingency plans (due to the client's increased confidence in a particular outcome)? Clearly, more applied work is needed on this issue. Experiments reported by Dougherty, Gettys and Thomas (1997) provide further evidence supporting Kuhn and Sniezek's (1996) finding that one should avoid multiple conflicting scenarios if one wishes to enhance likelihood estimates. Although their data are consistent with prior findings, they did not themselves

present multiple scenarios. Once again, this issue calls for more research and they pointed to the need for more detailed work on attitudes toward the overall likelihood of an individual scenario in order to better understand the relationship between scenario acceptance (or rejection) and judgments about the future. Other than a generalization, the type of information supplied in scenario quadrants may result in either an increase or decrease in subjective confidence. Scenarios involving risks may restrain forecasters' confidence (showing increased uncertainty).

What happens in the event that one first receives an explanatory framework (i.e., scenario narrative) and then predicts its likelihood? This dissertation intends to shed light on what happens to forecasters' confidence they assess likelihood of occurrence after reviewing scenarios but before generating forecasts for each scanerio quadrant.

Peterson and Pitz (1988) claimed that increasing salient information, even when such information was inconsistent, increased confidence. Uncertainty also increased with amount of information presented. This study will examine whether uncertainty increases due to having reviewed more information, where the first set of information is scenario narratives and the second set of information is risk implications. This way, there is an opportunity to see how state uncertainty (i.e., narratives) and effect uncertainty (i.e., risk implications) may change forecasters' confidence.

A recent study by Phadnis et al. (2015) examined experts' confidence towards others' decisions under single and multiple scenarios. They found that participants didn't display any difference in confidence for multiple scenarios

compared to a single scenario. They observed systematic changes in expert judgments after the use of a single scenario (Phadnis et al., 2015). Where Phadnis' research focused on people's confidence in others' investment decisions for the single and multiple scenarios provided, this research will focus on forecasters' confidence and assessment of likelihood of occurrence for four independent, mutually exclusive, collectively exhaustive scenarios which demonstrate the future in an ILS framework where the future is depicted with a 100% coverage.

2.13. Optimistic and Pessimistic Scenarios, Positivity Bias, Wishful Thinking

Most of the time all information is neither available nor efficiently considered, heuristics are applied in most decisions to simplify decision making (Busenitz & Barney, 1997). People consult to "rules of thumb" to assess situations or make decisions without consuming a lot of time (Hutchinson & Gigerenzer, 2005). When the decision making environment is highly complex and dynamic, intuitive judgments based on heuristics may lead to systematic biases (Kahneman & Tversky, 1996).

It can be argued that dealing with multiple options, laying all possible grounds visible may make a decision maker feel a fake feeling of satisfaction. Nevertheless, this feeling is of no use. This satisfaction may be expected to lead the decision makers to make a higher sales volume forecast and a higher market share forecast after reviewing a scenario narrative. The work also examines how scenario narratives may influence the magnitude of forecasts where two forecast variables are in discussion: Sales volume (where the forecast is a positive integer) or the company's share in the market (where the forecast is a percentage).

Hodgkinson and Starbuck highlight what kind of biases scenario developers are susceptible to (Hodgkinson & Starbuck, 2008). In the general sense, people have the propensity to construct overly optimistic scenarios which do not adequately take negative events in. Intuitive logics scenario development methodology overcomes this bias by facilitating a 2X2 matrix where both positive and negative aspects of trends are discussed. Even though intuitive logics scenarios simulate a set of positive and negative conditions simultaneously, the positivity bias can pave the way for forecasters to provide highly optimistic forecasts as individuals have the propensity to turn a blind eye to potential negative events (Buehler, Griffin & Ross, 1994; Schoemaker, 1995). Newby-Clark, Ross, Buehler, Koehler and Griffin (2000) state that even when people consider both pessimistic and optimistic futures at once, negative scenarios are considered less plausible and they are given less credence. Decision makers allow negative scenarios to have less impact on their judgments than positive ones. People frequently tend to imagine positive outcomes and ignore possible negative scenarios in favor of wishful thinking (Newby-Clark et al., 2000). Theoretical arguments and empirical evidence from psychology suggest that, in general, people are optimistic about the future (Weinstein, 1980; Kunda, 1987; Peterson, Seligman, & Vaillant, 1988). Motivated inference also proposes people's tendency to view the future with desirable outcomes (Kunda, 1987). This relates to "wishful thinking".

Mental simulations of a set of related events have the potential to alter forecasters' expectations and their likelihood assessments (Gregory & Duran, 2001). A scenario narrative is likely to induce people to believing that the event being depicted actually taking place is more likely (Carroll, 1978; Gregory, Cialdini &

Carpenter, 1982; Anderson, 1983). The effect can be based on the availability of a scenario in the memory, as picturing a scenario makes it easier to recall images related to events and influence judgment (Tversky & Kahneman, 1973; Kahneman & Tversky, 1982). Moreover, other factors may exist to moderate this effect, such as when people have strong prior beliefs or preferences about events (Carroll, 1978) or when scenarios are difficult to imagine or considered implausible (Anderson, 1983; Dougherty, Gettys & Thomas, 1997). In short, mentally simulating a particular scenario can elicit different behaviors (Anderson, 1983; Gregory et al., 1982). Van der Heijden, Bradfield, Burt, Cairns and Wright (2002) state that stories have the strongest influence when they elicit fear, hope, insecurity and threat because they induce decision makers to take action against that negative state. This could mean that a completely negative scenario narrative within the ILS framework may be influencing the forecasters to a greater degree than the completely positive scenario narrative. In a similar vein, this work questions how the inclusion of risks in scenario narratives may provoke emotional reactions and alter forecasts and/or confidence. Is there a specific aspect (i.e., the polar positive or polar negative) that the forecasters rely on more heavily for all remaining judgments?

While it is obvious that as decision makers, we cannot ensure an accuracy level for forecasts of a medium and long range horizon, it is possible to identify judgmental biases during forecasting and generate a strategy to de-bias. Once these biases are spotted, decision makers may improve the quality of their decisions by learning to consciously override some of the faulty heuristics that they automatically use on a regular basis. In keeping with Fischhoff's guidance, identifying any bias and describing the possible direction of bias should help decision makers to prevent

biases in their prospective forecasts. The following titles elaborate more on the potential heuristics to arise during the use of scenario advice.

2.14. Common Heuristics and Biases in Decision Making

2.14.1. Representativeness Heuristic

Tversky and Kahneman's (1974) work on intuitive judgment of probability was a crucial milestone in the field of decision making. These hallmark scholars tried to find out how people assess the probability of uncertain events or how they judge the value of an uncertain quantity. They found that there are several heuristic strategies used by humans in order to reduce the mental complexity of judging probabilities. This complexity reduction is often useful, but with no doubt, it can lead to suboptimal outcomes. The deviation between the optimal and actual outcome is defined as bias (Tversky & Kahneman, 1974).

In several empirical studies, Tversky and Kahneman proved that people use the representativeness heuristic as a cognitive shortcut. Tversky and Kahneman (1972: 430) defined representativeness as a heuristic "according to which the subjective probability of an event, or a sample, is determined by the degree to which (1) it is similar in essential characteristics to its parent population; and (2) it reflects the salient features of the process by which it is generated." In other words, people compare a new or unknown event/sample to a known comparable event/sample and judge the probability of the new event or sample as being similar to the known one.

Study-1 in this work comprises four mutually exclusive and collectively exhaustive scenarios. For the individuals, one of these quadrants may mean a significantly higher probability than the other quadrants. The likelihood of

occurrence assessment for some of the quadrants may change after reviewing scenario narratives. On the other hand, likelihood of occurrence pertaining to all conditions cannot increase or decrease at once, as the overall probability assessment will again be equal to 100%. Then do any of the likelihood of occurrence assessments change significantly after reviewing any scenario narratives? If yes, could it be related to any judgmental heuristics? This work could find some cues regarding these heuristics and biases.

2.14.2. Availability Heuristic

Availability heuristic proposes that people assess the probability of an event by the ease with which occurrences of similar events can be recalled (Schwarz, Bless, Strack, Klumpp, Rittenauer-Schatka & Simons, 1991; Tversky & Kahneman, 1973). People assess the frequency, probability or likelihood of an event by the degree to which instances or occurrences of that event are readily "available" in their memory (Tversky & Kahneman, 1973). Since Kahneman and Tverksy presented it in 1973, we have known that decision makers are more impressed by events which are "vivid". Information is retrieved from memory that is "available". In addition, an event that evokes emotions is likely to remain vivid. It will be more available than an event that is unemotional in nature, difficult to imagine or vague. This heuristic is fallible, however, because the availability of information is also affected by factors unrelated to the objective frequency of the judged event. These irrelevant factors (such as vividness) can inappropriately influence an event's immediate perceptual salience, the vividness with which it is revealed, or the ease with which it is imagined. Decision makers have less interest in less vivid data even though they sometimes yield more information (Gambrill & Shlonsky, 2000; Kahneman &

Tverksy, 1973). The question is, “does the vividness of scenarios influence judgmental forecasts?” According to Slovic, Finucane, Peters & MacGregor (2004), the affect heuristic is also closely linked to the availability heuristic proposed by Tversky and Kahneman (1974).

Previous research on vividness shows that specific, concrete examples influence people more; that is, concrete examples are effective in drawing more attention from decision makers (Nisbett & Ross, 1980). This begs the following question, “is obtaining a scenario narrative likely to be responsible for making some conditions more recent and vivid, thus leading to a higher likelihood of occurrence assignment, or a higher forecast, or greater confidence?” This work examines this inquiry in four mutually exclusive and collectively exhaustive conditions. All of the conditions cannot be subject to the availability heuristic as the total probability will again be equal to 100%. On the other hand, some of the conditions may be more subject to the availability heuristics after reviewing scenario narratives as the condition is presented with a vivid story.

An essential characteristic of medium and long-range planning is the difficulty, almost impossibility of predicting the business environment over the planning horizon with reasonable accuracy. Over the long planning horizon, not only is predicting the known variables of an organizational environment difficult, the environment is also likely to experience a number of step changes arising from unknown variables. In such situations, planners and managers cannot rely on historical data to envision the future they need to plan for.

2.14.3. Simulation Bias

In 1982, Kahneman and Tversky introduced a variant on the availability heuristic: the simulation heuristic. They acknowledged that availability as it applied to the recall of instances differed from its use in constructed scenarios. Kahneman and Tversky labeled the instances where we construct a scenario and use its ease of construction to estimate frequency or probability as "simulation heuristic". Thus, the simulation heuristic can be considered as a special application of the availability heuristic in subjective probabilities. They proposed that simulations could be used for prediction, assessing the probability of a specified event, assessing conditional probabilities, counterfactual assessments (the undoing of a transpired event and assessing the likelihood of an alternative outcome) and assessments of causality.

Much of the research on imagining and generating expectancies falls under the domain of the simulation heuristic rather than the availability heuristic. Although both involve the availability of information, the simulation heuristic refers to the ease with which one constructs scenarios (or the plausibility once constructed) whereas the availability heuristic refers to the ease with which one recalls relevant instances.

Simulation heuristics can be present in the case of scenarios. Tversky and Kahneman have labeled this bias of determining the likelihood of an event based on how easy it is to picture that event mentally (Tversky & Kahneman, 1981). This is also seen as a specialized adaptation of the availability heuristic.

It is not that easy to imagine situations or events that did not take place. Once an event can be vividly imagined, the judgment regarding the likelihood of occurrence has a propensity to change. One can predict the participants to make a

higher likelihood of occurrence assessment when the forecasts are attained after reviewing scenario narratives. If four mutually exclusive and collectively exhaustive conditions are under exploration, the likelihood of occurrence assessed to all conditions may not increase simultaneously whereas certain conditions may be subject to an augmentation while certain conditions may be subject to an alleviation with the presence of a scenario narrative. This study attempts to figure out which scenario quadrants could be subject to a significant increase or decrease in the assessment of likelihood of occurrence, i.e., simulation bias.

2.14.4. Affect Heuristics

While a "state" may evoke strong emotions, an "effect" (i.e., risks) is able to evoke strong emotions as well (Pachur, Hertwig, & Steinmann, 2012). The affect heuristic (Finucane, Alhakami, Slovic & Johnson, 2000; King & Slovic, 2014; Slovic, Finucane, Peters & MacGregor, 2007) focuses on the linkage between risks and emotions, proposing that individuals use their affective, emotional response to a risk to judge it. Pachur et al. (2012) have found that overall availability of the experience seems to be more influential than affective information. Their results furthermore demonstrate that people do not exclusively rely on one heuristic, but combine both heuristics in risk judgments (Pachur et al. 2012).

Risk perception is found to be strongly influenced by affect (Loewenstein et al., 2001). The vividness or emotional intensity of the first images consumers have in mind when they are verbally confronted with a hazard is likely to influence people's cognitions and finally judgments about the stimulus (Jackson, Allum & Gaskell, 2006). This dissertation analyzes whether negative-negative, positive-

negative, negative-positive, positive-positive conditions associate different kind of images to different sales levels and market share presences. Additionally, it is a good opportunity to analyze whether perception of threats leads to different extent of confidence.

Some researchers define affect as a state of feeling that human beings experience such as “sadness” or “happiness”. This is also related to feelings of “goodness” or “badness” with regard to an external stimulus (Finucane et al, 2000; Peters, Burraston & Mertz, 2004; Slovic & Peters, 2006).

Some researchers assume that people first cognitively evaluate a stimulus. This cognitive evaluation results in affective responses that directly influence human judgment and decision making. Several scholars state that the effect of cognitions on decision making is mediated by affective reactions (Cottle & Klineberg, 1974; Damasio, 1994; Loewenstein et al., 2001). According to Damasio’s (1994) somatic marker hypothesis, emotions are the result of images related to the expected consequences or decision making outcomes. People refer to a pool of positive and negative feelings tagged to their associations in order to make any new judgments (Finucane & Holup, 2006). Due to past experiences these images are marked by positive or negative feelings that are further linked to somatic states. Positive somatic markers are likely to result in a positive evaluation of the outcome consequences, whereas negative somatic markers are likely to lead to negative evaluations. Damasio (1994) emphasizes that these anticipatory emotions linked to images of outcomes and consequences were found to guide decision makers’ judgments in an accurate and efficient way as they present a kind of summary of the likely consequences. The majority of psychological studies investigating risk perception had a focus on the

cognitive factors that influence risk perception and acceptance (Peters & Slovic, 1996; Slovic, Monahan & MacGregor, 2000).

Alhakami and Slovic (1994) showed that risk and benefit are negatively correlated in people's minds, and that this is related to the overall feelings about the object in question. The affect heuristic proposes that if people's overall feelings about an object are positive, they judge risks to be low and benefits to be high, and this overall summary feeling serves as a mental shortcut in decision making (Peters & Slovic, 1996). In short, people evaluate the risk and benefits related to hazards or technologies according to their feelings about them (Finucane et al., 2000). In their study, Finucane et al. (2000) tested the validity of this hypothesis for various technologies and found that giving people information stating that benefits are high results in positive affect, which further decreased perceived levels of risk. It follows that forecasters may exhibit affective reactions towards ILS scenario narratives or risk implications in the course of forecasting.

CHAPTER-3: RESEARCH QUESTIONS

Using a mixed-methods approach, this research conducts two studies and incorporates ten research questions about forecasters' reactions 1) in the course of using intuitive logic scenarios as forecast advice, 2) in the course of having credibility labeled advisors; i.e., presumed and experienced credibility.

3.1. Research Questions of Study-1a

The research presented in Study-1a seeks an answer to a simple question: how likely is scenario content to influence forecasters? Using narratives, their risk implications or both simultaneously as treatment, Study-1a aims to analyze how scenarios may influence forecasters based on their content. This research examines how forecasts and confidence are likely to change by reviewing scenario narratives or risk implications in an ILS framework. Accordingly, the appropriate research questions and the hypotheses that follow from these questions are given in the following.

1) How does the advice comprising scenario narratives affect forecasts and confidence?

H1.1. Forecasts generated after reviewing advice comprising scenario narratives are likely to be higher than those generated without any narratives.

Availability heuristic is expected to amplify the feelings such as event desirability on optimism i.e., in case of reviewing more vivid scenarios. For instance, when the optimistic narrative is presented, decision makers could scale their forecasts up in particular in the fully optimistic case. This work will attempt to find evidence on wishful thinking, as optimism could be influenced by event desirability after reviewing the fully optimistic scenario. This work will attempt to bring case-specific evidence on the provision of vivid information as an extension to the general arguments initiated by Kahneman and Tversky in 1973.

H1.2. Forecasters' confidence after reviewing advice comprising scenario narratives are likely to be higher than those generated without reviewing any narratives.

Kuhn and Sniezek (1996) demonstrated that analyzing multiple scenarios can increase subjective confidence in predictions. Receiving more information may have a reinforcing effect. Kuhn and Sniezek also found that participants' uncertainty increased when they read either two conflicting scenarios or two hybrid scenarios (1996). With their different findings for confidence and uncertainty, Kuhn and Sniezek highlight an important dilemma for practitioners: If the advisor presents multiple scenarios (with conflicting information or outcomes) to a client, will it cause a client to increase allocation of resources to the development of contingency plans

(due to the client's increased uncertainty), or will it cause a decrease in the allocation of resources to the development of contingency plans (due to the client's increased confidence in a particular outcome)? Clearly, more applied work is needed on this issue. ILS framework is exclusive for its organized structure which incorporates four independent, mutually exclusive, collectively exhaustive scenarios where the future is depicted with a 100% coverage. The findings will be extension to the previous works which elaborated on unstructured multiple scenarios (e.g., Kuhn & Sniezek, 1996; Phadnis et al., 2015)

2) How does advice comprising risk implications affect forecasts and forecasters' confidence?

Researcher's hypotheses:

H2.1. Forecasts generated after reviewing advice comprising risks are likely to be lower than those generated without any advice.

H2.2. Forecasters' confidence after reviewing advice comprising risks is likely to be lower than their confidence without reviewing any advice.

H2.3. Forecasters' confidence after reviewing advice comprising risks is likely to be lower than their confidence after reviewing advice comprising scenario narratives.

Risks are items which highlight the uncertainty. They call attention to either the known or the unknown threats that is likely to emerge. If a cue is not at a decision maker's disposal, he or she is likely to neglect it. In this respect, having the risks in view may make the decision maker recognize the uncertainty, alleviate the

optimism and desirability in their forecast figures and consequently reduce his or her confidence in these predictions.

H2.4. Regardless of the message, reviewing more information will progressively increase forecasters' confidence in their sales forecasts.

Receiving more information may have a reinforcing effect on forecasters' confidence (Kuhn & Sniezek, 1996). On the other hand, apart from a generalization, the type of information supplied in scenario quadrants may result in either an increase or decrease in subjective confidence. Scenarios involving risks may restrain forecasters' confidence (showing increased uncertainty). Peter and Pitz (1988) observed that uncertainty increased with the amount of information presented. This question will examine whether uncertainty increases due to having reviewed more information, where the first set of information is scenario narratives and the second set of information is risk implications. This way, there is an opportunity to see how state (i.e., narratives) and effect (i.e., risks) uncertainty may change forecasters' confidence.

3) Can any systematic patterns be identified between the sale forecasts of the ILS quadrants?

H3.1. The polar worst quadrant will be drawing the moderate quadrants towards itself in terms of forecasts.

Decision makers pay greater attention to threats. As a result of survival genes, decision makers first check whether there are any threats or negative forces at play. This is stated in the status quo bias and prospect theory as well. They want to avoid falling behind on today's earnings. Decision makers' absolute fear of "fear" is

exploited in many fields such as the insurance sector, marketing campaigns and politics. With limited information, decision makers could be expected to anchor to the "negative" and circle around it. Taking action from Fischhoff's findings on risk perception (2009), once the negative force is identified, decision makers are likely to remain not able to differentiate the number of negative exposures. In this regard, when multiple exposures are discussed, decision makers may not be perceiving it as high as it would be based on one occasion. Their assessment for one occasion may remain close to multiple occasions. ILS framework offers a suitable setting for examining any systematic patterns within forecasts of different ILS quadrants.

4) Does forecasters' confidence change significantly from one quadrant to another in an ILS framework?

H4.1. The forecasters' confidence does not change significantly from one quadrant to another in an ILS framework.

In an ILS framework, four separate quadrants are presented. One of the quadrants emphasizes twice positive conditions, two quadrants represent one positive and one negative condition and one of the quadrants emphasizes twice negative conditions. The study aims to check whether more negativity imply less confidence.

Study-1a involved four test groups. In all of the test groups, the participants were informed that the scenarios and the content was prepared by an anonymous company specializing in scenarios. Group-1 received only the scenario conditions located in an ILS plot. The participants were requested to make point forecasts and their probabilistic estimate (confidence) that the realized value would be within +-5% of their point forecast. Group-2 received four ILS quadrants full of

scenario narratives depicting the year 2021. They made point forecasts and their probabilistic estimate (confidence) that the realized value would be within +-5% of their point forecast. Group-5 received the scenario narratives and risk implications to be encountered by the firm in each quadrant in 2021. After reviewing them, the participants were requested to make point forecasts and their probabilistic estimate (confidence) that the realized value would be within +-5% of their point forecast. Group-6 received the risk implications identified for each scenario quadrant. After reviewing them, the participants made point forecasts and their probabilistic estimate (confidence) that the realized value would be within +-5% of their point forecast.

Some business implications of the above research questions are summarized as follows:

Many organizations around the world consult experts for advice. Senior managers consult scenario experts to gain some clarity over how the firm should think about its sales strategy over the medium term planning horizon. Scenario narratives and risk implications are two examples of *Information* type advice which product managers and company forecast teams may utilize in making their forecasts.

The data, assumptions and inferences lose their essential linkage in memory. As a result, disconfirming one part of a judgment (e.g., a conclusion) may have no effect on the other parts (e.g., the data on which the conclusion was based). One of the ways to increase attention to disconfirming evidence is to develop schemas for “change”. If people expect and predict change, they are likely to notice its occurrence and incorporate its implications. Intuitive logics scenario framework has ability to facilitate this effect. Professionals often declare that they find intuitive

logics scenario framework useful to enrich their forecasting sessions. In addition, the type of the risks the company is taking may not be available immediately in managers' minds only by reviewing some scenario narratives. Not remembering risk implications may cause decision makers perceive risks as less threatening (Pachur et al. 2012) and lead them to underestimate what the scenario condition may bring about. Oehmen, Olechowski, Kenley and Ben-Daya (2014) found evidence in the context of new product development that risk management practices, including reviewing of risks, positively influence decision making quality, the stable execution of the company plans and a proactive organization. Furthermore, their findings indicate that applying risk management practices indirectly influence both project and company success mediated through the aforementioned constructs of decision making quality, stable plan execution, and a proactive organization. In this regard, enriching the scenarios with risk implications should be considered. Incorporating risk implications to the ILS framework appears promising in terms of enhanced thinking as well. Furthermore, the joint influence of scenario narratives and risk implications advice hasn't been investigated in this framework. Managers have not yet been provided with evidence to compare how they may be affected by reviewing varying scenario contents. Is it only the confidence that change, or are their forecasts also likely to change as a result of reviewing risk implications under each ILS quadrant? This study will examine this.

3.2. Research Questions of Study-1b

The research presented in Study-1b aims to investigate the following issues: How likely is assessment of likelihood of occurrence to influence forecasters'

confidence in the course of using scenarios as forecast advice? What kind of systematic biases may be effective on their assessments? Hence, the relevant research questions and the hypotheses are as follows:

5) Given that forecasters first assign the likelihood of occurrence to the intuitive logic scenario quadrants, do forecasters' confidence change as a result of reviewing scenario narratives?

H5.1. Compared to those who reviewed only the scenario condition, forecasters' confidence will be significantly higher for the positive-positive quadrant if scenario narratives are presented.

6) What reference points do decision makers take when they assign likelihood of occurrence to scenarios?

H6.1. Decision makers significantly fall back on their past experiences while they assign likelihood of occurrence to future scenarios.

7) Do scenario narratives influence assessment of likelihood of occurrence significantly?

H7.1. Decision makers will assign a relatively higher likelihood to the positive-positive quadrant after reviewing scenario narratives.

Wright et al. (2013) suggest that having individuals imagining the occurrence of a sequence of events makes the focal sequence appear more likely to occur than the probability for the intersection of these individually-evaluated events would imply. By the impact of desirability, the wishful thinking may make

forecasters assign a significantly higher likelihood to the fully positive quadrant after reviewing scenario narratives.

8) Does assigning likelihood of occurrence to scenarios affect forecasters' confidence in their predictions?

H8.1. Assigning likelihood of occurrence will not change forecasters' confidence in their predictions.

A scenario session may incorporate a treatment such as the likelihood of occurrence assessment. In this way, assessment of likelihood of occurrence may call individuals to consider the possibilities before attending to any forecasting activity. This initial screening for the assessment of the likelihood of occurrence may enable decision makers to attain an improved perspective on the scenario advice. This treatment may prompt individuals become aware that only one condition out of the entire set of conditions may come out to be true. This may alleviate the forecasters' confidence, yet it may not be significant. This work aims to examine whether assessment of likelihood of occurrence may significantly affect forecasters' confidence.

In Study-1b, two additional groups were incorporated.

Group-3 received the scenario conditions located on the typical ILS exhibit. After reviewing all conditions, they were firstly asked to assess the likelihood of occurrence of each quadrant. Then they generated point forecasts and their probabilistic estimate (confidence) that the realized value would be within +-5% of their point forecast.

Group-4 received four intuitive logics quadrants full of scenario narratives in the same vein as Group-2. The participants were asked to assess the likelihood of occurrence for each quadrant before starting any forecasting tasks. Then they were requested to make point forecasts and their probabilistic estimate (confidence) that the realized value would fall within +-5% of their point forecast.

Study-1b aims to shed light on how people assess likelihood of occurrence in each mutually exclusive and collectively exhaustive quadrant of intuitive logics scenarios. This study aims to find whether assessment of likelihood of occurrence is subject to any change when scenario conditions are enriched with narratives. This study has potential to show the decision makers' sensitivity in the likelihood of occurrence assessments as a result of reviewing scenario narratives rather than having only the conditions on paper. This awareness is supposed to clarify professionals' tendencies and reveal daily business communication in terms of the use of advice.

From this point forward, test groups will be referred to as G1_NoNar (where forecasters review only the scenario conditions), G2_Nar (where forecasters review the scenario narratives), G3_PrNoNar (where forecasters review only the scenario conditions and assess likelihood of occurrence before any forecasting tasks), G4_PrNar, (where forecasters review scenario narratives and assess likelihood of occurrence before any forecasting tasks), G5_NarRisk (where forecasters review scenario narratives and risk implications consecutively), G6_Risk (where forecasters review risk implications) to help the readers follow data about each test group.

3.3. Research Questions of Study-2

Study-2 focuses on advice users' reactions to credibility factors i.e., presumed credibility and experienced credibility.

9) For professionals, is advice more influential when it is associated with presumed credibility rather than experienced credibility?

H9.1. When the two attributes of experts (i.e., track record of accuracy (experienced credibility) and their apparent status (presumed credibility) yield conflicting indications of credibility, the advisor is more influential when it is associated with presumed credibility rather than experienced credibility.

H9.2. Individuals are more willing to use the advice of a high presumed credibility source than a high experienced credibility source.

This study was carried out by evidence collected from "*Recommend For*" advice taking test groups. The study aims to examine which of these attributes are more influential on advisees to use an expert's advice.

10) How do individuals' willingness to use forecast advice change according to the credibility of the source of advice?

As Study-1a and Study-1b hosts "*Information*" type advice and Study-2 hosts "*Recommend For*" type forecast advice, this work will be able to show forecasters' approaches to both type of advice. In addition to the ecologically valid forecasting activities, the exit questionnaire will collect forecasters' opinions.

From this point forward, test groups will be referred to as G1_HE-HP, G2_HE-LE, G3_HE-LP and G4_LE-LP. G1_HE-HP represents the group where the

advice source draws cues for high presumed and high experienced credibility, G2_HE-LE involves high presumed credibility and low experienced credibility advice source, G3_HE-LP represents the group where the advice source was labeled with low presumed credibility and high experienced credibility. Finally, G4_LE-LP involves the advice source labeled with low presumed credibility and low experienced credibility.

The design of all field experiments and their results are presented in Chapter-4. The research questions stated above will be included in Chapter-4 in tables as well.

CHAPTER-4: EXPERIMENTAL DESIGN AND METHODOLOGY

4.1. Experimental Design of Study-1

Preliminary work: Choosing the key driving forces

"Change is the only constant." (Heraclitus)

"Events do not just happen at random, but they are related to each other through a structure where causes drive effects and one event leads to another" (Van der Heijden, 2005: 105).

Intuitive logics scenarios consist of four quadrants constructed in a 2X2 matrix with two key driving forces. The study started by writing the typical driving forces in light of the field experience. Keywords were collected from business magazines, business reports, professionals on the external driving forces which would affect the sales volume and market share of a company selling wearable electronic products in 2021.

Shell scenarios concentrate on the two most important driving forces. Key driving forces, which serve as scenario axes, are those developments that score indicators, uncertainty and impact (Schwarz, 1991). The selection of the two most important driving forces is not often questioned in scenario handbooks (Klooster & Van Asselt, 2006). On the other hand, as Schoemaker (2004) points out under scenario limitations, working with only two driving forces must also be criticized by both professionals in business and professors in academia. Individuals have limited cognitive capacity, and cognitive overload is inevitable when there are too many tasks competing for finite cognitive resources (Ratner et al., 2008). Research has shown that humans cannot grasp and cannot work with more than three pieces of information at the same time due to their limited working memory (Rouder et al., 2008). In this respect, ILS framework provides a reasonable amount of information around two key driving forces.

Technology companies operate in a highly complex business environment defined by a diverse set of driving forces. Almost in any territory, there is high uncertainty on how some of these driving forces will evolve over a five year planning horizon. As of 2016, we can not see clearly into 2021 and the fate of economy, trends and consumer habits in wearable electronics.

A single-question survey was distributed to 42 business people and people from engineering schools. The survey asked them to pick the top two driving forces among seven options. The full list can be found in Appendix-2.

The top two key driving forces were chosen as:

1) Technology adoption level (of the people in the target sales territory)

2) State of the economy (in the target sales territory)

O'Brien argued that the practitioners of scenario development have a bias towards emphasizing economic factors while constructing their scenarios (O'Brien, 2004). She refers to practice-recognized issues as "future myopia" in scenarios. On the other hand, the meetings held with professionals and the reviews from business reports prepared by reputable institutions show that the state of the economy is an indispensable factor which determines a new product's marketing results in that sales territory. Professionals' expertise proves that business scenarios should address the economic stability of the target territory. One can recognize from daily media that even developed countries cannot rely on their healthy economy but try to foresee what kind of fracture they might encounter in the coming years. Almost all economies in the world are sensitive to economic conditions. The professionals express that it is highly probable for any country to experience a remarkable change in economic conditions until 2021.

The technology adoption rate of people, their desire to allocate a budget to a specific wearable technology product is a prominent external factor for companies in the market. Some technology products unpredictably fail while some technologies attract an unanticipated level of attention. Consumers' technology adoption rate strongly determines the rate of movement in the market. Consumer electronics are not inelastic commodity types. One can postpone consumption. It is consumers' buying habits that encourage this purchase sooner or later. Sales volume is dependent on how much appetite customers have for a product.

Once the survey results were attained, this work requested the opinions of two experts in the electronics industry, who actively hold senior management

positions in their respective companies. Reminding them that a certain company needs to incorporate sales volume and market share forecasts to their 2021 strategy plans, the experts assessed the appropriateness of these forces as the two primary driving forces. They confirmed that due to the uncertainty of the year 2021, sales would be highly sensitive to these two external driving forces. They stated that independent from the company's internal dynamics, these two forces are most probably the two topmost external forces determinant on sales 2021.

The Intuitive Logics Scenario framework is constructed using these two driving forces and it can be seen in Figure-2.

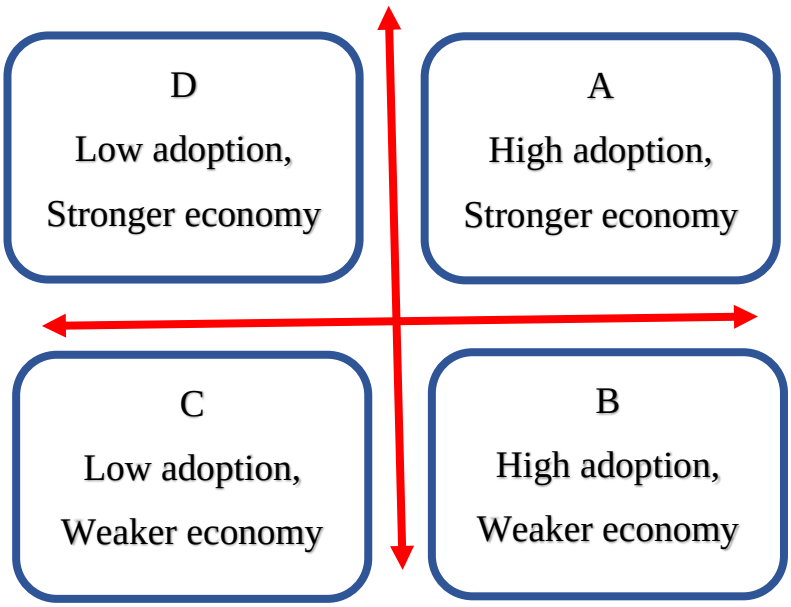


Figure 2. Intuitive Logics Scenario framework

In Study-1a and Study-1b of this dissertation, the participants received 2015's actual and 2016's projected sales volume and market share for the wearable product line of an undisclosed electronics brand. The historical data set was retrieved

from Euromonitor International in October 2016. This brand is a real global consumer electronics brand operating in the target sales territory (i.e., Turkey). No brand name was disclosed to the forecasting participants in order to prevent any extraneous bias in the study. The details can be seen in Appendix-1.

In this research, mutually exclusive and collectively exhaustive scenario quadrants encompassed the future with 100%. Particular attention was paid not to anchor on any single scenario. Finally, the scenario narratives and risk implications were prepared with identical content in each quadrant; that is, none of the quadrants had new content but rather the content was worded differently according to the identity of each quadrant. The scenario narratives were written in the same tense and using the identical grammar structure (as Schoemaker (1993) remarks, past tense was chosen to facilitate a sense of realization and take the forecasters into its ambience). The scripts of the scenario narratives and risk implications were of similar lengths in order to avoid a dominance effect. The aim was to generate the same level of emphasis on each scenario. The sentences used in the scenario narratives indicate possible, realistic events rather than extreme events.

The scenario narratives were developed for the four quadrants using sources such as a wide range of business reports (e.g., Forrest and Sullivan, Euromonitor International, Statista, investor reports, future magazines and other up-to-date publications), interviews with smart business people, and brainstorming. In order to avoid any unbalanced manipulation, special care was taken to keep the scenario narratives the same resolution and length. All narratives were elaborated to present coherence, comprehensiveness, internal consistency, novelty underpinned by rigorous structural analysis and logic. After preparation, scenario contents were

delivered to other professionals for checking. They reviewed and reported any vague sections needing revision. The goal was to eliminate irrelevant content or any sentences that might cause any misunderstanding. Clarity in the expressions was prioritized. The final narratives can be found in Appendix-4.

The experimental design phase was the most time-consuming part of the study. The initial goal was to inform the participants effectively and set the mood. It was considered to contribute to collecting a reliable data set. Several experiments were conducted from March to December 2016. The experiments achieved their final status after a vast amount of feedback from pilot test participants. Any ambiguities identified by the pilot study participants were revised with careful consideration, and further information was added where necessary.

STUDY-1A. Influence of Scenario Narratives and Risks on Judgmental Forecasts

Önkal et al. (2013) state in their paper that very little empirical work exists in the literature on providing scenarios as forecast support. As scenarios are tools that support decision making in enhancing understanding or challenging conventional thinking, qualitative inputs; i.e., scenarios, should be able to bridge the gap between the qualitative and the quantitative and enhanced understanding should move us further to solid results. The business world is always on the look out for opportunities to exploit the tools in hand, and organizations employ scenarios to quantify their expectations pertaining to new products.

In Study-1a and Study-1b of this work, the participants were informed that the "technology adoption rate of wearable technology products" and "state of the

economy" were chosen as the top two external driving forces that shape sales volume in the market. The participants received a global technology brand's actual sales volume and market share for 2015 and 2016 pertaining to the product line (i.e., wearable technology products).

In each group, professionals were requested to:

1a. Forecast sales volume (point forecast in units) for 2021 for the wearable technology product line in each quadrant

1b. For each sales volume forecast, make a probabilistic estimate (confidence) that the realized value would be within +-5% of their point forecast: (Between 0% and 100%)

2a. Forecast market share (point forecast in percentage) for 2021 for the wearable technology product line in each quadrant

2b. For each market share forecast, make a probabilistic estimate (confidence) that the realized value would be within +-5% of their point forecast: (Between 0% and 100%)

In order to communicate the confidence question better to the participants, the study delivered the question with an example: "To help you interpret your confidence assessment, think of the following example: If your forecast is 100, what is the probability that the actual value would fall between 95 and 105?"

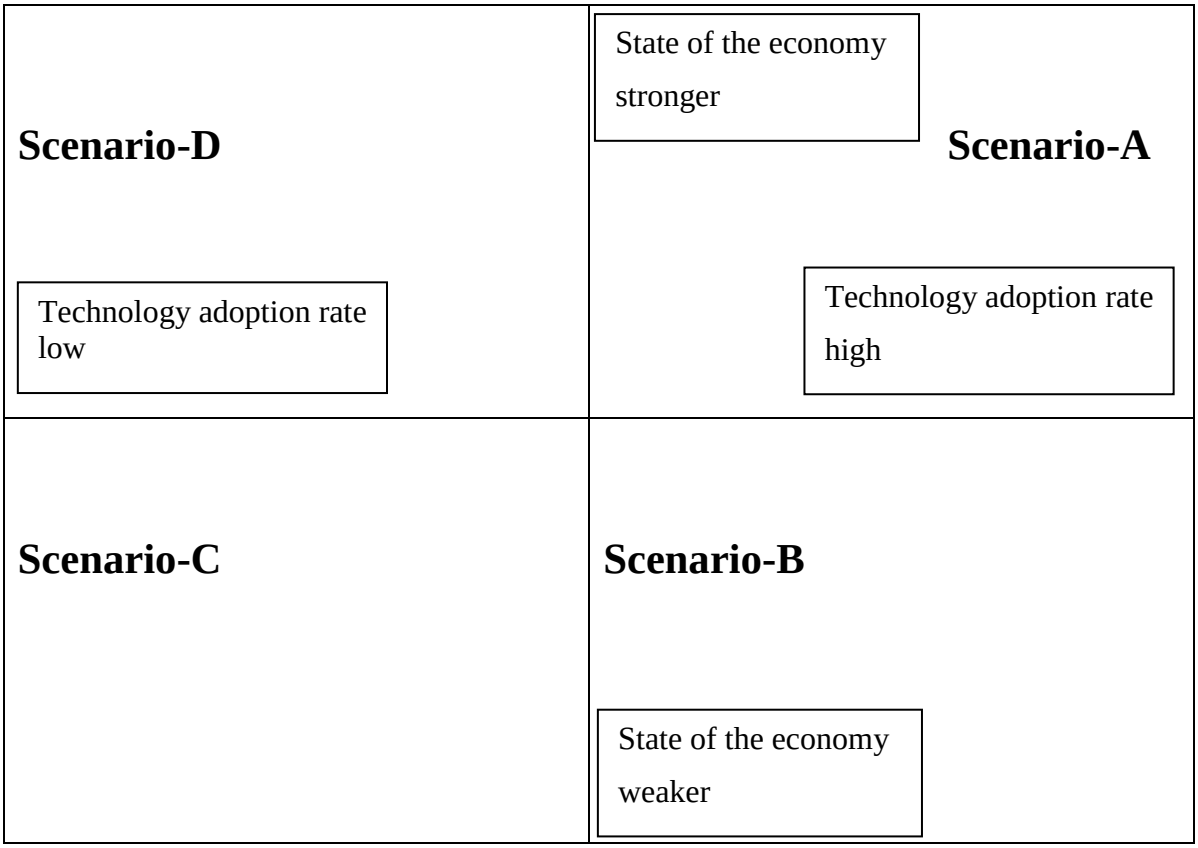
G1_NoNar provided judgmental forecasts for 2021 for each quadrant without reviewing any content, having reviewed only the conditions around the determined driving forces. The scenario narratives have a potential to change how the forecasters judge the future sales volume or the market share of a brand and how confident they

feel in their forecasts. To measure this, G2_Nar received the same quadrants comprising scenario narratives. The participants provided judgmental forecasts for 2021 for each quadrant after reviewing the scenario narratives. In addition, the extant literature hasn't provided information on how additional external information "risk implications" may influence forecasters. To examine this, G5_NarRisk received risk implications following the scenario narratives in each ILS quadrant. After reviewing them, the participants stated point forecasts and their probabilistic estimate (confidence) that the realized value would fall within +-5% of their point forecast.

In G6_Risk, the participants were asked to read the risk implications given in each quadrant and state their point forecasts with the probabilistic estimate (confidence) that the realized value would be within +-5% of their point forecast.

STUDY-1B. Assessment of Likelihood of Occurrence to Scenarios

Study-1b incorporates an additional treatment during scenario analysis: Assessment of likelihood of occurrence. G3_PrNoNar received the same information that G1_NoNar received. In the beginning, the participants were reminded that the future was depicted in four separate quadrants with the mutually exclusive and collectively exhaustive (MECE) principle. In a mutually exclusive and collectively exhaustive environment, every condition is separate; propositions do not double count, they cannot both occur. Only one of the proposed outcomes may take place. The sum of all propositions makes 100%. The intuitive logics scenario schema used in this study is demonstrated in Figure-3. Before beginning to work on any of their forecasts, the participants reviewed the supplied information and assessed the likelihood of occurrence for each scenario quadrant for the year 2021.



Pj(technology adoption ∩ state of the economy)=

…% for Scenario A

…% for Scenario B

…% for Scenario C

+…% for Scenario D

100%

Pj: likelihood of occurrence assigned to Scenario j, where j: A,B,C or D

Figure 3. Intutive Logics Scenario schema revisited

G4_PrNar received the same information that G2_Nar received. The participants acquired four scenario narratives developed around the two driving forces determined previously. First, they assigned a likelihood rate to each quadrant

to occur. After that, the participants made forecasts and stated their confidence with each specific forecast.

As a remark for G3_PrNoNar and G4_PrNar; the assessment of likelihood of occurrence task was completed as an uninterrupted task prior to forecasting tasks to enhance concentration while reading and assessing the scenarios. Participants of the pilot study mentioned that performing each likelihood assessment task intermittently prior to its pertinent forecasting task was confusing for them; hence these tasks were organized as two separate yet consecutive sets. After reviewing all conditions, participants stated likelihood for each quadrant. Following this, they worked on their forecasts, on their confidence that the realized value would be within +-5% of their point forecast.

Debriefing sessions

To interpret the statistical outputs comprehensively, debriefing sessions were conducted with 90 random respondents out of 251. Debriefing sessions aimed to identify respondents' motivations, priorities, biases using open-ended qualitative interviews. The following three steps (interview, coding and validation) were used. This session was crucial to find out the subconscious motives of forecasters and interpret the statistical results.

Data collection: Semi structured interviews

Interviews were conducted over the telephone, instant messaging or face to face and recorded with the explicit consent of each respondent. To identify how they had made their forecasts, a seeding question was used: "Describe how you decided

on your forecasts." After this seeding question, the interviews continued with the following questions:

What was the most uncertain part? Was the negative condition more uncertain?

How did you decide on your market share forecasts?

How did you decide on your sales forecasts? Did the scenarios make forecasting easier for you?

If your confidence changed based on the scenario, what did it depend on?

Do you think any of the four scenarios involve uncertainty? If yes, which scenario involves the most uncertainty?

The following question addressed the participants ignoring the competition (unexpectedly a large majority): "The competition could be influential in the best case quadrant, so things may not go as optimistic as the condition associates. What do you think about that?"

Leading questions were avoided for the informant to pursue a comfortable retrospection. All the "markers" were noted down (Weiss, 1995) from the information provided by the respondents when answering the open-ended questions, and explored each marker further through follow-up questions using the "breadth-first" approach described below.

Breadth-first approach to qualitative interview

The interview began by asking each respondent to describe how they had decided on their forecasts. When the respondent stopped talking, what they have said were reported back and asked if they were asked whether they wish to add anything. These questions were often met by long pauses as the respondent started thinking.

This procedure was repeated until the respondent mentioned that they had nothing more to add. From time to time, the respondent was provided with clarification questions whenever needed, such as: "what do you mean by...” and so on. This session aimed to elicit as much information from the participants as possible.

Following the recommendations of Lofland and Lofland (2006), at the beginning of each interview the respondent was told that there were neither right nor wrong answers to the interview questions and all that mattered was the respondent's perspective. The respondents were also told that confidentiality would be maintained, and any data from the interview would only be used anonymously in academic work. Interviews were scheduled for 20 minutes, whereas they lasted from 5 minutes to 40 minutes. After each interview, a memo describing overall impressions was written for each respondent.

Data analysis: Qualitative coding

In the initial coding of each interview, each statement made by the respondent was read. This was followed by focused coding of each interview to identify categories, their properties and dimensions (Strauss & Corbin, 1990). After coding all interviews individually, the codes were compared across all interviews. The continuous comparison of data and emerging codes took place at two levels: within each interview, which helped refine the open codes, and across interviews, which helped clarify any patterns appearing.

The codes from the debriefed interviews were used to interpret the statistical outputs. The discussion part was enhanced based on these interpretations and the extant literature.

4.2. Research Methodology of Study-1

This section outlines the framework used for designing and collecting data in Study-1. Study-1a and Study-1b involve six test groups in total. G1_NoNar acts as the control test group, where forecasters are only provided with scenario quadrants. Results from G1_NoNar, G2_Nar, G5_NarRisk and G6_Risk were used to find the answers to the research questions in Study-1a. Evidence from G1_NoNar, G3_PrNoNar, and G4_PrNar were used to answer the research questions in Study-1b. In addition to completing the forecasting tasks, all groups took the exit questionnaire consisting of 12 questions on a 7-point Likert scale. Table-1 summarizes the type of advice input and tasks in each test group in Study-1a and Study-1b.

Table 1. Description of the study groups in Study-1a and Study-1b

	Advice Input			**Task**		
	Scenario quadrants	**Scenario narratives**	**Risk implications**	**Assessment of likelihood of occurrence**	**Forecasting**	**Exit Questionnaire**
G1_NoNar	√				√	√
G2_Nar	√	√			√	√
G3_PrNoNar	√			√	√	√
G4_PrNar	√	√		√	√	√
G5_NarRisk	√	√	√		√	√
G6_Risk	√		√		√	√

In order to enrich the data collected, an exit questionnaire was given at the end of the forecasting activities. Participants responded to the semi structured questions on a voluntary basis after the forecasting activity and debriefing sessions were organized with random participants. The exit questionnaire and debriefing sessions aimed to serve as a triangulation tool. When a researcher combines different

methods, it is likely to reduce the weaknesses and biases that emerge from using only one method. Triangulating the data means getting data from different sources related to the same phenomenon (Bogdan & Biklen, 2006). Theory triangulation, which is the use of more than one theoretical frame for interpreting a phenomenon, is useful to combine research methods, quantitative and qualitative, to collect and interpret broader evidence.

Participant Profile

Data for all studies in this dissertation were collected via experiments. Professionals from different functional departments (program management, systems engineering, supply-chain, general management, strategy) were invited to represent alternative perceptions on a typical forecasting team contributing to medium to long term business plans. In terms of educational background, the majority hold engineering (industrial, electronics, mechanical) and business degrees. Additionally, the participants are highly accomplished people, most of whom are from top universities with graduate degrees.

This dissertation produced results from data collected from business professionals. Since this work prioritizes generalizability, access was sought and gained to professionals from diverse industries such as electronics, manufacturing, defense, IT, automotive and finance.

The data set was collected via Typeforms. Sample page views from Typeforms can be seen in Appendix-6. The participants received a small gift in return for attendance. Also, in recognition and appreciation of their efforts and participation, the participants will receive a digital copy of the study results.

Triangulation, Validity and Reliability Concerns

The research involved real business professionals to ensure reliability of results. Pilot test sessions were conducted before each real study. The debriefing sessions, member checking after pilot tests were conducted to assist to find any mismatches with the messages that this work intends. Any problematic, ambiguous points identified were revised before the massive data collection. These pilot tests served to increase validity significantly.

In each test, professionals were encouraged to join the experiment and convey their judgments carefully. They were told that their knowledge would provide more valuable input than they could ever expect. The participants were informed that any part of their contribution would be useful for academics to understand decision making processes better and suggest any improvements.

At the beginning of each study, a comprehensive information session was conducted for each study group. Participants of Study-1a and Study-1b received an overview on wearable technology products. Following that, they were supplied with scenario narratives, as well as risk implications in the relevant groups.

All participants were informed about the confidentiality of their responses. All of these policies aimed to prevent confounding factors such as social desirability, response bias and attrition. In order to suffer less from availability bias in scenario related work, as Wright et al. (2013) state in their paper, “remarkable people” were invited to the tests in Study-1a and Study-1b. These people represented a broad range expertise and viewpoints on relevant issues. Additionally, these individuals are also enthusiastic individuals who are capable and willing to challenge an organization's

as-usual business thinking.

To list all six criteria used to define field experiments (Harrison & List, 2004), in this work: 1) The participants comprise business professionals. 2) The participants were chosen carefully based on their business experience and knowledge on forecasting. 3) In Study-1a and Study-1b, the task involves forecasting for a real product line which is supposed to remain in the market until at least 2021. 4) Forecasts and assessments were collected in a systematic way using a neat platform. 5) The participants were informed that the results would be useful for managers to learn about decision making processes. 6) The majority of the participants completed the tasks during typical business hours.

Great care was afforded to ensure reliability throughout the studies. This entire work focused to collect repeatable data. Participants were introduced to the context with the brief information session at the beginning. The experiment group members were chosen with care to ensure similar characteristics such as education level, expertise and industry experience.

Validity was considered within different dimensions. To ensure face validity, the study was thoroughly checked in the pilot stage for completeness and balanced information for the issues being addressed for the target market. This research made special efforts to avoid any potential ambiguity that could cause difficulty for the participants. Additionally, the literature of different domains was reviewed to serve content validity. It is also planned that the results will be checked in terms of conclusion validity. Moreover, this work will be concluded with concurrent validity by comparing prospective results with extant evidence if already

caught by other researchers. Finally, this work plans to produce a study with external validity by ensuring the generalizability of the results.

In addition to the above issues, internal and external validity were addressed throughout both studies as follows:

Internal validity: The purpose of the study was presented to the participants before asking them to make any forecasts. Stating the study purpose explicitly is considered to increase the internal validity of data.

External validity: The participants are mid-level experienced knowledge workers from real companies. The collection of data from practitioners, especially those who have some sort of low or high level management responsibilities, done such that the results are valid, yet generalizable in its context and reflect the reality in business decision making.

Ecological validity: The research questions were obtained from real business life, and that proves the ecological validity of these studies.

Statistical Power Analysis of Study-1

Power analysis tests should be used to calculate the minimum sample size required to be reasonably likely to detect an effect on a given size. Factors influencing power are listed as follows:

- The statistical significance criterion used in the test
- The magnitude of the effect of interest in the population
- The sample size used to detect the effect

Table 2. Statistical power analysis results of Study-1

Study	Goal	Type of data	Input parameters	Output by GPower
Study-1A	Comparisons between groups	Two independent groups, non-parametric	Tail(s) = Two Parent distribution = Normal Effect size dz= 0.8 α err prob = 0.05 Power (1-β err prob) = 0.8 Allocation ratio N2/N1=1	Noncentrality parameter δ = 2.8723844 Critical t = 2.0089947 Df = 49.5662016 **Sample size group 1 = 27** **Sample size group 2 = 27** Total sample size=54 Actual power = 0.8041015
Study-1B	Comparisons within the group	Two dependent groups (matched pairs), Wilcoxon non-parametric	Tail(s) = Two Parent distribution = Normal Effect size dz= 0.8 α err prob = 0.05 Power (1-β err prob) = 0.8	Noncentrality parameter δ =3.0277590 Critical t =2.1550415 Df =13.3239449 **Total sample size = 15** Actual power = 0.8006782

This work takes the statistical significance criterion (alpha value) as 0.05. A priori tests were held to decide on sample sizes corresponding to each data analysis with Faul, Erdfelder, Lang and Buchner's guidance (2007). Software GPower 3.1.9.2 was utilized to make calculations, and Table-2 summarizes the minimum sample size to reach the target statistical power in Study-1. (1-beta) error probability was taken as 0.8. A priori power tests were used, and the sample size was computed with given alpha, power and effect size in each type of test.

Table-2 summarizes the minimum required sample size for each test type under their corresponding experiment inputs. GPower's recommended sample sizes were taken as the reference minimum sample size. The number of participants attending each test group is in line with the recommended sample sizes.

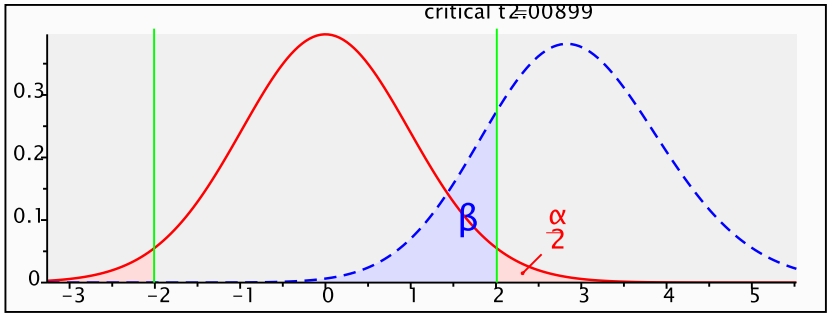


Figure 4. Power analysis graph for two independent groups, non parametric

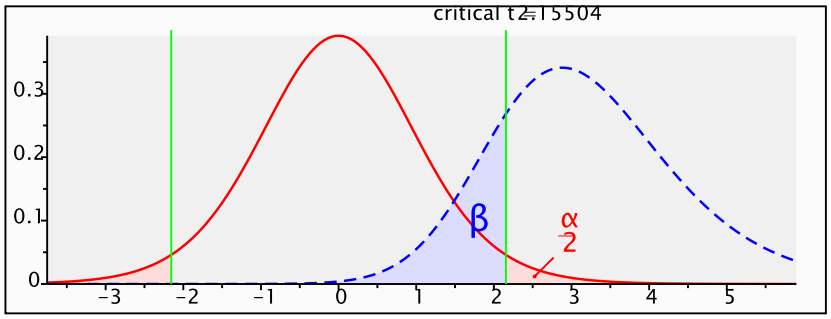


Figure 5. Power analysis graph for two dependent groups (matched pairs), Wilcoxon non-parametric

The sample sizes were determined by taking the minimum sample size calculated in GPower. Outputs by GPower show that the power of the statistical test is greater than 80% in each study. Relevant graphs are provided in Figure-4 and Figure-5.

Sampling for Study-1

It was important to get a sample that is not representative of only a small group of people, but the entire population. In addition, it was important to pick

participants randomly for each test group. In Study-1a and Study-1b, the studies were distributed electronically from a hub. The participants were assigned to a random test based on their surnames. The surname intervals were also mixed from time to time. The intention here was to avoid a possible "selection problem". In addition, from time to time, the order of the scenario quadrants the participants took were carefully changed. Four orders were used, the quadrants followed a clockwise flow and either started with A, B, C or D. Data was collected from at least 8 participants in each order under each test group of Study-1a and Study-1b.

For Study-1a and Study-1b the six study groups involved a total of 251 professionals who regularly make their own forecasts or attend forecasting sessions held in their organizations. The entire set consists of primary forecasters and policy makers working in either the private industry or the public sector. Forecasters were found not just from a single industry but from many sectors such as space and technology, electronics, defense, automotive, IT and finance. These sectors are fast-changing sectors in competitive circumstances and they feature shifting customer demands. Companies in these industries encounter many decisions that have to be made under uncertainty.

In this study, not only the senior management yet primary forecasters were in focus. This work involves not only senior managers who make the final decision at the top of a bureaucratic chain, but also a majority of forecasters who make their forecasts as mid-level managers. This approach is supposed to facilitate a realistic context for decision making and render assistance to increase the validity of the study.

All participants succeeded in completing the tasks. The control group, G1_NoNar has 42 participants. Study-1a comprises additional 127 participants, and Study-1b comprises 82 participants. Group related descriptive statistics pertaining to Study-1a and Study-1b are summarized in Table-3.

Table 3. Descriptive statistics for test groups in Study-1a and Study-1b

(*)	**Scenario conditions (**)**	**Scenario narratives**	**Risk implications**	**Assessment of likelihood of occurrence**
Scenario conditions	# of participants: 42 Mean Work XP: 9.3 Mean age: 33.3 (G1_NoNar)	# of participants: 43 Mean Work XP: 9.0 Mean age: 33.4 (G2_Nar)	# of participants: 41 Mean Work XP: 14.8 Mean age: 37.9 (G6_Risk)	# of participants: 41 Mean Work XP: 12.2 Mean age: 35.3 (G3_PrNoNar)
Scenario narratives			# of participants: 43 Mean WorkXP: 10.2 Mean age: 33.4 (G5_NarRisk)	# of participants: 41 Mean WorkXP: 10.0 Mean age: 33.4 (G4_PrNar)

(*) Intersection of rows and columns indicate the joint advice content. Each cell displays one study group from Study-1a and Study-1b.

(**) Scenario narratives, risk implications and assessment of likelihood of occurrence were located on scenario quadrants. In G1_NoNar, only the headings of the scenario quadrants were supplied and they didn't present any further information.

Among the participants, 38% of G1_NoNar participants hold at least a master's degree; 58%, 40%, 44% of G2_Nar, G5_NarRisk, G6_Risk have at least a master's degree, respectively. 63% of G3_PrNoNar and 49% of G4_PrNar hold at least a master's degree. This supports that the participants come from strong educational backgrounds. They are also from different sized firms, homogeneously

distributed in each test group. The participants had extensive industry and forecasting experience. Average industry experience was 11 years with 75% of participants having five or more years of experience. 49% of all participants had at least a master's degree. The study was delivered to those who had an engineering or technology background, and a small portion came from business school background. As such, this work is confident that the sample consists of qualified forecasters. Given these descriptive attributes, the sample can be characterized as consistent with other studies representing forecasters.

The data set was collected within a reasonable time frame where forecasters were requested to respond at their earliest convenience. The participants were encouraged to read the questions and respond carefully. They were informed that there are no right or wrong answers and whatever they conclude is important for this work to interpret decision making processes.

After the study, a statistical check was carried out to see whether the order of the scenario quadrants had any impact on forecasts and confidence. Taking order type as the factor, I applied the Kruskal Wallis test to each variable in each test group. With 95% confidence, the order of the scenario quadrants displayed no significant median difference in forecasts and confidence. In scope of checking the presence of order effect, Kruskal Wallis statistics with three degrees of freedom (H_3) and corresponding p-values for each forecast variable are presented in Table-4. Forecasters' confidence was checked for the presence of the order effect as well. The order effect was statistically insignificant with an alpha level of 0.05. Statistical outputs are presented in Table-5. The assessment of likelihood of occurrence was also checked and the statistical results prove that review order did not influence

individuals' likelihood assessments of the scenario quadrants in this work. The corresponding Kruskal Wallis statistics and p-values are presented in Table-6.

Table 4. Order effect statistical results of sales and market share forecasts

	G1_NoNar	G2_Nar	G3_PrNoNar	G4_PrNar	G5_NarRisk	G6_Risk
SalesA	H_3=0.85, insig. with p=0.838	H_3=3.90, insig. with p=0.272	H_3=4.68, insig. with p=0.197	H_3=4.79, insig. with p=0.188	H_3=7.27, insig. with p=0.064	H_3=2.19, insig. with p=0.533
SalesB	H_3=1.26, insig. with p=0.740	H_3=1.25, insig. with p=0.740	H_3=2.51, insig. with p=0.474	H_3=2.32, insig. with p=0.508	H_3=0.29, insig. with p=0.962	H_3=1.86, insig. with p=0.601
SalesC	H_3=3.12, insig. with p=0.374	H_3=6.68, insig. with p=0.083	H_3=2.00, insig. with p=0.572	H_3=4.13, insig. with p=0.248	H_3=1.51, insig. with p=0.681	H_3=1.89, insig. with p=0.595
SalesD	H_3=1.68, insig. with p=0.641	H_3=2.26, insig. with p=0.520	H_3=0.97, insig. with p=0.809	H_3=4.29, insig. with p=0.232	H_3=0.74, insig. with p=0.863	H_3=2.92, insig. with p=0.404
ShareA	H_3=0.87, insig. with p=832	H_3=6.41, insig. with p=0.093	H_3=0.63, insig. with p=0.890	H_3=3.83, insig. with p=0.281	H_3=3.78, insig. with p=0.286	H_3=5.49, insig. with p=0.139
ShareB	H_3=1.32, insig. with p=0.724	H_3=1.07, insig. with p=0.785	H_3=5.24, insig. with p=0.155	H_3=2.73, insig. with p=0.435	H_3=2.64, insig. with p=0.451	H_3=3.09, insig. with p=0.378
ShareC	H_3=3.00, insig. with p=0.392	H_3=1.63, insig. with p=0.653	H_3=1.88, insig. with p=0.598	H_3=1.42, insig. with p=0.700	H_3=2.84, insig. with p=0.417	H_3=3.94, insig. with p=0.268
ShareD	H_3=1.96, insig. with p=0.581	H_3=1.33, insig. with p=0.722	H_3=0.50, insig. with p=0.918	H_3=2.60, insig. with p=0.457	H_3=3.73, insig. with p=0.292	H_3=2.10, insig. with p=0.553

Table 5. Order effect statistical results of confidence

	G1_NoNar	G2_Nar	G3_PrNoNar	G4_PrNar	G5_NarRisk	G6_Risk
Conf_SalesA	H_3=3.28, insig. with p=0.351	H_3=2.19, insig. with p=0.534	H_3=2.20, insig. with p=0.533	H_3=0.88, insig. with p=0.830	H_3=3.66, insig. with p=0.301	H_3=2.96, insig. with p=0.397
Conf_SalesB	H_3=1.50, insig. with p=0.682	H_3=0.19, insig. with p=0.980	H_3=2.11, insig. with p=0.550	H_3=2.11, insig. with p=0.550	H_3=0.33, insig. with p=0.954	H_3=4.47, insig. with p=0.215
Conf_SalesC	H_3=1.31, insig. with p=0.726	H_3=2.73, insig. with p=0.434	H_3=0.65, insig. with p=0.885	H_3=0.64, insig. with p=0.888	H_3=3.26, insig. with p=0.353	H_3=4.70, insig. with p=0.195
Conf_SalesD	H_3=1.12, insig. with p=0.771	H_3=1.04, insig. with p=0.792	H_3=0.52, insig. with p=0.915	H_3=1.79, insig. with p=0.616	H_3=2.91, insig. with p=0.406	H_3=3.36, insig. with p=0.340
Conf_Share A	H_3=3.11, insig. with p=0.375	H_3=3.24, insig. with p=0.357	H_3=3.24, insig. with p=0.355	H_3=1.70, insig. with p=0.637	H_3=0.86, insig. with p=0.835	H_3=2.94, insig. with p=0.400
Conf_Share B	H_3=1.56, insig. with p=0.669	H_3=1.09, insig. with p=0.780	H_3=7.31, insig. with p=0.063	H_3=2.97, insig. with p=0.396	H_3=1.13, insig. with p=0.769	H_3=4.40, insig. with p=0.221
Conf_Share C	H_3=3.22, insig. with p=0.359	H_3=0.47, insig. with p=0.924	H_3=3.62, insig. with p=0.306	H_3=0.99, insig. with p=0.803	H_3=1.44, insig. with p=0.697	H_3=3.55, insig. with p=0.314
Conf_Share D	H_3=7.21, insig. with p=0.065	H_3=0.78, insig. with p=0.854	H_3=1.96, insig. with p=0.580	H_3=5.40, insig. with p=0.145	H_3=3.00, insig. with p=0.391	H_3=2.07, insig. with p=0.559

Table 6. Order effect statistical results of likelihood of occurrence assessments

	G3_PrNoNar	**G4_PrNar**
ProbA	H_3=4.46 insign. with p=0.216	H_3=5.76 insign. with p=0.124
ProbB	H_3=1.76 insign. with p=0.623	H_3=4.88 insign. with p=0.181
ProbC	H_3=1.95 insign. with p=0.582	H_3=1.86 insign. with p=0.603
ProbD	H_3=0.23 insign. with p=0.972	H_3=3.03 insign. with p=0.387

The results suggest that order effect is insignificant with a 95% confidence level, revealing that the review order of scenarios can not be cited as a confounding factor. With these verified, the statistical analyses regarding the research questions are now possible.

The subjects responded to eight forecasting tasks and provided information related to their confidence with these forecasts. The main body of the test involved sixteen outputs per participant where the content of the *Information* type advice changed in each test.

The responses were highly skewed and non-normal within a critical alpha value of 0.05. Appendix-5 presents the skewness pertaining to each variable. Even after logarithmic transformation, the data sets did not display a normal distribution. Since the data set shows non-parametric characteristics, the Kruskal-Wallis Test was applied to check any significant differences in the forecasts and confidence of the respondents after reviewing one type of content: Scenario narrative, risk implications

or both at once. The Kruskal-Wallis test is a nonparametric alternative to the one-way analysis of variance (for which this work assumes that the populations being sampled are also normally distributed). For the reliability of the Kruskal-Wallis test, each sample should consist of five or more measurements. The research collected more than 30 observations per variable in each test group.

The Kruskal Wallis test is useful for comparing two or more independent samples of equal or different sample sizes. The null hypothesis proposes the medians of all groups are equal, where the alternative hypothesis proposes at least one population median of one group is different from the population median of at least one other group. This work used the non-parametric Kruskal Wallis test to check whether there is an order effect and to draw comparisons between independent order groups employed in each test group.

In each test group, the participants provided responses to four quadrants. The responses for each scenario quadrant represent related samples within the test group. The Wilcoxon signed rank test is useful for comparing related samples. One-sample Wilcoxon is a non-parametric alternative to one-sample z and one-sample t procedures. Wilcoxon enables us to make comparisons through pairwise differences. The null hypothesis asserts the sign of median difference is equal to zero.This work used the Wilcoxon test to identify any significant discrepancies between the scenario quadrants within the test group.

For the comparison of the survey scores, the work used two-sample Mann Whitney (also called two-sample rank or two sample Wilcoxon rank sum) confidence interval and test procedures. This statistical test type is useful to make inferences

about the difference between two population medians based on data from two independent, random samples. The Mann Whitney test is a nonparametric alternative to the two-sample t-test with pooled sample variances.

4.3. Experimental Design of Study-2

What happens when the two attributes of experts (i.e., track record of accuracy (experienced credibility) and their apparent status (presumed credibility)) yield conflicting indications of credibility? Is advice more influential when its source is associated with presumed credibility rather than experienced credibility?

In Study-2, “the influence of the advisor” is measured by the extent to which forecasters changed their initial forecasts in the light of advice. In expert knowledge elicitation (EKE) for forecasting, the credibility of the advice source is likely to encourage forecasters to adjust their forecasts in the light of the advice. This work focuses on two levels of two attributes related to credibility: high/low presumption credibility and high/low experienced credibility.

Experienced credibility can be classified into two levels:

1) The high experienced credibility group: When the advisor is described by a high hit rate for his previous forecasts, participants assign highly experienced credibility to the forecast source.

2) The low experienced credibility group: When the advisor is described by a low hit rate for his previous forecasts, participants assign less experienced credibility to the forecast source.

Presumed credibility can be classified into two levels:

1) The high presumed credibility group: For each series, the forecast advice was presented with the following label: “the source of this forecast advice is a well-known financial analyst with extensive knowledge on stock price forecasting”. This label was designed to encourage the participants to engage a high presumed credibility to the forecast source.

2) The low presumed credibility group: For each series, the forecast advice was presented with the following label: “The source of this forecast advice is a taxi driver”. This label was planned to represent a low presumed credibility source of forecast advice. Taxi drivers were chosen as artificial experts. The experiment took place in Turkey and it is very common in Turkey for taxi drivers to engage their passengers in conversation on the economy and financial markets during any taxi ride. The participants treated this as a highly realistic, common situation. A sample from the experience practice series is provided in Appendix-7.

Under many circumstances, people will base the assessment of an expert’s credibility on both the experience of accuracy with the expert (i.e., advice source) as well as the presumed credibility of the source. This raises the question of how the two forms of credibility interact, and in particular, what happens when they present conflicting indications.

Study-2 comprises *Recommend For* type forecasting advice presented to business professionals. The study was delivered in two phases. In Phase-1, twelve time series plots of weekly closing stock prices were provided for a 30-week period. The data was taken from the actual stock market and the identity of the stocks and the time period were not disclosed to prevent any biases or extraneous information

effects. The participants were informed that these were real stock price series with undisclosed stock names and concealed time periods. The participants received the time series and studied the series carefully. Then they were requested to generate a point forecast as well as an interval forecast for the 31st period in light of the given time series. After all the series were complete, the participants finished phase-1 and returned the form, then they were given the phase-2 form.

Phase-2 consisted of two stages. In the first stage, the forecasters received time series plots for the last 30 weekly closing prices of twelve stocks as the experience building time series. Similar to Phase-1, the identity of these stocks and their time period were kept confidential to prevent any potential biases or extraneous information effects. In the first stage, forecasters were given the time series, the forecast advice (both point and interval forecasts), the realized stock price value of the 31st week and the source of the forecast advice. After reviewing these twelve series, forecasters received a table which summarizes the overall performance of the source providing forecast advice. In this stage, no action was required of the participants.

In the second stage, the same time series plots from stage-1 were provided to the individuals. In this stage, forecasters were also given forecast related advice (both point and interval forecasts) from the same forecast source as in stage-1. The forecasters were requested to review the series, the source and the advice carefully. After reviewing the forecast advice, they worked on their final point forecast and final interval forecasts for the 31st period again. Table-7 exhibits the four experimental conditions based on the experienced credibility (i.e., experienced

accuracy) and the presumed credibility cues that were provided. The numbers in the cells indicate the number of professional participants, average years of work experience and average age. The group code is shown in the parentheses.

Table 7. Descriptive statistics for test groups in Study-2

	High Presumed Credibility "Source of this forecast advice is a well-known **financial analyst** with extensive knowledge on stock price forecasting"	**Low Presumed Credibility** "Source of this forecast advice is a **taxi driver**"
High Experienced Credibility [Initial 12 experience-building series had MAPE of 2.94% for the point forecasts and a hit rate of 83% for the intervals]	# of Participants : 21 Mean Work XP : 9.3 Mean Age : 32.9 (G1_HE-HP)	# of Participants : 20 Mean Work XP : 12.1 Mean Age : 35.2 (G3_HE-LP)
Low Experienced Credibility [Initial 12 experience-building series had MAPE of 14.94% for the point forecasts and a hit rate of 17% for the intervals]	# of Participants : 21 Mean Work XP : 10.8 Mean Age : 34.1 (G2_LE-HP)	# of Participants : 20 Mean Work XP : 7.4 Mean Age : 31.2 (G4_LE-LP)

Judgmental adjustment measures used in Study-2 are the following:

AAP= | adjusted point forecast –initial point forecast |

SAA= | adjusted upper bound – initial upper bound | + | adjusted lower bound – initial lower bound |

$$APAP = \frac{|\text{adjusted point forecast} - \text{initial point forecast}|}{\text{initial point forecast}} \times 100$$

$$APAI = \frac{|\text{adjusted interval width} - \text{initial interval width}|}{\text{initial interval width}} \times 100$$

Judgmental adjustment measures are summarized in Table-8:

Table 8. Summary of judgmental adjustment measures

	Frequency of adjustments	**Size/Magnitude of Adjustments**	
Point forecasts	% of initial point forecasts adjusted	AAP Absolute adjustment in point forecasts	APAP Absolute % adjustment in point forecasts
Interval forecasts	% of initial interval forecasts adjusted	SAA Sum of absolute adjustments on interval bounds	APAI Absolute % adjustment in interval forecast width

Advice utilization measures used in Study-2 are the following:

$$\text{Advice shift} = \frac{\text{adjusted point forecast} - \text{initial point forecast}}{\text{provided point forecast} - \text{initial point forecast}}$$

$$\text{Weight of advice, WoA} = \frac{|\ \text{adjusted point forecast} - \text{initial point forecast}\ |}{|\ \text{provided point forecast} - \text{initial point forecast}\ |}$$

$$\text{Weight-of-own estimate (WoE)} = \frac{|\ \text{provided point forecast} - \text{adjusted point forecast}\ |}{|\ \text{provided point forecast} - \text{initial point forecast}\ |}$$

In addition, the type of advice is likely to affect forecasters' willingness to take that advice. This study focused on *Recommend For* type advice. The work was published in International Journal of Forecasting with additional studies carried out by Önkal, Gönül, Goodwin, Thomson and Öz (2017). In addition to the forecasting activity, the study addressed the following question to get an idea of the forecasters' approach:

Please indicate your agreement/disagreement with the following statement:

"I would be willing to use this advice while working on my forecasts"

Adjustment of forecasts after reviewing advice and the indication of willingness to use this advice will show how individuals approach forecast advice from an advice source representing high/low presumption credibility and high/low experienced credibility. This will provide an opportunity to observe how forecasters approach advice when it is *Recommend For* type.

This finding is expected to inform advisors about the conditions that motivate professionals' to use some advice. Gaining awareness regarding the mindset of forecasters will help professional advisors improve their services.

Sampling for Study-2

The respondents were chosen from several different sectors such as finance, IT, space and defense and electronics. They were chosen randomly to take the paper-based test. They were left alone to work on their forecasts and then hand in their forecasts. The participants were given information that there were no right or wrong answers and that whatever forecasts they made after careful assessment would be appreciated.

The participants who took part in this study come from strong educational backgrounds and have extensive industry and forecasting experience, as well. Average industry experience was 10 years with 88% of participants having five or more years of experience. They work for companies of various sizes and they are homogeneously distributed to each test group. The study was delivered to the participants who had degrees from engineering or technology related fields and some

from business school. As such, this work is confident that the sample consists of qualified forecasters. Given these descriptive attributes, the sample can be characterized as consistent with other studies representing forecasters.

The data set fits into normal distribution. One-way ANOVA with repeated measures was used for statistical checks. This technique is used to compare the means of the samples using the F distribution. ANOVA tests the null hypothesis that samples in all groups are drawn from populations with the same mean. ANOVA produces the F statistic, the ratio of variance calculated among the means to the variance within the samples. If the group means are drawn populations with the same mean values, the variance between the group means should be lower than the variance of the samples. A higher ratio means the samples are drawn from populations with different mean values. The reliability of one-way ANOVA depends on the following assumptions: Residuals are normally distributed, the variance of the populations is equal, and responses for a given group are independent and identically distributed normal random variables. These assumptions are validated in this study.

4.4. Research Methodology of Study-2

This section outlines the framework used for designing and collecting data in Study-2. Study-2 involved four study groups in total. G1_HE-HP was related to perceptions regarding high presumed and high experienced credibility advice sources, and G2_HE-LE regarding high presumed credibility and low experienced credibility advice sources, G3_HE-LP low presumed credibility and high experienced credibility advice source and finally G4_LE-LP was related to

perceptions regarding low presumed credibility and low experienced credibility advice sources. Table-9 summmarizes the joint credibility test groups in Study-2.

Table 9. Description of the test groups in Study-2

	High Presumed Credibility "The source of this forecast advice is a well-known **financial analyst** with extensive knowledge on stock price forecasting"	**Low Presumed Credibility** "The source of this forecast advice is a **taxi driver**"
High Experienced Credibility [Initial 12 experience-building series had MAPE of 2.94% for the point forecasts and a hit rate of 83% for the intervals]	(G1_HE-HP)	(G3_HE-LP)
Low Experienced Credibility [Initial 12 experience-building series had MAPE of 14.94% for the point forecasts and a hit rate of 17% for the intervals]	(G2_LE-HP)	(G4_LE-LP)

Participants of Study-2 received an overview on their tasks and the information pages that describe the attributes of the source providing the forecast advice. At the end of all studies, the participants attended an exit questionnaire following the forecasting task and rated their opinions on a 7-point Likert scale.

Study-2 witnessed remarkable people who were interested in reviewing the historical course of stock prices and make forecasts for the next period. To list all six criteria used to define field experiments (Harrison & List, 2004), in this work: 1) The participants consist of business professionals. 2) The participants were chosen carefully based on their business experience and knowledge on forecasting. 3) In

Study-2, the task involves reviewing a real stock's progress over time and making a forecast for the next period. 4) Forecasts and confidence assessments were collected in a systematic way using papers arranged in order. 5) The participants were informed that the results would be useful for managers to learn about decision making processes. 6) The majority of the participants completed the tasks during typical business hours.

Statistical Power Analysis of Study-2

Software GPower 3.1.9.2 was utilized to make calculations, and Table-10 summarizes the minimum sample size to reach the target statistical power in Study-2. (1-beta) error probability was taken as 0.8. A priori power tests were used, and the sample size was computed with given alpha, power and effect size in each type of test. Table-10 summarizes the minimum required sample size for each test type under their corresponding experiment inputs. GPower's recommended sample sizes were taken as the reference minimum sample size. The number of participants attending each test group is in line with the recommended sample sizes.

Table 10. Statistical power analysis results of Study-2

Study	**Goal**	**Type of data**	**Input parameters**	**Output by GPower**
STUDY-2	Compare three or more unmatched groups	ANOVA, Repeated measures, within-between interaction	Effect size f = 0.8 α err prob = 0.05 Power (1-β err prob)= 0.8 Number of groups = 4 Number of measurements=12 Corr among rep measures=0.99	Noncentrality parameter λ=6144 Critical F= 1.6997069 Numerator df = 33 Denominator df = 44 **Total sample size =8** Actual power= 1.0

The sample sizes were determined by taking the minimum sample size calculated in GPower. Outputs by GPower show that the power of the statistical test is greater than 80% in the study. Relevant graphs are provided in Figure-6.

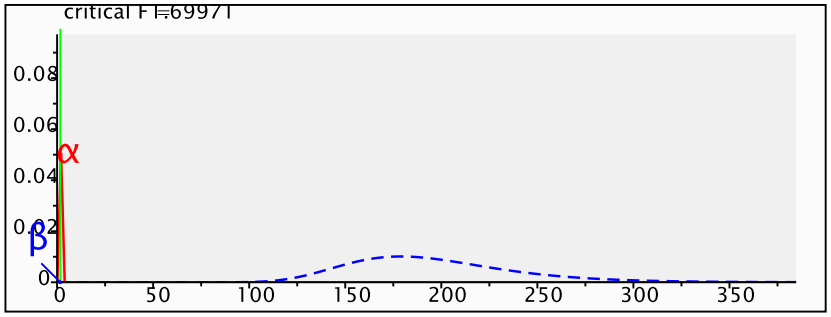


Figure 6. Power analysis graph for ANOVA, Repeated measures, within-between interaction

CHAPTER-5: DATA ANALYSIS AND FINDINGS

This chapter provides information on the data analysis performed to find answers to each research question in all two studies. Statistical evidence is sought through MINITAB statistical software. All statistical results are evaluated with a reference alpha equal to 0.05. Boxplots and other graphs are used to provide preliminary insights into the data and various findings. These results are then summarized within tables under each research question. While this chapter presents the statistical findings, discussions of these results are made on the basis of the extant literature in the next chapter, Chapter-6: Discussion.

5.1. Data Analysis and Findings of Study-1a

The research questions of Study-1a can be listed as follows:

1)	How does advice comprising scenario narratives affect forecasts and confidence?

2)	How does the advice comprising risk implications affect forecasts and confidence?
3)	Can any systematic patterns be identified within the sales forecasts of the ILS setting?
4)	Does forecasters' confidence change significantly from one quadrant to another in an ILS framework?

Data analysis and findings start by comparing forecasts and confidence after reviewing advice comprising scenario narratives affect forecasts and confidence.

1) How does advice comprising scenario narratives affect forecasts and confidence?

Figure-7 presents how the data pertaining to G1_NoNar and G2_Nar appears. The median value is indicated by the horizontal line inside the box. The rectangular box represents the middle 50% (interquartile range) of the data. Lines called "whiskers" extending from the box representing the upper and lower 25% of the distribution (excluding outliers).The boxplots enable the comparison of central tendency and variability of the samples. The location of median, the height of the rectangular box, the length of the whiskers provides an overview of each distribution's characteristics. In this sense, Figure-7 provides a brief insight that the variance of sales forecasts-A is larger compared to the variance of sales forecasts-C in both G1_NoNar and G2_Nar. In addition, Figure-8 displays the median sales forecasts pertaining to G1_NoNar and G2_Nar.

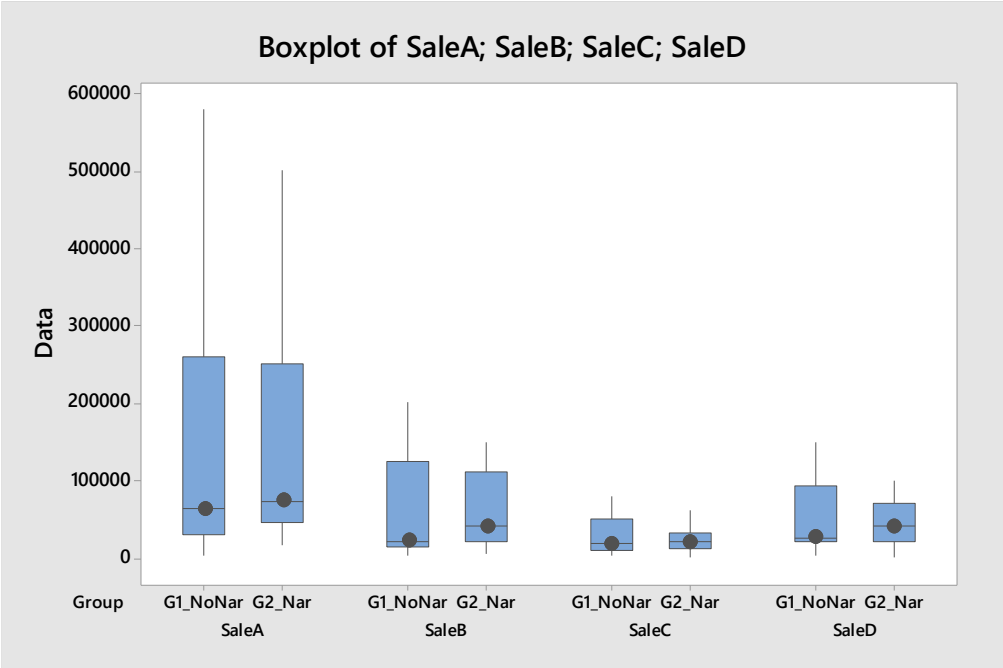


Figure 7. Boxplot of sales forecasts in G1_NoNar and G2_Nar

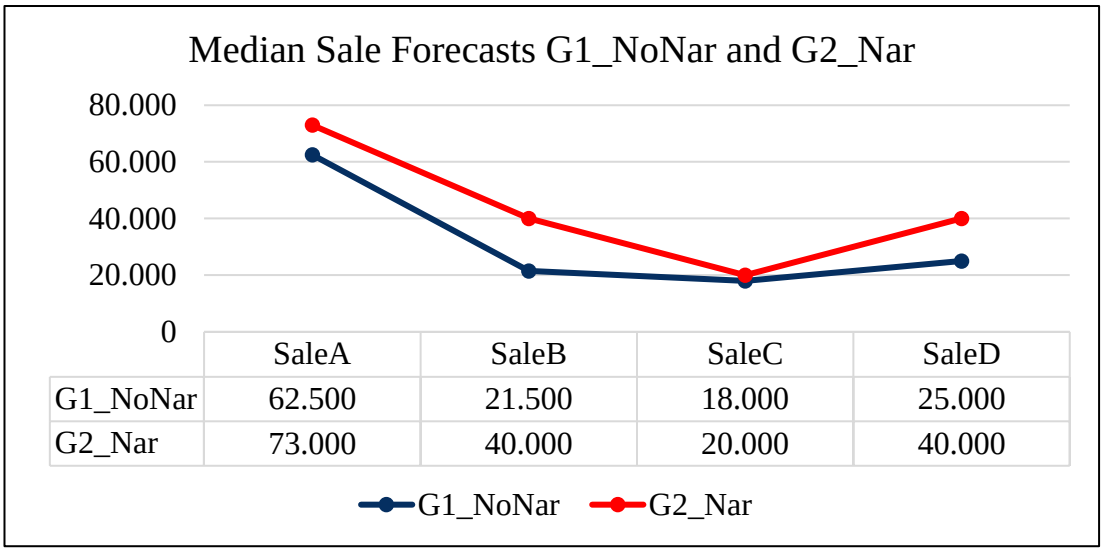


Figure 8. Median sales forecasts in G1_NoNar and G2_Nar

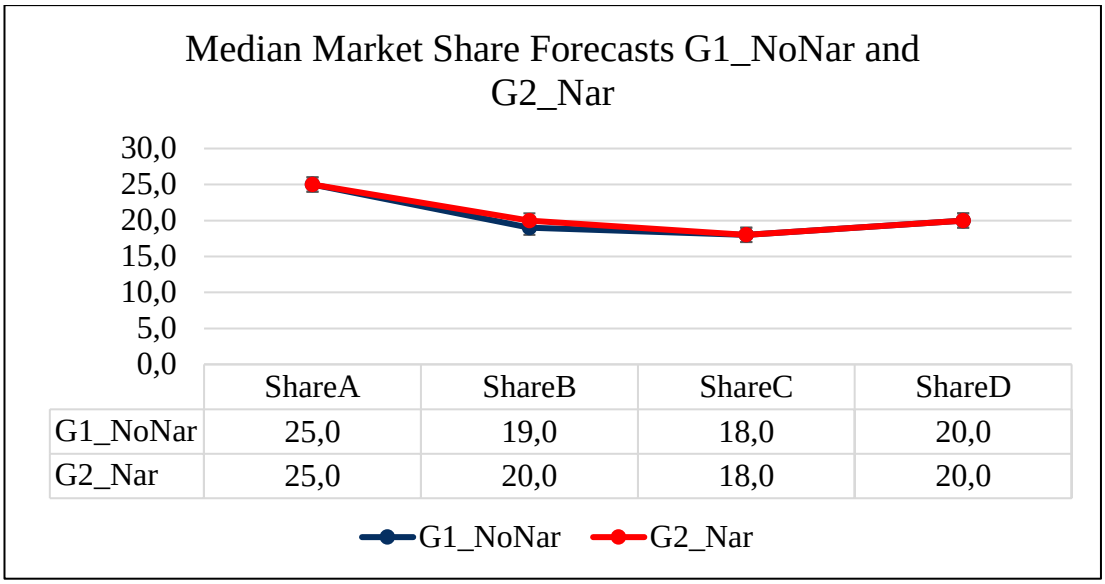


Figure 9. Median market share forecasts in G1_NoNar and G2_Nar

Figure-9 illustrates the market share forecasts of G1_NoNar and G2_Nar. Median market share forecasts display a pattern around the same level.

Table 11. Median sales and market share forecasts in G1_NoNar and G2_Nar

	G1_NoNar	**G2_Nar**	**Statistical comparison**
SalesA	62,500	73,000	H_1=1.58, insign. with p = 0.208
SalesB	21,500	40,000	H_1=1.06, insign. with p =0.303
SalesC	18,000	20,000	H_1=0.00, insign. with p =0.951
SalesD	25,000	40,000	H_1=0.79, insign. with p = 0.374
	G1_NoNar	**G2_Nar**	**Statistical comparison**
ShareA	25.0	25.0	H_1=0.00, insign. with p = 0.947
ShareB	19.0	20.0	H_1=0.06, insign. with p =0.802
ShareC	18.0	18.0	H_1=0.24, insign. with p =0.621
ShareD	20.0	20.0	H_1=1.73, insign. with p = 0.188

Each forecast made by the participants in G1_NoNar for each quadrant was compared to those of G2_Nar. The first research hypothesis predicted that the forecasts generated after reviewing the advice comprising scenario narratives would be higher than those generated without reviewing any narratives. The statistical findings in Table-11 do not support this hypothesis. There is no significant median difference between quadrants of sales and market share forecasts in the test groups G1_NoNar and G2_Nar. With alpha equal to 0.05, the Kruskal-Wallis test did not find any significant median difference in neither sales nor market share forecasts between having reviewed a scenario narrative and not having reviewed one.

Following this, the forecasters' confidence was examined in both sales and market share forecasts. The second hypothesis predicted forecasters' confidence after reviewing advice comprising scenario narratives is likely to be higher than those generated without reviewing any narratives. The findings presented in Table-12 partly support this hypothesis.

Table 12. Median confidence in sales forecasts in G1_NoNar and G2_Nar

	G1_NoNar	**G2_Nar**	**Statistical comparison**
Conf_SalesA	70.0	80.0	H_1=4.35, sign. with p = 0.037
Conf_SalesB	62.5	80.0	H_1=3.98, sign. with p = 0.046
Conf_SalesC	60.0	70.0	H_1=0.97, insign. with p = 0.326
Conf_SalesD	70.0	80.0	H_1=1.81, insign. with p = 0.178
	G1_NoNar	**G2_Nar**	**Statistical comparison**
Conf_ShareA	70.0	80.0	H_1=0.52, insign. with p = 0.469
Conf_ShareB	67.5	75.0	H_1=0.92, insign. with p = 0.337
Conf_ShareC	70.0	70.0	H_1=0.07, insign. with p = 0.791
Conf_ShareD	70.0	70.0	H_1=0.03, insign. with p = 0.860

When alpha is taken as 0.05, confidence in the sales forecasts in quadrant-A and quadrant-B shows significant difference. Forecasters' confidence in the best case quadrant; i.e., "A" where technology adoption rate is high and the state of the economy is stronger, the moderate quadrant i.e.,"B" where technology adoption rate is high and the state of the economy is weaker, is significantly higher when scenario narratives are presented.

Figure-10 demonstrates the median confidence in sales forecasts in G1_NoNar and G2_Nar. Interestingly, the computed median confidence is always higher when forecasters review advice of scenario narratives during their forecasting tasks than those who do not review any information beyond scenario conditions. On the other hand, statistically, the median difference can only be proved in the confidence in sales forecast-A and the confidence in sales forecasts-B.

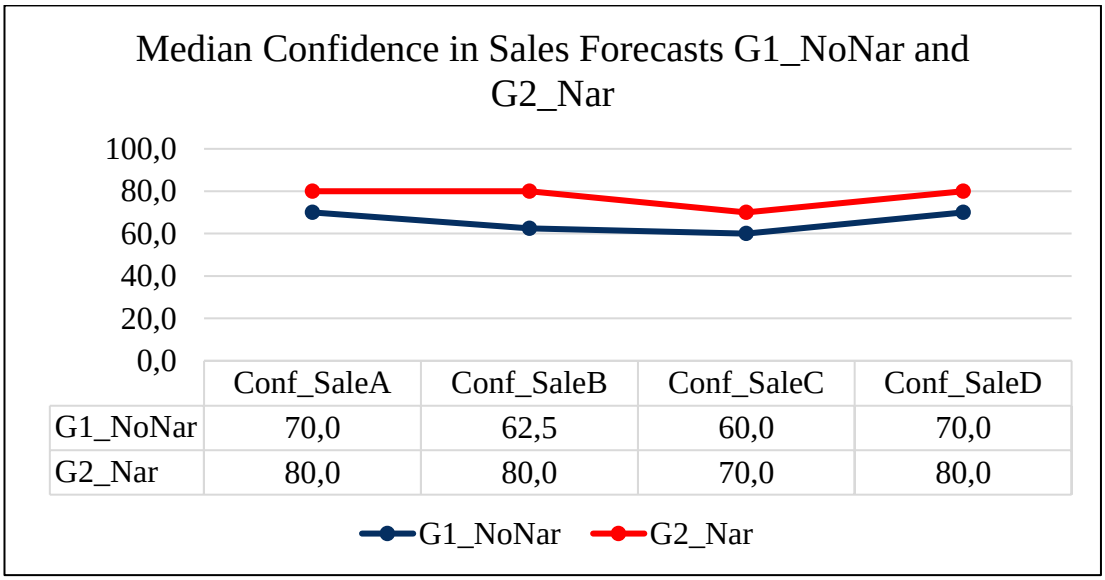
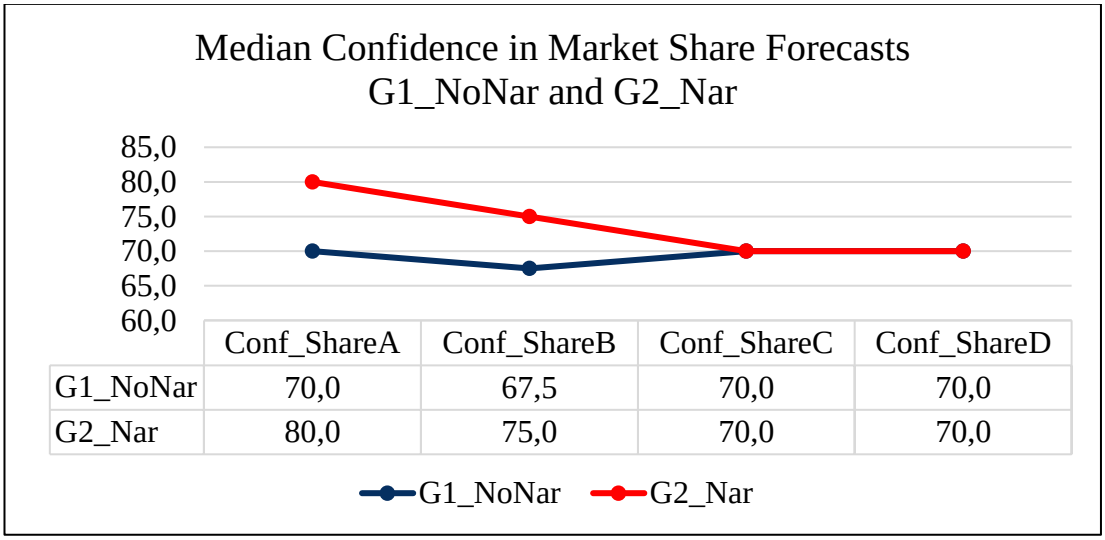


Figure 10. Median confidence in sales forecasts in G1_NoNar and G2_Nar

The results of the analysis indicate that confidence in sales forecasts-A and sales forecasts-B are higher when forecasters review scenario narratives (for sales forecasts-A, the test statistics are H_1=4.35, p = 0.037; for sales forecasts-B, the test statistics are H_1=3.98, sign. with p = 0.046). Reviewing scenario narratives boosts confidence in sales forecasts only in two of the four quadrants. The median difference in confidence in the remaining quadrants is insignificant. The median confidence in market share forecasts is not significant in any of the quadrants at all. Reviewing scenario quadrants does not have a significant influence on forecasters' confidence in their market share forecasts.

Median confidence in market share forecasts in quadrant-C and quadrant-D are calculated as the same number. All test statistics and p-values regarding the confidence can be seen in the Table-12 with the degrees of freedom for Kruskal-Wallis statistics equal to 1. Figure-11 demonstrate how median confidence in market share forecasts acts in G1_NoNar and G2_Nar.



	Conf_ShareA	Conf_ShareB	Conf_ShareC	Conf_ShareD
G1_NoNar	70,0	67,5	70,0	70,0
G2_Nar	80,0	75,0	70,0	70,0

Figure 11. Median confidence in market share forecasts in G1_NoNar and G2_Nar

2) How does the advice comprising risk implications affect forecasts and confidence?

The analysis started by focusing on forecasters' responses from the exit questionnaire. Exit questions #5 and #7 may provide preliminary insights into how forecasters feel about scenario advice and risk advice.

Table 13. Forecasters' median ratings for the usefulness of scenario based advice and risk based advice

	Exit questionnaire question	Median
Q5	How would you rate the usefulness of scenario based advice for forecasting?	**5.0**
Q7	How would you rate the usefulness of risk based advice for forecasting?	**6.0**

The sign test for median was applied to compare question-5 and question-7. The p-value was calculated as 0.0000 and the null hypothesis was rejected: The respondents' median rating for question-5 (i.e., usefulness of scenario based advice) is significantly different from median rating of question-7. Median of question-5 is calculated 6.0 while that of question-7 is 5.0. This shows that forecasters regard risk advice as significantly more useful than scenario narratives. This finding is consistent with the extant literature (e.g. Kahneman, Tversky, 1979; Ito, Larsen, Smith & Cacioppo, 1998) in that people make judgmental forecasts by taking dangers or threats as their reference point. After this brief insight, the Figure-12 and Figure-13 can be viewed for the boxplots and the median sales forecasts:

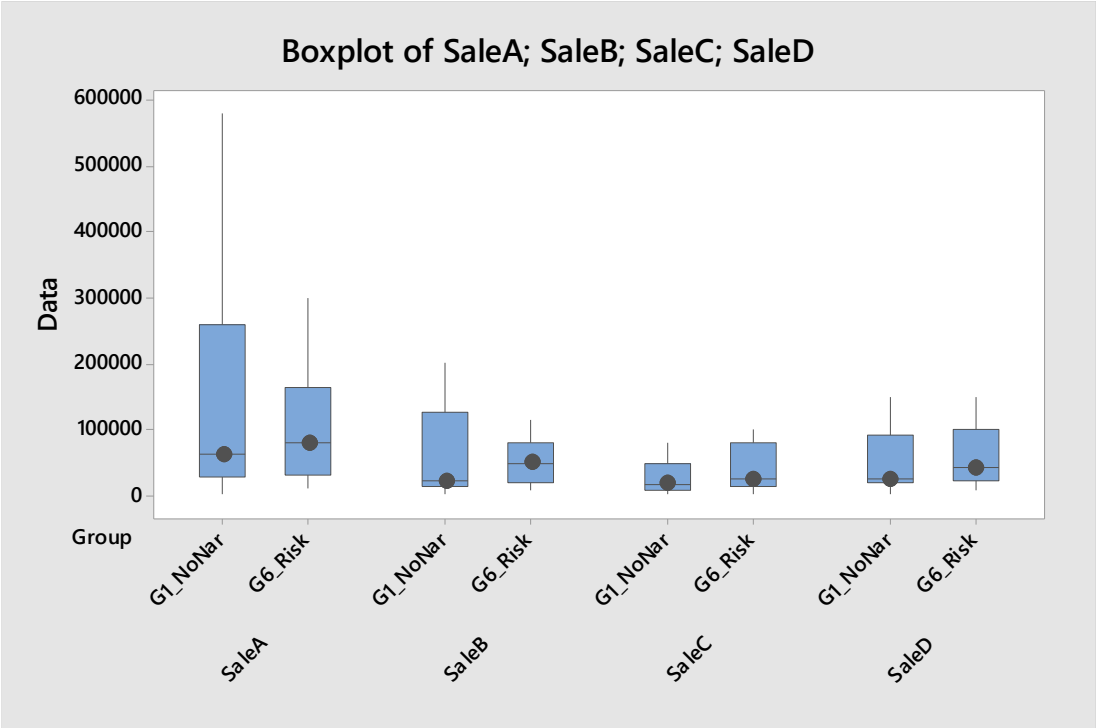


Figure 12. Boxplot of sales forecasts in G1_NoNar and G6_Risk

Median computations of sales forecasts in G6_Risk are all higher than they are in G1_NoNar. The dispersion of forecasts in the best scenario quadrant-A is larger than it is in the worst scenario presented in quadrant-C. In terms of interquartile ranges, the best scenario quadrant illustrates a broader range. There is no tight upper limit for the forecasts of the best case quadrant, whereas the worst case is limited to any pessimistic number above zero.

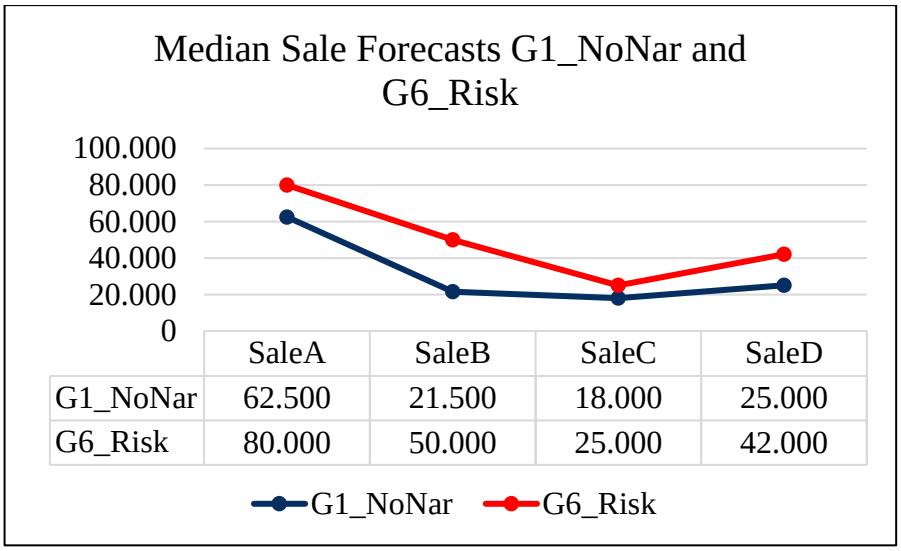


Figure 13. Median sales forecasts in G1_NoNar and G6_Risk

Table 14. Median sales and market share forecasts in G1_NoNar and G6_Risk

	G1_NoNar	**G6_Risk**	**Statistical comparison**
SalesA	62,500	80,000	H_1=0.03, insign. with p=0.855
SalesB	21,500	50,000	H_1=0.44, insign. with p=0.509
SalesC	18,000	25,000	H_1=2.73, insign. with p=0.099
SalesD	25,000	42,000	H_1=1.29, insign. with p=0.256
	G1_NoNar	**G6_Risk**	**Statistical comparison**
ShareA	25.0	23.0	H_1=0.17, insign. with p=0.680
ShareB	19.0	20.0	H_1=0.68, insign. with p=0.411
ShareC	18.0	19.0	H_1=0.48, insign. with p=0.487
ShareD	20.0	20.0	H_1=0.10, insign. with p=0.752

The first hypothesis in this question predicted that the forecasts generated after reviewing the advice mentioning risks would be lower than those generated without any advice. The analyses are presented in Table-14. The statistical evidence does not support this hypothesis. Median sales and market share forecasts of

G1_NoNar and G6_Risk are not significantly different. Forecasts generated after reviewing risk implications are not significantly different from those generated after reviewing only scenario quadrants. Neither sales forecasts nor market share forecasts are able to prove any difference in any of the quadrants.

Figure-14 takes a close look at the median market share forecasts of these test groups. Forecasters' confidence in their sales and market share forecasts in G1_NoNar and G6_Risk can be viewed Figure-15, Figure-16, Figure-17 and Figure-18.

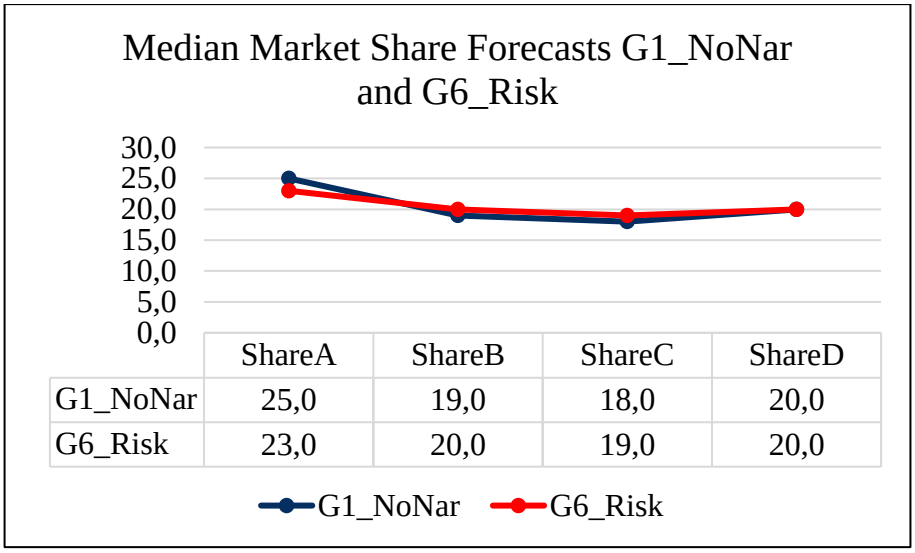


Figure 14. Median market share forecasts in G1_NoNar and G6_Risk

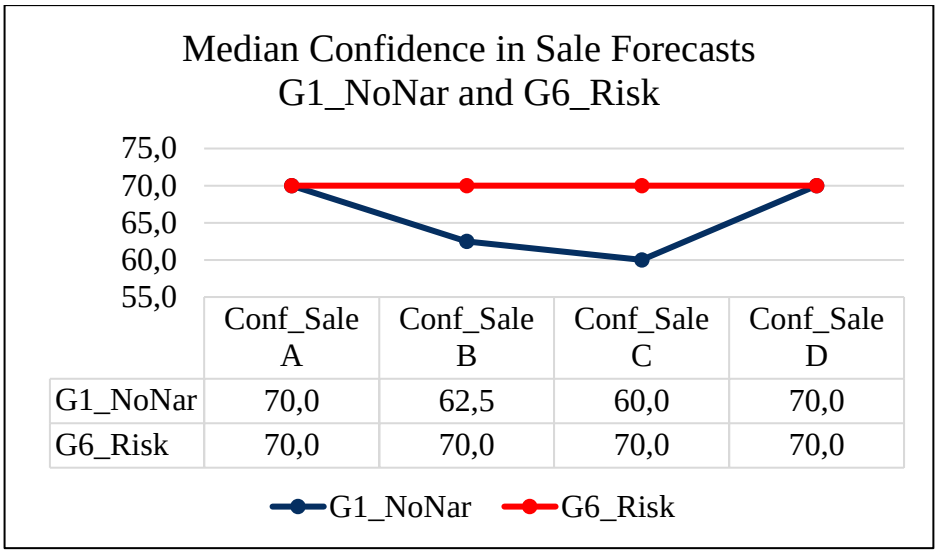


Figure 15. Median confidence in sales forecasts in G1_NoNar and G6_Risk

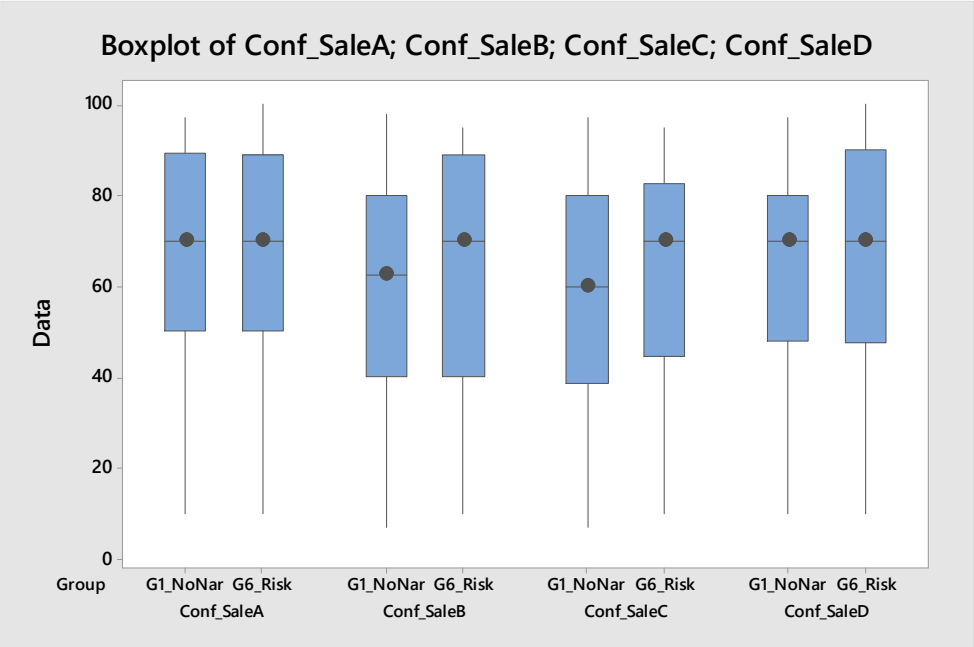


Figure 16. Boxplot of confidence in sales forecasts in G1_NoNar and G6_Risk

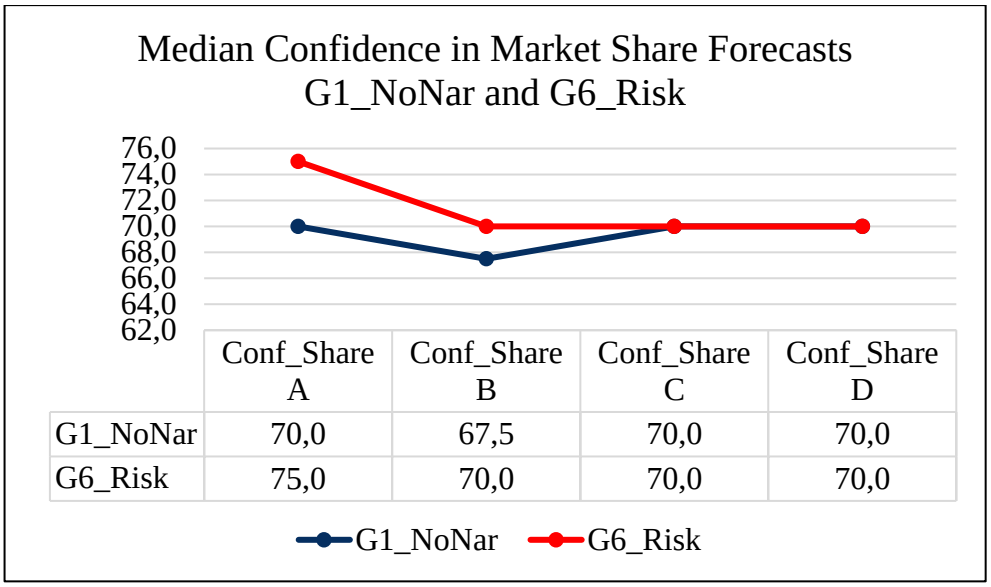


Figure 17. Median confidence in market share forecasts in G1_NoNar and G6_Risk

Table 15. Confidence in sales and market share forecasts in G1_NoNar and G6_Risk

	G1_NoNar	**G6_Risk**	**Statistical comparison**
Conf_SalesA	70.0	70.0	H_1=0.38, insign. with p=0.540
Conf_SalesB	62.5	70.0	H_1=1.18, insign. with p=0.278
Conf_SalesC	60.0	70.0	H_1=0.60, insign. with p=0.440
Conf_SalesD	70.0	70.0	H_1=1.13, insign. with p=0.287
	G1_NoNar	**G6_Risk**	
Conf_ShareA	70.0	75.0	H_1=0.58, insign. with p=0.445
Conf_ShareB	67.5	70.0	H_1=0.60, insign. with p=0.440
Conf_ShareC	70.0	70.0	H_1=0.87, insign. with p=0.352
Conf_ShareD	70.0	70.0	H_1=0.03, insign. with p=0.869

The research hypothesis predicted forecasters' confidence after reviewing advice comprising risks would be lower than their confidence without reviewing any scenario advice (i.e., risks or narratives). Table-15 illustrates how median confidence

varies among the quadrants. Results from each quadrant of G1_NoNar should be statistically compared to that of G6_Risk. Median confidence in the sales and market share forecasts of G1_NoNar and G6_Risk appear insignificantly different with an alpha value of 0.05. This shows that, in contrast to the hypothesis, forecasters' confidence does not differ through reviewing risk implications. All test statistics and p-values comparing forecasters' confidence with reviewing risk implications and those made without reviewing any content related to scenarios can be seen in Table-15.

An ILS quadrant can be enriched with scenario narratives or risk implications. An advisor does not necessarily have to provide all of the information at once, yet can focus on only a relevant scenario's risk implications per quadrant. The next research hypothesis predicted forecasters' confidence after reviewing advice comprising risks is likely to be lower than their confidence after reviewing advice comprising scenario narratives. In order to make this comparison, forecasters were provided with forecast advice based on scenario narratives in G2_Nar and forecast advice of risk implications were presented to individuals in G6_Risk during the forecasting session.

Figure-18 illustrates the boxplot of sales forecasts made in test groups G2_Nar and G6_Risk. The interquartile range appears broad for sales forecasts-A compared to the remaining quadrants. The spread of forecasts is large for sales forecasts-A and it is narrow for sales forecasts-C for both test groups. The last section in this chapter discusses the statistical comparisons for the best case quadrant (A) variance and the worst case quadrant (C) variance.

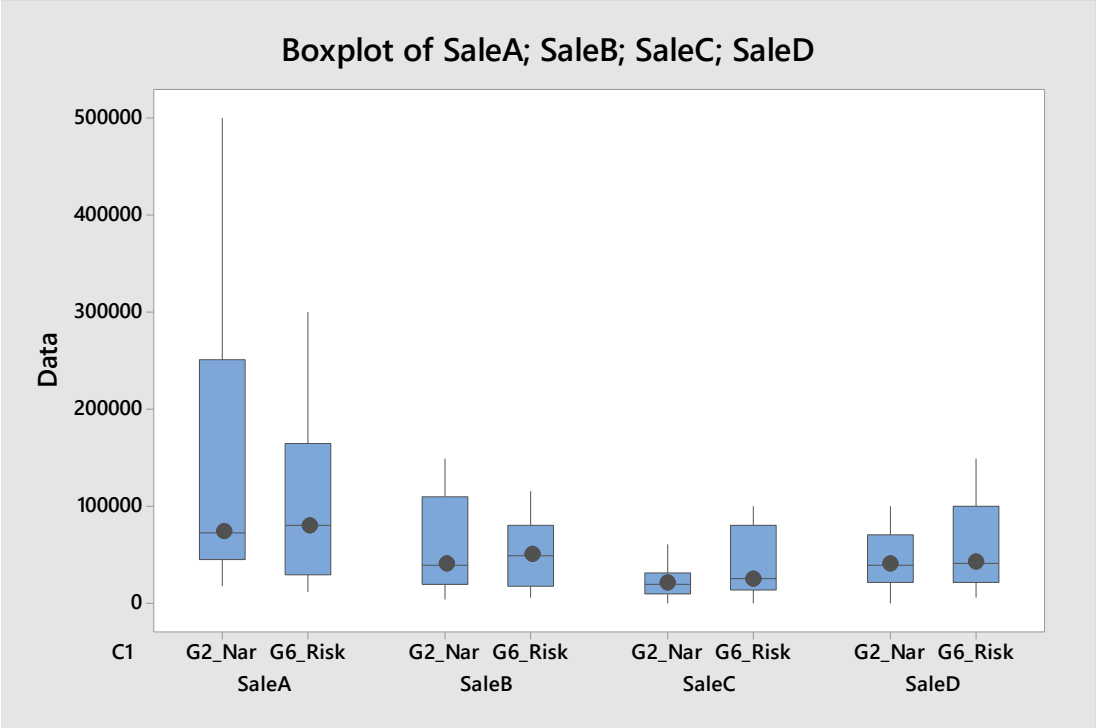


Figure 18. Boxplot of sales forecasts in G2_Nar and G6_Risk

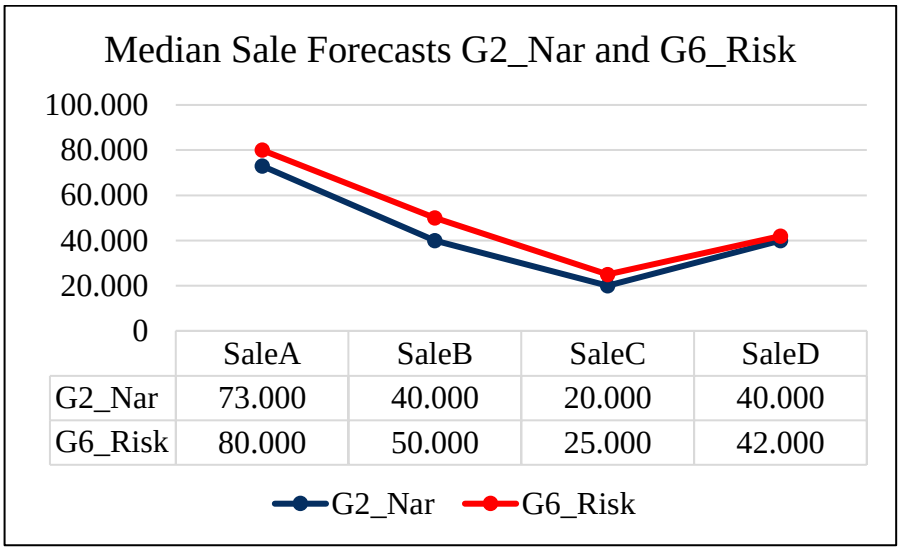
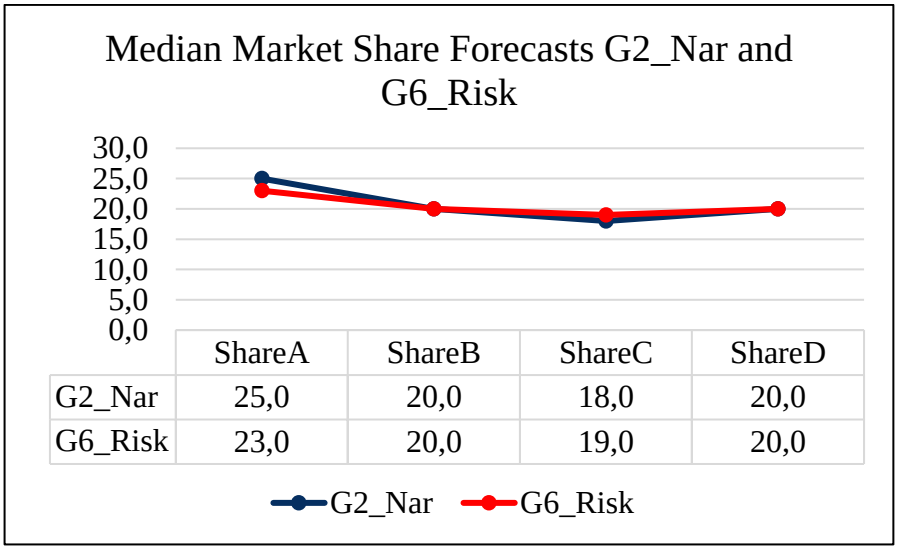


Figure 19. Median sales forecasts in G2_Nar and G6_Risk

Figure-19 illustrates the median sales forecasts of G2_Nar and G6_Risk. In all quadrants, the median sales forecast of G6_Risk is found slightly higher than that of G2_Nar. That does not guarantee a significant difference, data analysis will prove whether there is any significant difference when forecasters review risk implications pertaining to that scenario quadrant rather than scenario narratives depicting the future.



	ShareA	ShareB	ShareC	ShareD
G2_Nar	25,0	20,0	18,0	20,0
G6_Risk	23,0	20,0	19,0	20,0

Figure 20. Median market share forecasts in G2_Nar and G6_Risk

Figure-20 illustrates the market share forecasts for each quadrant in G2_Nar and G6_Risk. Median market share forecasts of G2_Nar and G6_Risk are computed as the same in the moderate case scenarios B and D and they are about the same figures in the polar quadrants; i.e., the best case presented by quadrant A and the worst case presented by quadrant C.

Table 16. Sales and market share forecasts in G2_Nar and G6_Risk

	G2_Nar	**G6_Risk**	**Statistical comparison**
SalesA	73,000	80,000	H_1=0.60, insign. with p=0.439
SalesB	40,000	50,000	H_1=0.00, insign. with p=0.961
SalesC	20,000	25,000	H_1=2.57, insign. with p=0.109
SalesD	40,000	42,000	H_1=0.23, insign. with p=0.632
	G2_Nar	**G6_Risk**	
ShareA	25.0	23.0	H_1=0.05, insign. with p=0.819
ShareB	20.0	20.0	H_1=0.91, insign. with p=0.341
ShareC	18.0	19.0	H_1=1.09, insign. with p=0.297
ShareD	20.0	20.0	H_1=2.54, insign. with p=0.111

Sales and market share forecasts made after reviewing scenario narratives (G2_Nar), are not statistically different than those generated after reviewing risk implications (G6_Risk). The Kruskall-Wallis test statistic with degrees of freedom of 1 and the pertinent p-value is provided in the Table-16. Taking the alpha value equal to 0.05, the null hypothesis cannot be rejected; i.e., their median is equal.

The next item is the forecasters' confidence in their forecasts. Though the research hypothesis predicted forecasters' confidence after reviewing advice comprising risks is likely to be lower than their confidence after reviewing advice comprising scenario narratives, the statistical results donot support this. After reviewing risk implications (G6_Risk), confidence in neither sales nor market share forecasts is not significantly different than those generated after reviewing scenario narratives (G2_Nar).

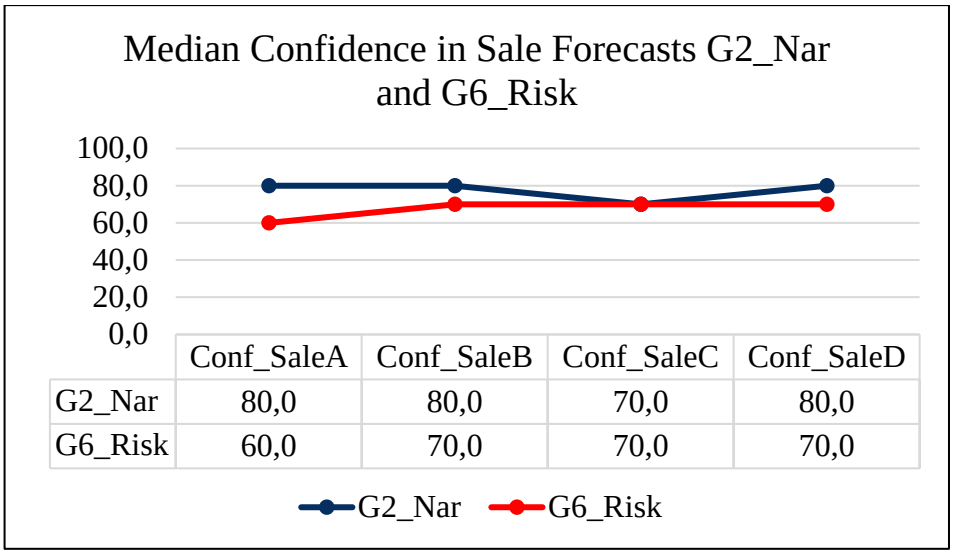


Figure 21 Median confidence in sales forecasts in G2_Nar and G6_Risk

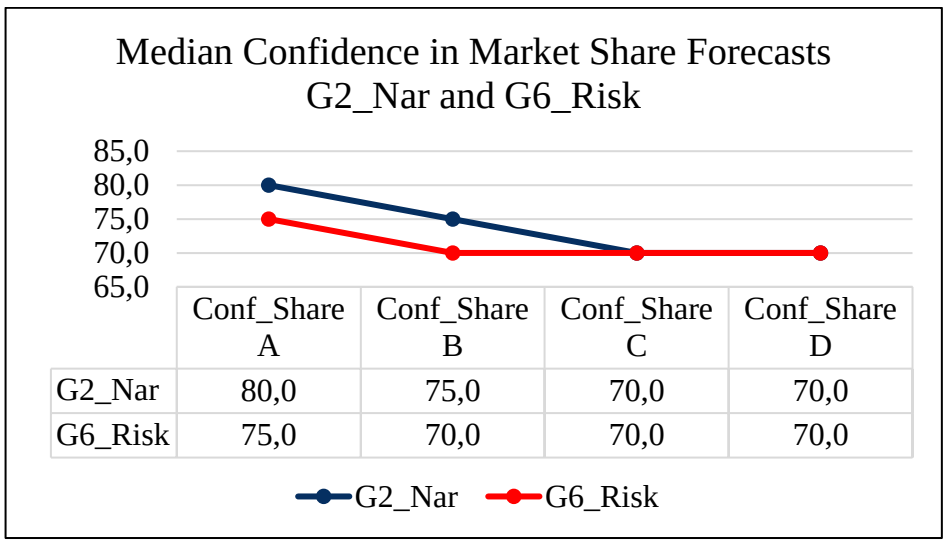


Figure 22. Median confidence in market share forecasts in G2_Nar and G6_Risk

With 95% confidence, Kruskal Wallis test shows forecasters' confidence in sales and market share forecasts do not significantly change based on these completely different scenario contents i.e., one test group presents only narratives and the other test group presents only risk implications within the forecast advice.

All test statistics and computations specific to the confidence can be viewed in Table-17. Figure-21 and Figure-22 illustrate how forecasters' confidence acts in G2_Nar and G6_Risk.

Table 17. Confidence in sales and market share forecasts in G2_Nar and G6_Risk

	G2_Nar	**G6_Risk**	**Statistical comparison**
Conf_SalesA	80.0	60.0	H_1=1.97, insign. with p=0.160
Conf_SalesB	80.0	70.0	H_1=0.55, insign. with p=0.459
Conf_SalesC	70.0	70.0	H_1=0.03, insign. with p=0.854
Conf_SalesD	80.0	70.0	H_1=0.00, insign. with p=0.964
	G2_Nar	**G6_Risk**	
Conf_ShareA	80.0	75.0	H_1=0.01, insign. with p=0.907
Conf_ShareB	75.0	70.0	H_1=0.02, insign. with p=0.875
Conf_ShareC	70.0	70.0	H_1=0.63, insign. with p=0.429
Conf_ShareD	70.0	70.0	H_1=0.01, insign. with p=0.904

Going one step further, the next research hypothesis made a generalization and predicted the following: Regardless of the message, reviewing more information would progressively increase forecasters' confidence in sales. This time the research zooms into four test groups: G2_Nar where forecasters take narratives as forecast advice, G6_Risk where they take risk implications as forecast advice, G5_NarRisk where they take forecast advice jointly consisting of the narrative and its risk implications at once. The research initiates from the control test group, G1_NoNar where no information is supplied to forecasters yet they only receive the scenario conditions. Figure-23 and Figure-24 illustrate the confidence for sales forecasts of these four test groups simultaneously. The boxplot shows the interquartile range of confidence is similar for all focused groups.

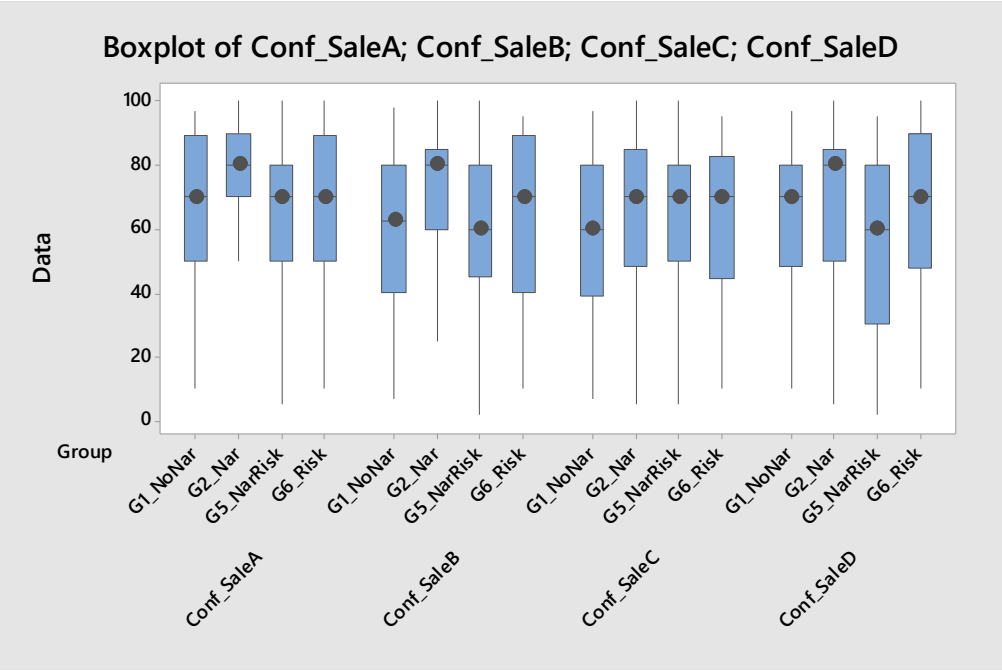
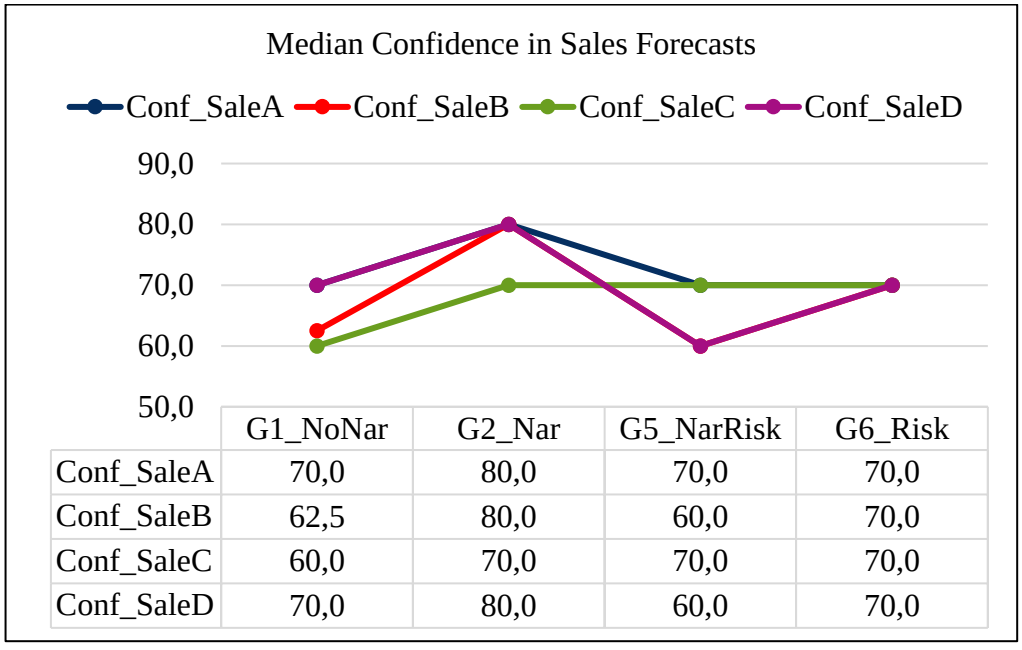


Figure 23. Boxplot of confidence in sales forecasts in G1_NoNar, G2_Nar, G5_NarRisk and G6_Risk



	G1_NoNar	G2_Nar	G5_NarRisk	G6_Risk
Conf_SaleA	70,0	80,0	70,0	70,0
Conf_SaleB	62,5	80,0	60,0	70,0
Conf_SaleC	60,0	70,0	70,0	70,0
Conf_SaleD	70,0	80,0	60,0	70,0

Figure 24. Median confidence in sales forecasts in G1_NoNar, G2_Nar, G5_NarRisk and G6_Risk

There are four test groups where different level of information is presented to forecasters before they work on any sales forecasts. In G2_Nar, participants reviewed scenario narratives and in G6_Risk they read risk implications. G5_NarRisk received two information sets at once, both scenario narratives and risk implications. In G1_NoNar, participants only reviewed scenario conditions.

The research indicates reviewing only "scenario conditions" as level-0, reviewing one type of information (it can be either the scenario narrative or the risk implication) as level-1, two types of information (both scenario narrative and the risk is presented at once) as level-2. The Kruskal-Wallis test statistics are employed with an alpha value of 0.05. The findings indicate that reviewing more information could influence forecasters' confidence in sales forecasts in a significant way: Confidence in sales forecasts of both A and B is significantly higher in G2_Nar than that in G1_NoNar. Interestingly, countering the hypothesis' prediction, in the best case quadrant of G5_NarRisk where two sets of information were provided, confidence is significantly lower than that in G2_Nar. Thus, reviewing more information does not guarantee a boost in individuals' confidence in their sales forecasts.

Table-18 compares the forecasters' confidence in their sales forecasts by group. The table indicates the increase in the amount of information supplied based on the forecast advice provided.

Table 18. Comparison of confidence in sales forecasts for level changes

	Levels	Statistical results		Interpretation
G1_NoNar to G2_Nar	From Level-0 to Level-1	**Conf_SalesA**	H_1=4.35, sign. with p = 0.037	In quadrants A and B of G2_Nar, median sales confidence is significantly higher than it is in G1_NoNar.
		Conf_SalesB	H_1=3.98, sign. with p = 0.046	
		Conf_SalesC	H_1=0.97, insign. with p = 0.326	
		Conf_SalesD	H_1=1.81, insign. with p = 0.178	
G2_Nar to G5_NarRisk	From Level-1 to Level-2	**Conf_SalesA**	H_1=5.80, sign. with p=0.016	In quadrant-A of G2_Nar, median sales confidence is significantly higher than it is in G5.
		Conf_SalesB	H_1=2.68, insign. with p=0.102	
		Conf_SalesC	H_1=0.21, insign. with p=0.649	
		Conf_SalesD	H_1=2.64, insign. with p=0.105	
G1_NoNar to G6_Risk	From Level-0 to Level-1	**Conf_SalesA**	H_1=0.38, insign. with p=0.540	No median difference in confidence in sales forecasts.
		Conf_SalesB	H_1=1.18, insign. with p=0.278	
		Conf_SalesC	H_1=0.60, insign. with p=0.440	
		Conf_SalesD	H_1=1.13, insign. with p=0.287	
G6_Risk to G5_NarRisk	From Level-1 to Level-2	**Conf_SalesA**	H_1=0.58, insign. with p=0.445	No median difference in confidence in sales forecasts.
		Conf_SalesB	H_1=0.37, insign. with p=0.541	
		Conf_SalesC	H_1=0.06, insign. with p=0.801	
		Conf_SalesD	H_1=2.10, insign. with p=0.148	
G1_NoNar to G5_NarRisk	From Level-0 to Level-2	**Conf_SalesA**	H_1=0.03, insign. with p=0.874	No median difference in confidence in sales forecasts.
		Conf_SalesB	H_1=0.14, insign. with p=0.707	
		Conf_SalesC	H_1=0.37, insign. with p=0.545	
		Conf_SalesD	H_1=0.11, insign. with p=0.741	

It is not possible to make a generalization that supplying more information will cause an increase in the median confidence. It seems that confidence does not increase in a progressive way, it appears case-specific. Forecasters' confidence in sales forecasts did not significantly differ in G5_NarRisk or in G6_Risk relative to

those who only reviewed scenario conditions in G1_NoNar. The confidence did not prove any difference between G6_Risk, where forecasters reviewed only risks and G5_NarRisk, where forecasters reviewed both narratives and risks as forecast advice.

3) Can any systematic patterns be identified within the sales forecasts of the ILS setting?

The research hypothesis predicted the polar worst quadrant (C) may be drawing the moderate quadrants towards itself as forecasters may not be able to differentiate the level of negativeness. First, the plots of median sales forecasts pertaining to G1_NoNar, G2_Nar, G5_NarRisk and G6_Risk can be viewed in Figure-25. As additional insights, Figure-25 shows that sales forecasts for quadrant-A always display a more dispersed pattern than those in the other quadrants. On the other hand, sales forecasts in quadrant-C, which is the worst case quadrant among the four, display a smaller spread compared to other quadrants. Figure-26 provides a close look at the median sales forecasts computed in each test group.

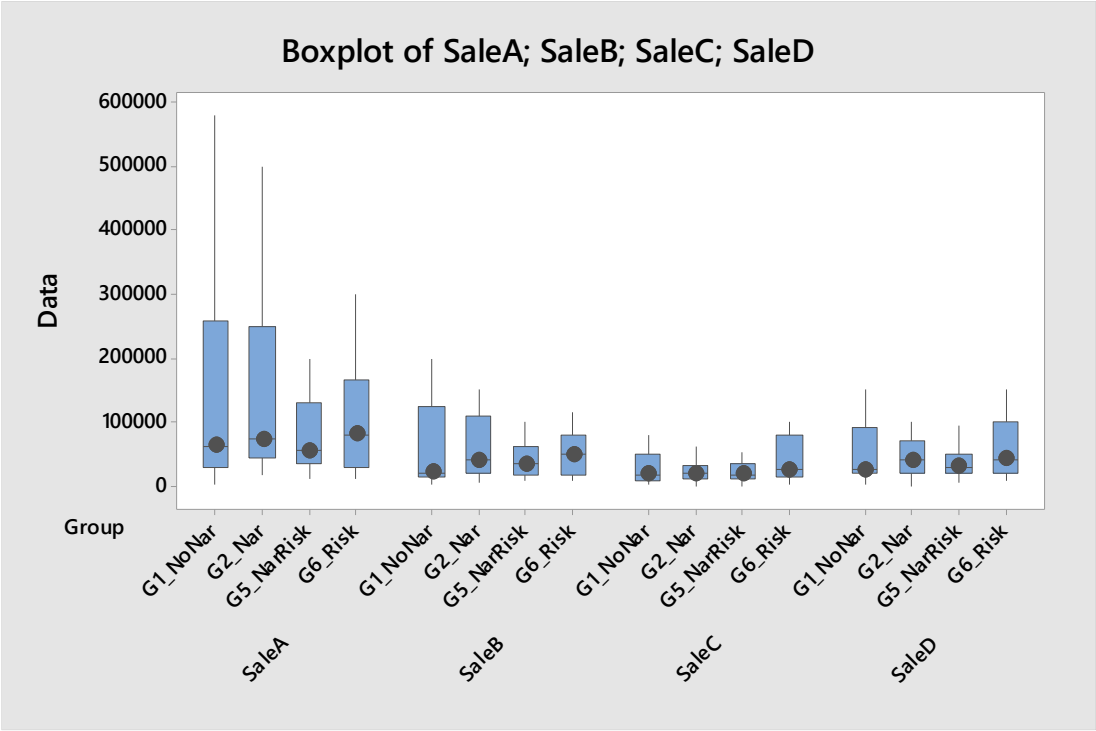
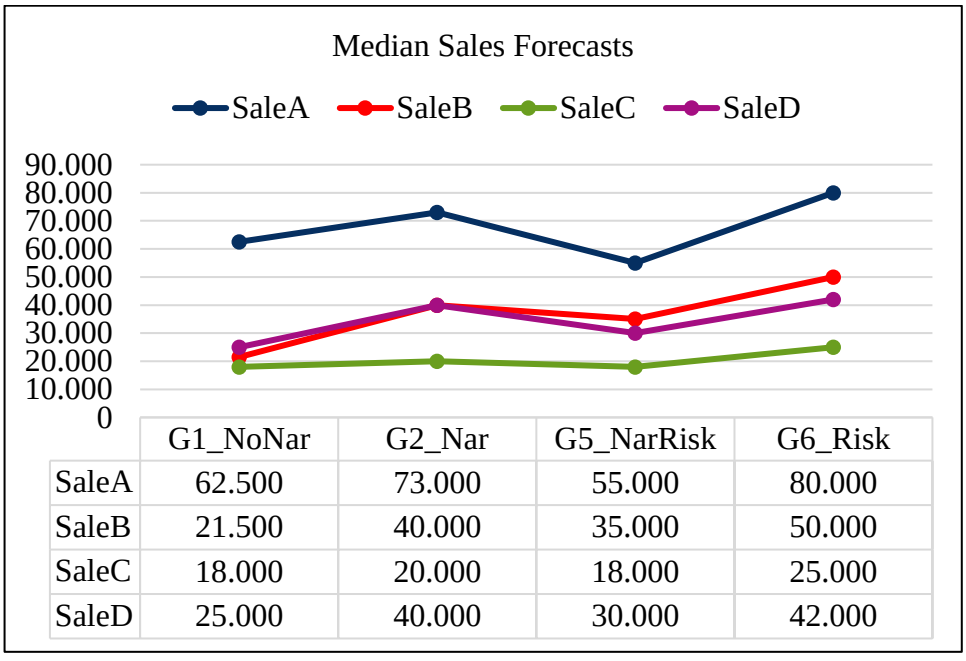


Figure 25. Boxplot of sales forecasts in G1_NoNar, G2_Nar, G5_NarRisk and G6_Risk



	G1_NoNar	G2_Nar	G5_NarRisk	G6_Risk
SaleA	62.500	73.000	55.000	80.000
SaleB	21.500	40.000	35.000	50.000
SaleC	18.000	20.000	18.000	25.000
SaleD	25.000	40.000	30.000	42.000

Figure 26. Median sales forecasts in G1_NoNar, G2_Nar, G5_NarRisk and G6_Risk

Quadrant-A represents the positive-positive scenario, quadrant-C represents the negative-negative scenario, and quadrant-B and D represent positive-negative and negative-positive scenarios respectively. In each test group, the median sales forecasts found for quadrant-A are always higher than those for quadrants B, C and D. As expected, the computed median sales forecasts for the moderate quadrants B and D are close to each other. In G1_NoNar, the calculated median sales forecasts of quadrants B, C, D are extremely close to each other. This work questions whether it is a significant systematic pattern between some quadrants within the test group. This finding has the potential to reveal some decision making biases. This comparison will explore whether scenario content influences forecasters to apply a significant differentiation in their forecasts among scenario quadrants.

The tone of each quadrant is examined since each of them could generate different feelings of affection. Quadrant-B and quadrant-D represent moderate tones: (positive-negative) and (negative-positive). On the other hand, quadrant-A (positive-positive) represents the best case scenario among the four. Quadrant-C (negative-negative) is represents the worst case quadrant among the four. It would not be surprising to expect the forecasters to make insignificantly different forecasts for quadrant-B and quadrant-D. On the other hand, is one of the polar quadrants drawing the moderate ones (B and D) towards itself? Is there a systematic pattern anywhere within the test group?

The data does not meet the requirements of a parametric test. Since the sales forecasts generated for quadrants A, B, C and D are related samples within the test group, the Wilcoxon test is expected to provide the most reliable statistical results. The Wilcoxon test is based upon ranking observations and assessing whether

their population mean ranks differ. The Wilcoxon test tries to detect any shifts between paired differences.

The Wilcoxon signed rank test was applied to test the sales forecast difference of each quadrant pair AB, AC, AD, BC, BD and DC. While the null hypothesis test claims the median difference is equal to zero, the statistical findings indicate that all forecast pairs, except BD, are significantly different. Wilcoxon signed rank test results for G1_NoNar, G2_Nar, G5_NarRisk and G6_Risk are presented in Table-19 with the test statistic denoted by W and the p-value. The intersection of each column and row indicates its paired test result. Quadrants are tested by Wilcoxon signed rank test with an alpha level equal to 0.05, “sign.” means the corresponding median difference of that pair is significant whereas “insign.” means their median difference is insignificant.

Table 19. Wilcoxon signed rank test results for sales forecasts in G1_NoNar, G2_Nar, G5_NarRisk and G6_Risk

	G1_NoNar			**G2_Nar**		
	SalesA	**SalesB**	**SalesC**	**SalesA**	**SalesB**	**SalesC**
SalesA	-	-	-	-	-	-
SalesB	W=822.0, sign. with p=0.000	-	-	W=850.0, sign. with p=0.000	-	-
SalesC	W=858.0, sign. with p=0.000	W=746.0, sign. with p=0.000	-	W=889.0, sign. with p=0.000	W=816.5, sign. with p=0.000	-
SalesD	W=861.0, sign. with p=0.000	W=371.0, insign. with p=0.605	W=34.5, sign. with p=0.000	W=864.5, sign. with p=0.000	W=536.5, insign. with p=0.172	W=21.5, sign. with p=0.000
	G5_NarRisk			**G6_Risk**		
	SalesA	**SalesB**	**SalesC**	**SalesA**	**SalesB**	**SalesC**
SalesA	-	-	-	-	-	-
SalesB	W=689.5, sign. with p=0.000	-	-	W=700.5, sign. with p=0.000	-	-
SalesC	W=860.0, sign. with p=0.000	W=726.0, sign. with p=0.000	-	W=696.5, sign. with p=0.000	W=696.0, sign. with p=0.000	-
SalesD	W=777.0, sign. with p=0.000	W=449.0, insign. with p=0.414	W=134.0, sign. with p=0.000	W=768.0, sign. with p=0.000	W=432.0, insign. with p=0.376	W=197.0, sign. with p=0.012

W denotes Wilcoxon statistic.

It is proven that forecasters can strongly differentiate the best case (A) and the worst case quadrant (C). Quadrant B and D represent the moderate conditions, and forecasters treat them in similar tones; i.e., neither too good nor too bad. It appears that forecasters may be falling short to differentiate two different moderate scenarios. This signals the use of affect heuristics. They simply choose to evaluate them in the same category, as forecasters are not encouraged to consider whether one of the driving forces may bring a higher influence on their forecasts. While the analytical structure of the ILS method offers a systematical method to explore the future, it also constraints scenario users. The method falls short of prompting the forecasters to evaluate the conditions with their distinctive impact value, yet they presume each of the two driving forces has a standardized impact. Forecasters remain confined due to the affect heuristic, they are exposed to take an emotional response i.e., the affect heuristics to differentiate the conditions. While the extent of technology adoption rate and state of the economy should be pushing the wearable technology product sales to different levels, none of the forecasters questioned this requirement neither during the session nor after the session.

Test results show that forecasters can differentiate the polar quadrants A from C, they can differentiate both A and C from B, D strongly even when they didn't have any information but the ILS framework. Although each quadrant is painting a different circumstance, G1_NoNar could push forecasters fall into the trap of considering scenarios closer due to holding no information (i.e., less vividness). The analysis showed that in case forecasters review neither scenario narratives nor risk implications, they are as likely as to give differentiated forecasts for different scenarios. This is an important clue to improve forecasting with scenarios: Using the

ILS framework assist forecasters to elaborate on different scenarios systematically independent from the extent or the type of information presented within the ILS framework.

4) Does forecasters' confidence change significantly from one quadrant to another in an ILS framework?

The next hypothesis predicted the forecasters' confidence wouldn't change significantly within ILS quadrants. Figure-27 provides a preliminary insight on the behavior of forecasters' confidence in each quadrant and in each group.

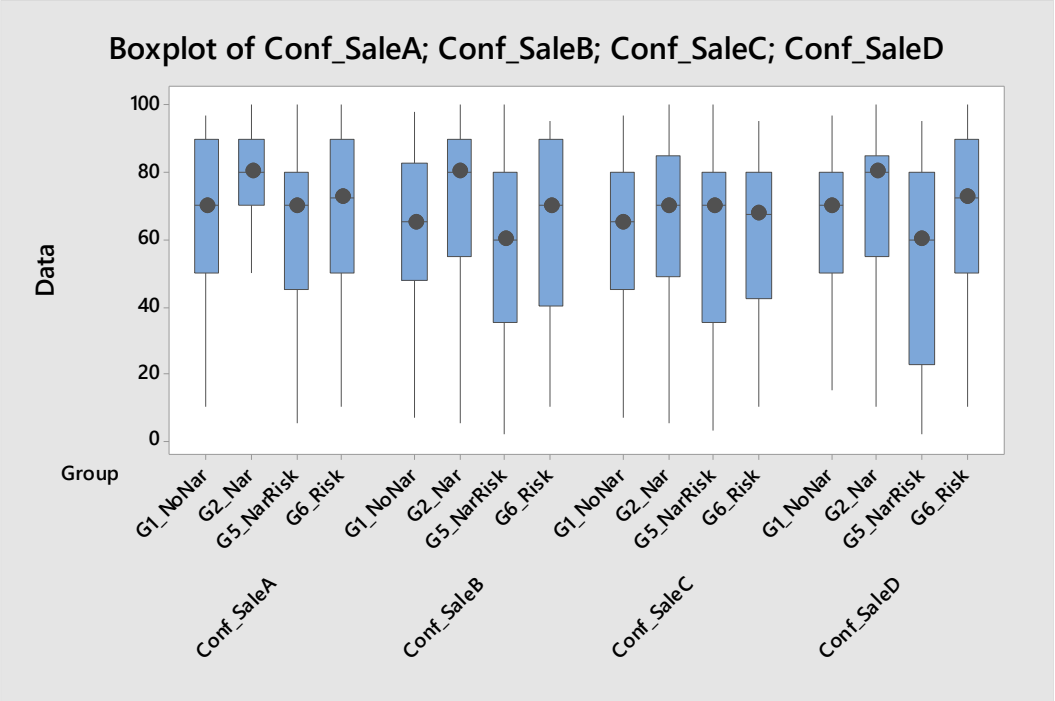
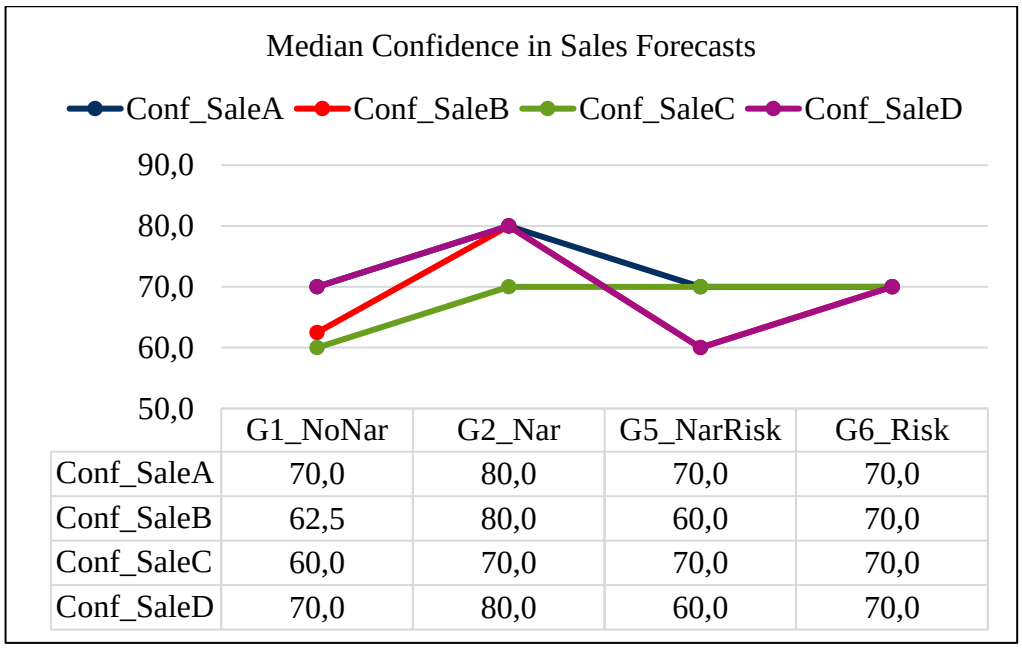


Figure 27. Boxplot of confidence in sales forecasts in G1_NoNar, G2_Nar, G5_NarRisk and G6_Risk

Wilcoxon signed rank test is used to check the median confidence difference of sales forecasts in each test group. With an alpha level equal to 0.05, the findings indicate that there is not a significant confidence difference within any of the pairs

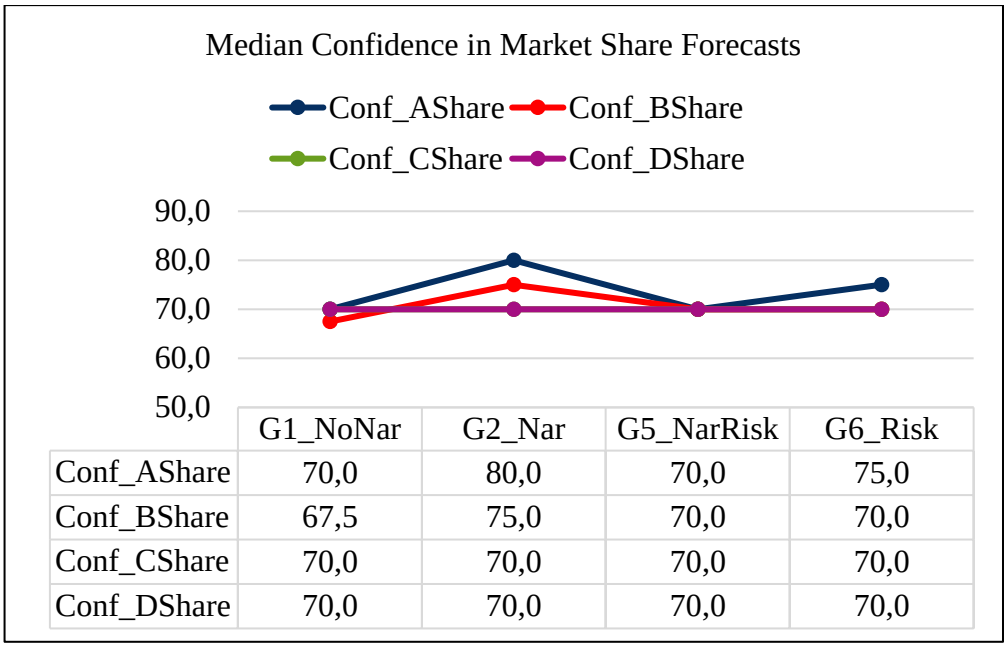
(i.e., AB, AC, AD, BC, BD and CD) in G1_NoNar, G5_NarRisk and G6_Risk. The statistical results indicate that in G2_Nar, confidence in sales forecasts-A is significantly higher than B, C and D (respectively with statistics W=256.5, pvalue=0.012; W=366.0, p=0.001, W=347.0, pvalue=0.005). The analysis shows that the median confidence in the best case quadrant forecasts of G2_Nar is significantly higher than other quadrants within the test group. This gives a clue that an optimistic scenario narrative may play a significant role to boost forecasters' confidence in their sales forecasts. Wilcoxon signed rank test statistic and the pertinent p-value for each comparison can be viewed in the table presented in Table-20.

Following median confidence of sales forecasts; median confidence of market share forecasts were examined as well. The statistical findings can be viewed in Table-21. There is no significant median confidence difference evident within any of the study groups.



	G1_NoNar	G2_Nar	G5_NarRisk	G6_Risk
Conf_SaleA	70,0	80,0	70,0	70,0
Conf_SaleB	62,5	80,0	60,0	70,0
Conf_SaleC	60,0	70,0	70,0	70,0
Conf_SaleD	70,0	80,0	60,0	70,0

Figure 28. Median confidence in sales forecasts in G1_NoNar, G2_Nar, G5_NarRisk and G6_Risk



	G1_NoNar	G2_Nar	G5_NarRisk	G6_Risk
Conf_AShare	70,0	80,0	70,0	75,0
Conf_BShare	67,5	75,0	70,0	70,0
Conf_CShare	70,0	70,0	70,0	70,0
Conf_DShare	70,0	70,0	70,0	70,0

Figure 29. Median confidence of market share forecasts in G1_NoNar, G2_Nar, G5_NarRisk and G6_Risk

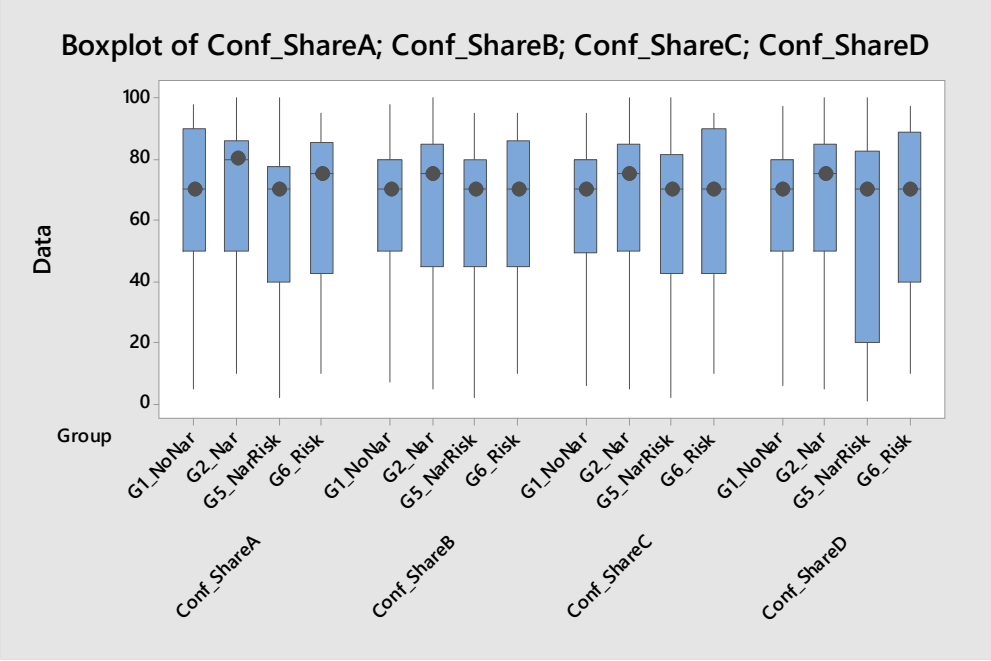


Figure 30. Boxplot of confidence of market share forecasts in G1_NoNar, G2_Nar, G5_NarRisk and G6_Risk

Table 20. Pairwise comparisons of confidence in sales forecasts in G1_NoNar, G2_Nar, G5_NarRisk and G6_Risk

	G1_NoNar			G2_Nar		
	Conf_SalesA	**Conf_SalesB**	**Conf_SalesC**	**Conf_SalesA**	**Conf_SalesB**	**Conf_SalesC**
Conf_SalesA	-	-	-	-	-	-
Conf_SalesB	W=271.0, insign. with p=0.050	-	-	W=256.5, sign. with p=0.012	-	-
Conf_SalesC	W=278.5, insign. with p=0.088	W=223.5, insign. with p=0.638	-	W=366.0, sign. with p=0.001	W=118.0, insign. with p=0.052	-
Conf_SalesD	W=281.0, insign. with p=0.173	W=201.5, insign. with p=0.367	W=182.5, insign. with p=0.456	W=347.0, sign. with p=0.005	W=157.0, insign. with p=0.574	W=97.5, insign. with p=0.137
	G5_NarRisk			**G6_Risk**		
	Conf_SalesA	**Conf_SalesB**	**Conf_SalesC**	**Conf_SalesA**	**Conf_SalesB**	**Conf_SalesC**
Conf_SalesA	-	-	-	-	-	-
Conf_SalesB	W=237.5, insign. with p=0.249	-	-	W=196.0, insign. with p=0.194	-	-
Conf_SalesC	W=258.0, insign. with p=0.852	W=166.0, insign. with p=0.406	-	W=183.0, insign. with p=0.353	W=152.0, insign. with p=0.966	-
Conf_SalesD	W=331.0, insign. with p=0.214	W=231.0, insign. with p=0.779	W=324.5, insign. with p=0.437	W=118.0, insign. with p=0.945	W=91.0, insign. with p=0.157	W=58.5, insign. with p=0.248

Table 21. Pairwise comparisons of confidence of market share forecasts in G1_NoNar, G2_Nar, G5_NarRisk and G6_Risk

	G1_NoNar			G2_Nar		
	Conf_ShareA	**Conf_ShareB**	**Conf_ShareC**	**Conf_ShareA**	**Conf_ShareB**	**Conf_ShareC**
Conf_ShareA	-	-	-	-	-	-
Conf_ShareB	W=223.0, insign. with p=0.106	-	-	W=217.5, insign. with p=0.143	-	-
Conf_ShareC	W=201.0, insign. with p=0.307	W=175.0, insign. with p=0.241	-	W=231.5, insign. with p=0.065	W=110.5, insign. with p=0.546	-
Conf_ShareD	W=218.0, insign. with p=1.000	W=139.5, insign. with p=0.057	W=130.0, insign. with p=0.253	W=245.5, insign. with p=0.078	W=102.5, insign. with p=0.664	W=112.5, insign. with p=0.447
	G5_NarRisk			**G6_Risk**		
	Conf_ShareA	**Conf_ShareB**	**Conf_ShareC**	**Conf_ShareA**	**Conf_ShareB**	**Conf_ShareC**
Conf_ShareA	-	-	-	-	-	-
Conf_ShareB	W=225.5, insign. with p=0.871	-	-	W=188.5, insign. with p=0.128	-	-
Conf_ShareC	W=157.0, insign. with p=0.853	W=231.5, insign. with p=0.770	-	W=111.0, insign. with p=0.533	W=108.5, insign. with p=0.378	-
Conf_ShareD	W=260.5, insign. with p=0.194	W=239.0, insign. with p=0.041	W=286.0, insign. with p=0.141	W=200.5, insign. with p=0.313	W=155.5, insign. with p=0.620	W=127.5, insign. with p=0.987

In 95% confidence interval, the Wilcoxon signed rank test confirms the median confidence of market share forecasts does not change between the quadrants in any of the test groups.

5.2. Data Analysis and Findings of Study-1b

The research questions of Study-1b can be listed as follows:

5)	Given that forecasters first assign the likelihood of occurrence to the intuitive logic scenario quadrants, do forecasters' confidence change as a result of reviewing scenario narratives?
6)	What reference points do decision makers take when they assign likelihood of occurrence to scenarios?
7)	Do scenario narratives influence assessment of likelihood of occurrence significantly?
8)	Does assigning likelihood of occurrence to scenarios affect forecasters' confidence in their predictions?

5) Given that forecasters first assign the likelihood of occurrence to the intuitive logic scenario quadrants, do forecasters' confidence change as a result of reviewing scenario narratives?

In Study-1b, participants were first requested to review the scenario information before performing any forecasting tasks. They read and provided their likelihood of occurrence assessments for each quadrant of G3_PrNoNar and G4_PrNar, where only scenario conditions were provided in G3_PrNoNar and scenario narratives were presented in G4_PrNar. The hypothesis prediction was that,

given that forecasters first assign the likelihood of occurrence, the forecasters' confidence would be significantly higher for the positive-positive quadrant upon reviewing scenario narratives.

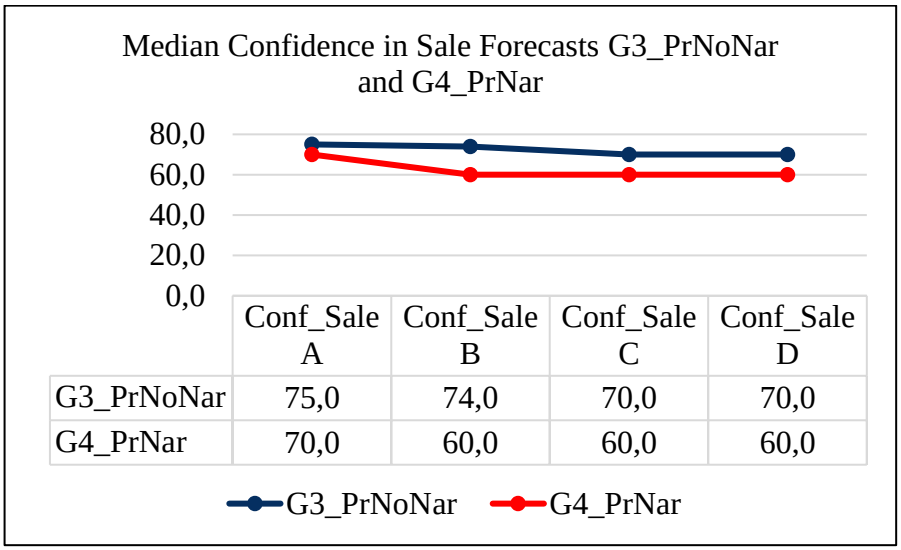
When the median confidence in sales forecasts is compared, confidence in sales-B is significantly higher in G3_PrNoNar with the Kruskal-Wallis statistic equal to 5.96 and p-value 0.015. A significant median difference is not statistically visible in the remaining sales forecasts. When the median confidence in market share forecasts is compared, a notable difference is seen between G3_PrNoNar and G4_PrNar for each quadrant. The median confidence in market share forecasts in G4_PrNar is significantly lower than G3_PrNoNar in any quadrant.

Table 22. Confidence in sales and market share forecasts in G3_PrNoNar and G4_PrNar

	G3_PrNoNar	**G4_PrNar**	**Statistical comparison**
Conf_SalesA	75.0	70.0	H_1=0.85, insign. with p=0.357
Conf_SalesB	74.0	60.0	H_1=5.96, sign. with p=0.015
Conf_SalesC	70.0	60.0	H_1=3.69, insign. with p=0.055
Conf_SalesD	70.0	60.0	H_1=2.92, insign. with p=0.087
	G3_PrNoNar	**G4_PrNar**	**Statistical comparison**
Conf_ShareA	75.0	60.0	H_1=4.03, sign. with p=0.045
Conf_ShareB	70.0	60.0	H_1=7.04, sign. with p=0.008
Conf_ShareC	70.0	60.0	H_1=4.41, sign. with p=0.036
Conf_ShareD	75.0	50.0	H_1=10.18, sign. with p=0.001

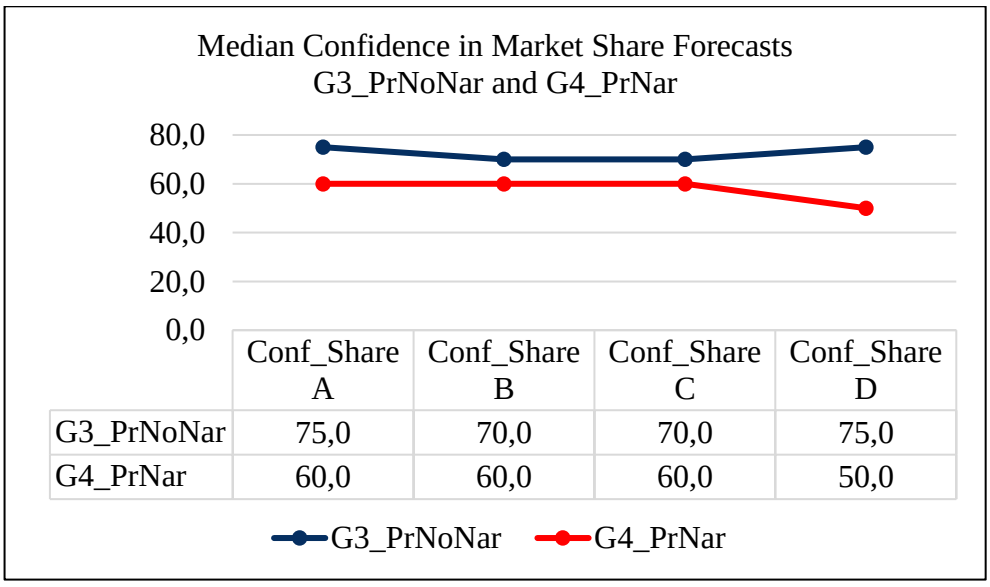
Given that the participants first assess likelihood of occurrence, reviewing scenario narratives decreases forecasters' confidence in market share forecasts. Market share forecasts are expressed from 0 to 100. As a fact, the market share

variable is not an easy variable to shift upwards or downwards for any company in the market. This is an important clue that, given that the individuals first work on the likelihood of occurrence, their confidence in market share forecasts falls significantly upon reviewing scenario narratives. The statistical evidence can be seen in Table-22.



	Conf_Sale A	Conf_Sale B	Conf_Sale C	Conf_Sale D
G3_PrNoNar	75,0	74,0	70,0	70,0
G4_PrNar	70,0	60,0	60,0	60,0

Figure 31. Median confidence in sales forecasts in G3_PrNoNar and G4_PrNar



	Conf_Share A	Conf_Share B	Conf_Share C	Conf_Share D
G3_PrNoNar	75,0	70,0	70,0	75,0
G4_PrNar	60,0	60,0	60,0	50,0

Figure 32. Median confidence in market share forecasts in G3_PrNoNar and G4_PrNar

6) What reference points do decision makers take when they assign likelihood of occurrence to scenarios?

The next research hypothesis was that decision makers significantly rely on their past experiences while they assign likelihood of occurrence to future scenarios. This work has two groups involving assessment of likelihood of occurrence: G3_PrNoNar and G4_PrNar. In G3_PrNoNar, participants assess the likelihood of occurrence of scenarios by having access only to the scenario condition. In G4_PrNar, the participants assess the likelihood of occurrence after reviewing the scenario narratives. The median probabilities of each test are provided in Table-23.

Table 23. Median probabilities in G3_PrNoNar and G4_PrNar

	Prob-A	**Prob-B**	**Prob-C**	**Prob-D**
G3_PrNoNar median likelihood of occurrence assessment	25.00	40.00	20.00	10.00
G4_PrNar median likelihood of occurrence assessment	30.00	35.00	20.00	15.00
Mann Whitney test results	W=1543.5 insign. with p=0.1431	W=1998.5 sign. with p=0.0058	W=1744.5 insign. with p=0.6917	W=1429.0 sign. with p=0.0111

Following these comparisons, the research takes a closer look at the relationship within the test group. The participants assigned the highest likelihood to quadrant-B. The Wilcoxon test was applied to compare all likelihood of occurrence assessments within the test in pairs. Test results are displayed in Table-24 and Table-25. With an alpha level equal to 0.05, the Wilcoxon signed rank test proves that

probability of all quadrants is significantly different within test group G3_PrNoNar. In pairwise comparisons i.e., AB, AD, BC and BD; the p-value is computed as 0.000 with test statistics 96.5, 612.0, 777.0 and 736.5 respectively. Pairwise comparison of AC reveals a test statistic 468.5 and p-value 0.034, pairwise comparison of CD gives a test statistic 444.0 and p-value 0.001.

Table 24. Comparison of pairwise median probabilities within G3_PrNoNar

G3_PrNoNar	Prob-A	Prob-B	Prob-C
Prob-B	W= 96.5, p=0.000 (sign.)	-	-
Prob-C	W=468.5, p=0.034 (sign.)	W=777.0, p=0.000 (sign.)	-
Prob-D	W=612.0, p=0.000 (sign.)	W=736.5, p=0.000 (sign.)	W=444.0, p=0.001 (sign.)

Table 25. Comparison of pairwise median probabilities within G4_PrNar

G4_PrNar	Prob-A	Prob-B	Prob-C
Prob-B	W=288.0, p=0.342 (insign.)	-	-
Prob-C	W=550.5, p=0.001 (sign.)	W=676.0, p=0.000 (sign.)	-
Prob-D	W=603.0, p=0.000 (sign.)	W=642.5, p=0.000 (sign.)	W=307.0, p=0.427 (insign.)

Quadrant-B displays the peak median probability among four quadrants in both G3_PrNoNar and G4_PrNar. When the participants were questioned on how they assessed this probability, their common response was the following statement: “In Turkey, it used to be the same. People are always willing to purchase new technologies even though the economy is not doing well. It is the same at the individual level. Even if the individuals are not well off, they will adopt the technology swiftly and they will definitely be willing to spend a lot of money on it.” Here, it is worth mentioning that the study did not provide any information about the sales territory to avoid generating any bias. Participants simply assumed that the sales territory was Turkey. Although the forecasting study emphasized that it was focusing on five years into the future, the year 2021, the participants took the past as “representative”. The respondents were asked why they had taken the past as reference even though the forecasts were about five years into the future, they were surprised. They stated that “separating the future from the past was not easy”.

Consumer behavior is expected to evolve over time in response to changes in the composition of products in the market. It was obviously not easy for the forecasters in the study to completely disregard their past experiences. The past should be interpreted carefully within its specific context and dynamics; past patterns in markets may not always result in accurate predictions for the future. Past experience can only provide limited insight into the future because the future comes with its own dynamics. When they were reminded on this fact, the participants confirmed their agreement. However, 80% of the informants stated that even after being reminded, forcing the mind to disregard the past was not very easy.

7) Do scenario narratives influence assessments of likelihood of occurrence significantly?

The next hypothesis predicted that the decision makers would assign a significantly higher likelihood to the positive-positive quadrant compared to the other quadrants after reviewing scenario narratives. Quadrant-A represents the positive-positive quadrant. In both G3_PrNoNar and G4_PrNar, the second highest ranking probability pertains to quadrant-A. The study asked the respondents their motivation for assigning such a high value to quadrant-A, to which the informants replied this was what they wished would happen. They stated that after reviewing the positive-positive scenario, they felt they really wanted the scenario to come true. When forecasters review narratives, they would have a tendency to assign a higher probability to that fully positive scenario as the availability heuristic may stimulate wishful thinking heuristic when scenario narratives were presented. On the other hand, between G3_PrNoNar and G4_PrNar the median probability of A did not prove a significant difference with an alpha level equal to 0.05. The Mann Whitney test statistic W was found as 1350.5 and the p-value is equal to 0.1167.

Quadrant-B deserves attention as it possesses the highest likelihood of occurrence assessment among the four. The Mann Whitney test was employed to make a comparison between the test groups. Two-sample Mann Whitney (also called two-sample rank or two-sample Wilcoxon rank sum) confidence interval and test procedures are useful for making inferences about the difference between two population medians based on data from two independent, random samples. The Mann Whitney test shows that the median probability of quadrant-B is significantly higher in G3_PrNoNar than in G4_PrNar (W=1996.5, p=0.0061). Though judgments

in G4_PrNar could be clouded by the availability heuristic due to the vivid narrative they received, the statistical findings did not support this prediction for the quadrant with the highest probability. When decision makers do not have access to scenario narratives, they are more likely to assess higher probabilities to the particular scenario they consider the most probable. This proves the representativeness heuristic was more actively involved more when less information was provided to the forecasters. It appears that the availability heuristic may only be partly influential. The likelihood assessment of only quadrant-D is significantly higher in G4_PrNar (W=1428.0, p-value=0.0108). The remaining quadrants A and C did not indicate any significant difference in terms of likelihood of occurrence assessments.

8) Does assigning likelihood of occurrence to scenarios affect forecasters' confidence?

The research goal was to examine whether forecasters' confidence in their predictions change significantly after assigning a likelihood of occurrence to each quadrant. This can be examined by comparing G2_Nar i.e., where forecasters attend to forecasting and G4_PrNar, i.e., where forecasters apply the assessment of likelihood of occurrence and attend to the forecasting session by reviewing scenario narratives.

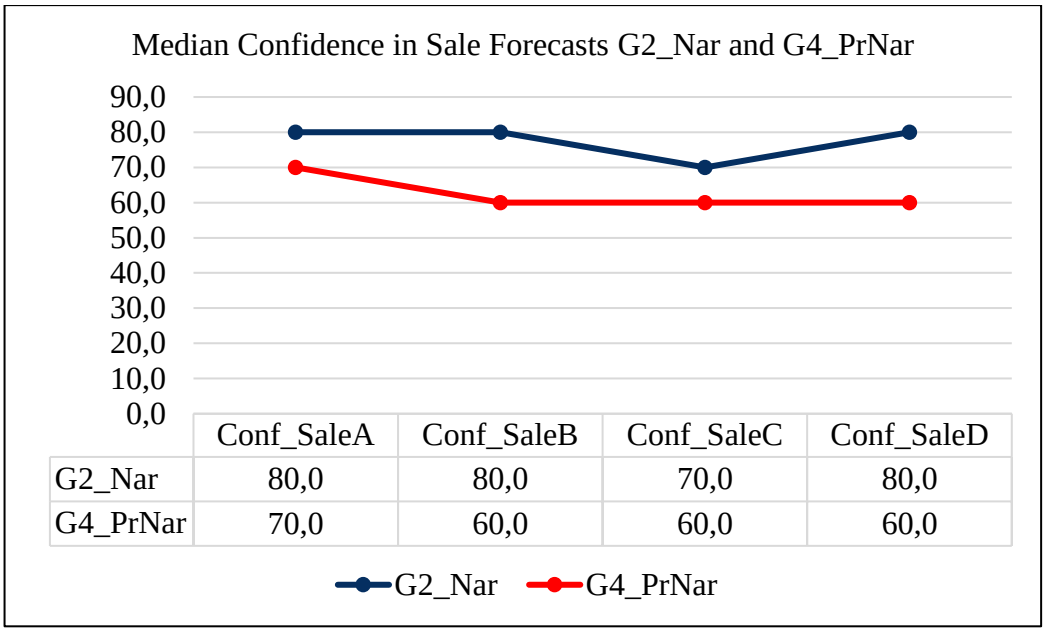


Figure 33. Median confidence in sales forecasts in G2_Nar and G4_PrNar

Table 26. Confidence in sales and market share forecasts in G2_Nar and G4_PrNar

	G2_Nar	**G4_PrNar**	**Statistical comparison**
Conf_SalesA	80.0	70.0	H_1=4.75, sign. with p=0.029
Conf_SalesB	80.0	60.0	H_1=6.96, sign. with p=0.008
Conf_SalesC	70.0	60.0	H_1=2.84, insign. with p=0.092
Conf_SalesD	80.0	60.0	H_1=6.27, sign. with p=0.012
	G2_Nar	**G4_PrNar**	**Statistical comparison**
Conf_ShareA	80.0	60.0	H_1=2.17, insign. with p=0.140
Conf_ShareB	75.0	60.0	H_1=3.52, insign. with p=0.060
Conf_ShareC	70.0	60.0	H_1=1.37, insign. with p=0.242
Conf_ShareD	70.0	50.0	H_1=6.19, sign. with p=0.013

The hypothesis predicted assigning likelihood of occurrence to scenario narratives would not change forecasters' confidence significantly. Forecasters' confidence were statistically compared in pairs i.e., Quadrant-A of G2_Nar was

compared to that of G4_PrNar and the remaining quadrants in a similar manner. The Kruskal-Wallis test shows that the assessment of likelihood of occurrence decreases forecasters' confidence in their sales forecasts significantly in quadrant-A, B and D (H_1=4.75, p-value 0.029; H_1=6.96, p-value=0.008 and H_1=6.27 p-value=0.012 respectively). Additionally, assessment of likelihood of occurrence affects the confidence in market share forecasts significantly in quadrant-D, the case in which technology adoption rate is low and the economy is stronger. Given that participants reviewed scenario narratives, the median confidence in market share forecasts is significantly less in quadrant-D in the case where likelihood of occurrences are assessed before forecasting.

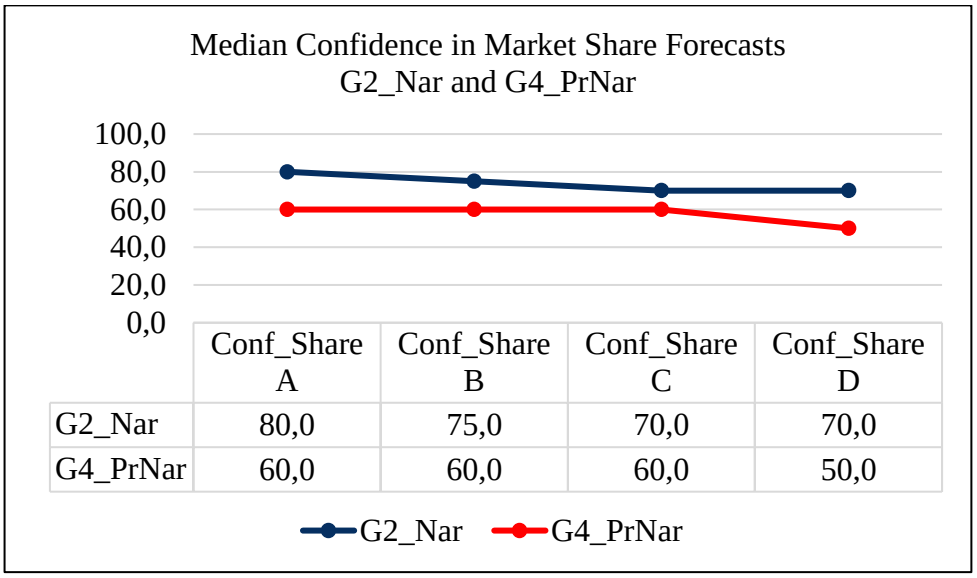


Figure 34. Median confidence in market share forecasts in G2_Nar and G4_PrNar

Given that forecasters reviewed scenario narratives before performing any forecasting tasks, the assessment of likelihood of occurrence reduced the forecasters' confidence in sales forecasts A, B and D and in market share forecasts-D. This

assessment task may have prompted forecasters to think over the scenario narratives more profoundly, gain greater awareness on the uncertainty.

5.3. Coding in Study-1

Coding is the process of organizing and sorting the qualitative data. The following table serves as a way to label, compile and organize the data elicited from the debriefing sessions and the information the participants provided on the voluntary basis after they finished the study. The table may allow summarizing and synthesizing what is happening in the qualitative data. In linking data collection and interpreting the data, coding becomes the basis for developing the analysis. Most of the time, it is complementary to the statistical findings.

Table 27. Coding summary

Major categories	**Mostly repeating phrases**
Decision on the sales forecasts	• Naturally I had to anchor to initial piece of past data • The fully pessimistic scenario implies more uncertainty • It was difficult to decide on the increase based on the provided initial piece of past data • Past was an inevitable reference however I believe that I was influenced by my future optimism at some extent • I was completely influenced by the current and past status before I assessed the future sales • I decided on my forecasts taking the past as reference

	• I first decided to remember what happened in the past
Decision on the market share forecasts	• I was supposed to make decisions under an extremely high uncertain environment • The scenario narratives guided me to make a decision • I thought on my basis in the beginning • I took the current state as basis
Decision on the confidence	• I was more confident with my forecasts in the scenario I deem most likely • The more optimistic the conditions, the more I became confident in my forecasts • The uncertainty is typical in all scenario quadrants when they are provided with the same amount of information. Having more information could boost confidence. • I don't believe that my confidence in my predictions may change so easily
Assessment of the likelihood of occurrence	• The fully optimistic scenario was distinguished for me to assign a higher likelihood of assessment • I assessed the likelihood of occurrence based on my past experience with the industry • It was difficult to interpret some of the scenario quadrants. I don't know why

Table-27 provides the major results of the open coding analysis of 90 participants who accepted to respond to the debriefing sessions or entered data at the end of the study regarding the retrospective questions. The table shows 4 superordinate and 17 subordinate mostly repeating sentences emerging from the

analysis of practitioners' impressions with the study. The superordinate categories include decision on the sales forecasts, decision on the market share forecasts, decision on the confidence and assessment of the likelihood of occurrence. The table also indicates that subcategories can have common concepts. Thus, for any major category, practitioners are conscious of the uncertainty of the future despite having access to scenarios.

It was also interesting that individuals provided more information on their confidence in the study groups where the assessment of likelihood of occurrence took place. This treatment may have significantly made the forecasters to think over their confidence.

5.4. Additional Insight on Study-1: Variance of Sales Forecasts

Boxplots tend to be most useful when there are many observations in a data set. Boxplots allow us to recognize that visually the variance of sales forecasts-C is consistently lower than that of sales forecasts-A in all test groups except G5_NarRisk and G6_Risk.

The statistical significance can be checked using the test for equal variances. This test offers "multiple comparisons" as the more powerful method compared to Levene's test. Since the samples hold more than 20 observations each, multiple comparisons will be used to draw conclusions on equal variances. The multiple comparison intervals were used to determine whether standard deviations pertaining to sales forecasts-A and C remain significantly different from each other. In terms of visual identification, if two intervals do not overlap in the plots, then the corresponding standard deviations (and variances) are significantly different. If the p-value for the multiple comparisons test is less than the chosen significance level, then

at least one standard deviation is significantly different from one other standard deviation. Table-28 displays variance computations and the statistical results attained from the test of equal variances.

Table 28. Variance in sales forecasts in each test group

	Variance of SalesA	**Variance of SalesC**	**Comparison of Variance of SalesA to Variance of SalesC**
G1_NoNar	10,131,126,141,249	27,862,286,400	p-value=0.003 (sign.)
G2_Nar	201,976,225,643,556	59,807,637,136	p-value=0.000 (sign.)
G3_PrNoNar	3,584,153,230,596	2,604,571,225	p-value=0.000 (sign.)
G4_PrNar	103,086,190,940,769	54,702,193,225	p-value=0.000 (sign.)
G5_NarRisk	251,511,277,081	92,636,227,044	p-value=0.122(insign.)
G6_Risk	667,368,089,476	50,646,602,304	p-value=0.143 (insign.)

In G1_NoNar, G2_Nar, G3_PrNoNar and G4_PrNar; forecasters have a tendency to make significantly more dispersed forecasts for the fully positive scenario than those in the fully negative scenario. That brings an insight that fully positive scenario may not guarantee “certainty”, yet forecasters donot generate the same range of forecasts as they are in the worst case quadrant. The common feature of these four groups is “not incorporating any risk implications”. When risk implications are provided to forecasters, the variance of forecasts does not prove difference for the best and worst case scenario quadrant. Provision of risk implications may have erased the variance difference between the fully positive and the fully negative case. Appendix-8 provides visuals regarding the test for equal

variances for G1_NoNar, G2_Nar, G3_PrNoNar, G4_PrNar, G5_NarRisk and G6_Risk respectively. Table-28 supports the visuals with statistical evidence.

5.5. Data Analysis and Findings of Study-2

The research questions in Study-2 can be listed as follows:

9)	For professionals, is advice more influential when it is associated with presumed credibility rather than experienced credibility?
10)	How do individuals' willingness to use forecast advice change according to the credibility of the source of advice?

9) For professionals, is advice more influential when it is associated with presumed credibility rather than experienced credibility?

The research hypothesis predicted when the two attributes of experts (i.e., track record of accuracy (experienced credibility) and their apparent status (presumed credibility)) yield conflicting indications of credibility, the advisor is more influential when it is associated with presumed credibility rather than experienced credibility. The hypothesis predicted professionals are more willing to take the advice from a high presumed credibility source than a high experienced credibility source.

This study took place via questionnaires collected from "*Recommend For*" type advice taking test groups. The aim was to examine whether one of the attributes of an advisor is more influential on encouraging advisees to use that advice. This research will provide insights on individuals' willingness to use forecast advice.

In four test groups, 82 professionals produced point and interval forecasts for the 31st weekly forecast of twelve different stocks firstly on their own. Then, they produced their forecasts after reviewing forecast advice labeled as coming from advisors with presumed or experienced credibility. Firstly judgmental adjustments the individuals applied to their initial forecast, and then the findings on advice utilization are reported for each source credibility group.

Results on Judgmental Adjustments of Initial Forecasts

Table-29 presents the number of observations in parantheses in each category. The table presents forecasters' judgmental adjustments after they received forecast advice. The source of the forecast advice is indicated in each test group. The row titles that indicate conflicting indications of credibility are written in bold.

Table 29. Judgmental adjustments on initial professionals' forecasts

Point Forecasts	% of initial point forecasts adjusted	AAP	APAP
Presumed high, experienced high (G1_HE-HP)	84.92% (252)	0.41 (252)	5.05% (252)
Presumed high, experienced low (G2_LE-HP)	79.37% (252)	0.32 (252)	3.87% (252)
Presumed low, experienced high (G3_HE-LP)	84.17% (240)	0.30 (240)	3.73% (240)
Presumed low, experienced low (G4_LE-LP)	82.08% (240)	0.23 (240)	2.78% (240)
	Not significant.	$F_{3,78} = 4.32$, $p = 0.007$ $\eta^2_p = 0.14$	$F_{3,78} = 4.33$, $p = 0.007$ $\eta^2_p = 0.14$

Table 29. (cont'd)

Interval Forecasts	% of initial interval forecasts adjusted	SAA	APAI
Presumed high, experienced high (G1_HE-HP)	96.03% (252)	1.04 (252)	139.30% (252)
Presumed high, experienced low (G2_LE-HP)	90.48% (252)	0.75 (252)	92.49% (252)
Presumed low, experienced high (G3_HE-LP)	94.58% (240)	0.82 (240)	104.70% (240)
Presumed low, experienced low (G4_LE-LP)	92.08% (240)	0.57 (240)	108.80% (240)
	Not significant.	$F_{3,78} = 6.85$, $p < 0.0001$ $\eta^2_p = 0.21$	Not significant.

F-test scores show that significant differences exist among the four credibility groups for the adjustment size measures (AAP, APAP, SAA except APAI). When the adjustment frequency is checked statistically, the scores of all of the groups appear similar. Additional 2X2 factorial ANOVA analyses were carried out as well. Repeated measures design was run to investigate the factor effects that generate these distinctions.

When point forecasts are checked, both of the main effects have a significant influence on the size of the adjustments. The main effect of the experienced credibility factor is significant on adjustment magnitude ($F_{1,78} = 5.08$, $p = 0.027$, $\eta^2_p = 0.06$ for AAP; $F_{1,78} = 5.65$, $p = 0.02$, $\eta^2_p = 0.07$ for APAP); also, there exists a significant main effect of the presumed credibility ($F_{1,78} = 7.79$, $p = 0.007$, $\eta^2_p = 0.09$

for AAP; $F_{1,78}$ =7.23, p = 0.009, η^2_p = 0.08 for APAP). The interaction effect between experienced and presumed credibility does not display significance since its computed p-value is greater than 0.05. Pairwise comparisons among the groups indicate that individuals from the high presumed and high experienced credibility group adjusted their forecasts significantly higher than the individuals experiencing low credibility with low presumptions (Tukey's HSD for G1_HP-HE vs. G4_LP-LE, p-value = 0.0034 for AAP and p-value = 0.0033 for APAP). None of the other differences between the groups were statistically strong to prove significance (Tukey's HSD p > 0.1).

In terms of the interval forecasts; the findings are parallel to those observed in interval forecasts only for SAA scores. The magnitude of the adjustments (i.e., SAA) were checked, and significant main effects exist for both presumed ($F_{1,78}$ = 7.34, p = 0.008, η^2_p = 0.09) and experienced credibility ($F_{1,78}$ = 13.08, p = 0.001, η2p = 0.14). The interaction effect is insignificant. Pairwise comparisons on SAA show that individuals from high presumed and high experienced credibility group adjusted forecasts significantly higher than the individuals experiencing low credibility (Tukey's HSD for G1_HP-HE vs. G2_HP-LE, p-value = 0.0341; Tukey's HSD for G1_HP-HE vs. G4_LP-LE, p-value = 0.0002). The presumed credibility did not have a significant effect on individuals when the experienced credibility was high (Tukey's HSD for G1_HP-HE vs. G3_LP-HE, p-value > 0.1). That implies that given that the advisor is labelled as experienced, advisees are not further influenced by the attribute of presumed credibility. The remaining pairwise differences were also insignificant (Tukey's HSD p > 0.1). As an additional insight; the presumed and experienced credibility factors were not influential in differentiating the size of

interval widths as measured by APAI. Even though there were distinct adjustments on the interval bounds (i.e., SAA scores), when the widths of the initial intervals and the final intervals are compared, the width remained nearly the same across all groups.

Results on Advice Utilization

Advice utilization scores were calculated through three measures: Weight of advice (WoA), Advice shift and Weight of own Estimate (WoE). They were calculated after excluding the rare cases (12 out of 984) where the initial point forecast was exactly the same as the provided advice. In 3 of the 12, the initial predictions were also equal to the final forecasts so they were perfect discounting scores (0 for advice-shift and WoA, 1 for WoE). The remaining 9 cases were excluded from the calculations as well. "Ordinary" cases of advice utilization constituted 71.24% of the data and the remaining 28.46% cases were classified as "extraordinary".

Mean advice utilization scores are presented in Table-29. F-test scores show that some significant differences exist among the four groups across all three scores. The 2X2 factorial ANOVA suggests that across all utilization scores the significant main effects of the experienced credibility factor can be identified with ($F_{1,78} = 5.60$, $p = 0.020$, $\eta^2_p = 0.07$ for advice-shift , $F_{1,78} = 6.32$, $p = 0.014$, $\eta^2_p = 0.07$ for WoA and $F_{1,78} = 5.25$, $p = 0.025$, $\eta^2_p = 0.06$ for WoE) as well as the presumed credibility factor ($F_{1,78} = 7.24$, $p = 0.009$, $\eta^2_p = 0.08$ for advice-shift , $F_{1,78} = 4.80$, $p = 0.032$, $\eta^2_p = 0.06$ for WoA and $F_{1,78} = 6.40$, $p = 0.013$, $\eta^2_p = 0.08$ for WoE). None of the interaction effects were significant (all $p > 0.05$).

Table 30. Mean advice utilization scores for ordinary cases in forecasts

	Advice-shift	WoA	WoE
Presumed high, experienced high (G1_HP-HE)	0.45 (21)	0.45 (21)	0.52 (21)
Presumed high, experienced low (G2_HP-LE)	0.36 (21)	0.34 (21)	0.62 (21)
Presumed low, experienced high (G3_LP-HE)	0.34 (20)	0.36 (20)	0.63 (20)
Presumed low, experienced low (G4_LP-LE)	0.25 (20)	0.26 (20)	0.72 (20)
	$F_{3,78} = 4.28$, $p = 0.007$ $\eta^2_p = 0.14$	$F_{3,78} = 3.73$, $p = 0.015$ $\eta^2_p = 0.13$	$F_{3,78} = 3.89$, $p = 0.012$ $\eta^2_p = 0.13$

Considering the statistical results from judgmental adjustments and from advice utilization, when a source exhibits high presumed and high experienced credibility, the utilization of their advice is the greatest when compared against a source with low experienced and low presumed credibility (Tukey's HSD for G1 vs. G4, p-value = 0.0033 for advice-shift, p-value = 0.0072 for WoA and p-value = 0.0056 for WoE). The remaining pairwise differences were all insignificant (Tukey's HSD $p > 0.1$).

Debriefing with Participants of Study-2

After the forecasting tasks were completed in two phases, the study collected opinions with an exit survey from each participant. In addition, the study included debriefing sessions with 58 professionals (approximately equal proportions from each experiment group) in person. Capturing as many ideas and themes as possible

was the main goal. In these in-person debriefing sessions, the study was seeking words or phrases which captured or signalled the decision makers' internal motives, practical concerns and orientations to make forecasts after reviewing presumption and experience labeled advice.

Interestingly, almost all of the professionals started the conversation with a question on their test performance. "How did I perform? I'm confident about my forecasts.". This is interesting because these two sentences incorporate conflicting emotions. The respondents state that they were confident about their performances but they asked to know about their own actual performance. This can be interpreted as a "persistence to reject their uncertainty". 45% of informants admitted that they were uncertain about their initial decision, since the question was a complex one. They said that receiving directional advice was not so helpful because they did not know the rationale behind. They expressed their pleasure at seeing a reference point while they sought a reference on which to anchor their forecast. On the other hand, 30% of them stated that the source's advice was not helpful and they themselves had to be careful. 20% of participants informed us that a track record was not sufficient to foster enough trust to follow any forecast advice. 10% of participants responded similarly to the following: "I believe that regardless of the title and past performance, everybody has a chance at making a hit for any coincidental period". The advice takers emphasized the importance of the time period given for the performance information. They asked about the period (i.e., whether the specific years featured an economic crisis, or not) during which the aforementioned hit rate was measured. They said that their opinion would change based on that specific piece of additional information.

Using someone's track record is an "attempt" to predict their future performance. While using performance heuristics, people factor past performance into their expectations for the future (Critcher & Rosenzweig, 2014). Posner (2015) emphasizes that success may be a negative predictor of future performance improvement, in part because it is easier for people who initially perform poorly to improve substantially through learning than it is for those who perform well from the start. Executives should admit that past success does not predict future improvement (Posner, 2015). Experimental evidence suggests that while education is generally associated with more accurate self-assessment, it is also likely to generate a blind spot in thinking about one's own knowledge. The "curse of expertise" is explained by a failure to recognize the amount of detailed information that has been forgotten. (Fisher & Keil, 2016). In the study, 40% of informants stated that they needed more cues. 50% of the informants who reviewed a taxi driver's advice stated that they wanted to hear the taxi driver's rationale for his forecasts. 20% of advice takers who reviewed a financial analyst's advice said that they wanted to know more about the financial analyst. They mentioned that since intentional manipulation is common among financial analysts, they wish they could have built a relationship with the financial analyst based on trust before being taking this advice. This proves the advisees' pursuit of a closer relationship with the advisor as underlined by Swol and Sniezek (2005).

10) How do individuals' willingness to use forecast advice change according to the credibility of the source of advice?

The previous pages feature the analysis of forecasters' willingness to use forecast advice through forecast adjustments and advice utilization measures. The

exit survey collected ratings from the test participants for more insights on advice use as well. The individuals' ratings for "willingness to use forecast advice" for each source credibility condition were contained. After each forecasting task, the individuals responded to the following.

Please indicate your agreement/disagreement with the following statement:

"I would be willing to use this advice while working on my forecasts"

A 7-point Likert scale was used. Figure-35 provides preliminary insights for the use of advice in particular to each source credibility condition.

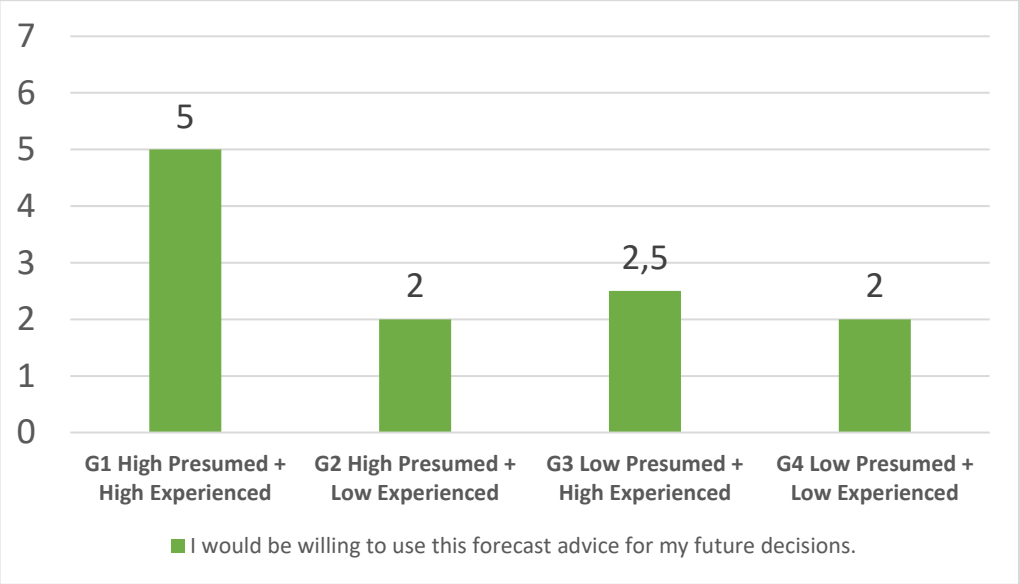


Figure 35. Median ratings for individuals' willingness to use forecast advice under each source credibility condition

Interestingly, given that the source advisor is equipped with low experienced credibility, individuals do not reduce their willingness rating further when the presumption level falls from high to low. One can conclude that when faced with low experienced credibility, the expectation is so low that a thermostat keeps the

advisee's encouragement at the minimum level and the willingness to use the advice do not fall more.

Table-31 provides the Wilcoxon signed ranked test results for pairs of median ratings for willingness to use advice. Taking 95% as the confidence level, individuals assign credit to the high presumed and high experienced advice source significantly more than to the high presumed and low experienced advice source, and the low presumed and low experienced advice source.

Table 31. Comparison of individuals' ratings for willingness to use advice

	G1_HE-HP	**G2_LE-HP**	**G3_HE-LP**
G2_LE-HP	H_1=10.08, sign. with pvalue=0.000 (1)	-	-
G3_HE-LP	H_1 = 2.15, insign. with pvalue=0.143 (2)	H_1 = 1.45, insign. with pvalue=0.228 (4)	-
G4_LE-LP	H_1 = 11.15, sign. with pvalue= 0.001 (3)	H_1 = 0.17, insign. with pvalue=0.677 (5)	H_1= 2.58, insign. with pvalue=0.108 (6)

Exit survey scores suggest that individuals believe they do not differentiate a low presumed-high experienced advisor from a high presumed-high experienced advisor (2). This indicates that low presumption does not deteriorate the advisor's credibility as long as he/she is high experienced. Individuals believe that their willlingness to use advice does not change significantly in the case of a highly experienced advisor when he/she is equipped with low presumed credibility (6). Interestingly, the converse attribute dyad appears invalid; individuals change their ratings significantly for low experienced credibility when the advisor is high presumed (1). In addition, given that an advice source is either high or low

experienced, forecasters believe that high presumption does not significantly increase their willingness ratings to use the advice (2)(5). Individuals' ratings for willingness to use advice support the statistical evidence attained from judgmental adjustments and advice utilization performance measures: Both the presumed and experienced credibility of the advisor are influential in determining the weight attached to the advice.

CHAPTER-6: DISCUSSION

In this dissertation, the use of advice has been investigated from several aspects. In Study-1a and Study-1b, scenarios were used as advice (i.e., *Information* type advice) and the impact of scenario contents on forecasts and forecasters' confidence in their forecasts as well as the impact of likelihood of occurrence assessments on forecasters' confidence were examined in an ILS setting. To date, researchers have conducted a lot of experiments measuring forecasters' confidence and their forecasts for different settings. They have put forth general findings on the provision of scenarios. However, this work is the first to produce results using one of the most popular scenario techniques; namely, intuitive logic scenarios. The intuitive logic scenario context is exclusive for presenting four quadrants simultaneously and encompassing the future with 100%. Rather than describing a version of the future in a disorganized way, organized elaboration using intuitive logics scenarios have been preferred in the provision of "*Information"* based advice in Study-1.

The sample is reliable with 251 forecasters from the business world. These individuals confirmed their knowledge on forecasting with a rating of 5.0 out of 7.0. The individuals who participated in the experiments have different professional backgrounds, representing various industries and companies. 45% of the participants hold master's degrees from highly competitive universities. The groups were tested for the order effect and participants' profile attributes such as age and experience. These attributes do not indicate a significant difference.

To summarize the scenario context used in this work; the four quadrants describe the future market of wearable technology products in terms of high/low technology adoption rate, and stronger/weaker economic conditions in the relevant territory. Quadrant-A represents conditions involving a high technology adoption rate and a stronger economy. It is the best case among the four cases. Quadrant-C depicts the worst case future for the market: Low technology adoption rate and a weaker economy. Quadrant-B describes conditions involving high technology adoption rate and a weaker economy. Finally, quadrant-D describes a future context with a low technology adoption rate but a stronger economy. In the debriefing sessions, the advice takers who rated the scenario quadrants in terms of how easy to imagine they found them, 7 out of 10 stated that it was relatively easier to imagine A and B, whereas it was hard to imagine D.

6.1. Influence of Scenarios and Risks on Judgmental Forecasts and Confidence

When forecasters reviewed the scenario narratives, their levels of confidence in their forecasts were significantly higher after reading quadrant-A and

B than when they reviewed the conditions without any narratives. When the study made scenario narratives available for forecasters to review, forecasters' confidence changed significantly in sales forecasts-A and B. Median confidence in sales forecasts-A and B in the provision of scenario narratives is as high as 80%, which is quite substantial for a sales forecast generated in 2016 for the year 2021. Having access to more scenario information may have caused the illusion of control and made forecasters feel more confident in their sales forecasts relating to the year 2021. This can be categorized under overconfidence as it is provided in Moore and Healy's first definition of overconfidence. Moore and Healy (2008) provide the first definition of overconfidence as the overestimation of one's actual ability, performance, level of control or chance of success. Research on the illusion of control has shown that, when people have no control over some event, they frequently act as if they have some sort of control (Presson & Benassi, 1996; Thompson, Armstrong & Thomas, 1998). Wright, Bradfield and Cairns (2013) state that the act of generating scenarios has the potential to increase confidence in the likelihood of a scenario occurring. This work brings an extension to Wright, Bradfield and Cairn's (2013) arguments. In an ILS setting with mutually exclusive and collectively exhaustive scenarios, in quadrant-A (which is distinctive for representing the fully optimistic quadrant) and quadrant-B (which is distinctive for representing the most likely quadrant based on forecasters' assessments) forecasters' confidence increased in their sales forecasts.

The availability heuristic is expected to amplify feelings such as event desirability on optimism i.e., in the case of reviewing more vivid scenarios. For instance, with the optimistic narrative presented within the scenario narratives,

decision makers could scale their forecasts up in particular in the fully optimistic quadrant-A. This didn't appear to be true in this study. This result is in line with the extant literature. A number of researchers have examined the effect of event desirability on optimism and found no effects (Helweg-Larsen & Shepperd, 2001; Weinstein, 1980). As Krizan and Windschitl's (2007) review of the literature explains, the evidence for wishful thinking, in which optimism is influenced by event desirability, is not strong.

Selective perception involves the tendency of individuals to ignore and dismiss information that is contrary to their expectations or anticipations. Anticipations, in particular, are directly influenced by past experience. In the debriefings, the individuals categorized A and B as "easy to imagine" quadrants although the study did not address such a question. Another common characteristic of these quadrants is that they received the highest likelihood of occurrence assesments among the four. The representativeness heuristic could be the reason underlying the high likelihood assessment of quadrant-B, and wishful thinking could be responsible for the assessment of quadrant-A. The sum of their median likelihood of occurrence assessment is equal to 75% irrespective of reviewing the scenario narratives. This implies that the forecasters believe one can make an accurate description about the future market with a 75% chance of getting it right by using only these two scenarios. It could be that individuals attach more confidence to the scenarios they find easier to imagine when they review scenario narratives. Reviewing the narrative may have made them confirm what they already perceive selectively more proximate to their anticipations. Windschitl, Scherer, Smith and Rose have elicited similar findings. In their study, individuals favored information

supporting their prediction, and this fueled an increase in their confidence (Windschitl, Scherer, Smith & Rose, 2013).

Incorporating risks into the scenario content may be regarded as a "game changer" in scenario analysis. The exit survey questions #9 and #10 asked individuals how the scenario based advice and the risk based advice respectively influenced their forecasts. The statistical test results show that forecasters believe receiving risk based advice would influence their forecasts more significantly than receiving scenario based advice and the p-value is equal to 0.001. Interestingly, forecasting activities show that there is no significant median forecast difference between:

- not reviewing any scenario content and reviewing risks
- reviewing scenario narratives and reviewing risks

Additionally, there is no median difference between sales forecasts made upon reviewing scenario narratives and risks simultaneously and in reviewing advice based on risks with one exception: Only sales forecasts-C are significantly higher when forecasters review risk based forecast advice. The worst scenario quadrant is significant with H_1=5.23 and p-value equal to 0.022. It is interesting that forecasters made higher forecasts after reviewing the relevant content in quadrant-C, other than reviewing both scenario narratives and risks simultaneously. Even though the information presented in that quadrant is only risk-based, being aware of the possible risks may have made individuals feel safer and optimistic so that they scaled up their sales forecasts significantly.

Forecasters' confidence should also be examined closely. The incorporation of risks could account for the decrease in forecasters' confidence. Exit survey questions #6 and #8 focused on opinions related to the forecasters' confidence. Question #6 inquired the influence of "advice comprising scenarios" on forecasters' confidence whereas Question #8 inquired the influence of "advice comprising risks" on forecasters' confidence. The sign test proves that the ratings are significantly different. Forecasters believe reviewing risks would influence their confidence significantly more than reviewing scenarios. Their median rating is significant with a p-value equal to 0.0015. Strikingly, the statistical test results confirmed that forecasters' confidence does not vary:

- between not reviewing any scenario content and reviewing risks,
- between reviewing scenario narratives and reviewing risks,
- between reviewing scenario narratives and risks simultaneously and reviewing risks.

Exit survey results indicated that forecasters believe risk based advice is significantly more influential on forecasters' confidence than scenarios. On the other hand, statistical findings showed that upon reviewing advice comprising risks, forecasters' confidence is not significantly different than their confidence following advice comprising scenario narratives. Individuals may be regarding the risks as helpful reference points because they explain what threats the future may unfold. Nevertheless, the findings in this work show that forecasters' confidence is not affected by risk based advice. Viewing all conditions simultaneously with 100% coverage may have contributed to this finding.

It is a remarkable finding that although there was data covering only two years (pertaining to each variable) available to forecasters, median sales forecasts did not display a significant difference based on the scenario content. It appears that scaling forecasts up or down is not so easy by simply varying the scenario content. Forecasts remained robust despite the changing scenario content although there is substantially high uncertainty in the context, the wearable technology sector which is merely two years old.

6.2. Patterns within the Intuitive Logics Scenario Quadrants

In terms of the relationship between the quadrants; the common characteristic of quadrants B, C, D was that they all involve at least one "negative" condition. Decision makers pay greater attention to threats. As a result of survival genes, decision makers first check whether there are any threats or negative forces at play. This is stated in the status quo bias and prospect theory as well. Decision makers want to avoid falling behind on today's earnings. Individuals' absolute fear of "fear" is exploited in many fields such as the insurance sector, marketing campaigns and politics. With limited information, decision makers could be expected to anchor to the "negative" and circle around it. It follows from Fischhoff's findings on risk perception (2009) that once the negative force is identified, decision makers are likely to remain unable to differentiate the amount of risks and the number of negative exposures. In this regard, in terms of multiple exposures, decision makers may not perceive the negativity as high as it would be based on one occasion. Their assessment for one occasion may remain close to multiple occasions.

Baumeister, Bratslavsky, Finkenauer and Vohs (2001) emphasize this in their paper, “Bad is stronger than good.”. The researchers showed that events which are negatively valenced (losing friends, losing money, receiving criticism) have a greater impact on the individual than positively valenced events of the same type (gaining friends, winning money, receiving praise). Studies of brain waves using electroencephalography (EEG) also confirm that negative information has a stronger effect on the brain than equally extreme positive information (Ito, Larsen, Smith & Cacioppo, 1998). Additionally, as Fischhoff highlights in his work, decision makers have a tendency to overestimate the risk probability of one occasion (2009). Their work proves that in the event of multiple exposures, decision makers perceive the risk as likely as if it were based on one occasion. In other words, their assessment for one occasion is close to that for multiple occasions. In this dissertation, it is observed that even in cases where less information is supplied; i.e., when conditions are provided without any information, decision makers do not form a systematic pattern in the set of bad conditions; i.e., B, C and D. It is good that they do not only see a completely positive scenario, and they tend not to make significantly close predictions for the scenario involving one negative force and the scenario involving two negative forces. Presenting the future simultaneously and systematically with 100% coverage may have been a remedy to differentiate between various future directions as forecasters found it hard to imagine the future without plotting such a systematic picture.

Given that people are generally loss-averse (Kahneman & Tversky, 1979), managers are likely to allocate a greater portion of their attention to protecting their organization against what they interpret to be threats, compared to the issues they

interpret as situational descriptions. On the other hand, this potential vulnerability does not seem to be a problem in intuitive logics scenarios. Irrespective of the scenario content, forecasters are able to differentiate every quadrant (except the moderate scenarios within a study group) and make significantly different sales and market share forecasts. Intuitive logic scenarios can stimulate different forecasts for different conditions presented in adjacent quadrants, the total of which covers the future with 100%. This is a cue that scenarios may ensure a better understanding of the future despite decision makers' limited cognitive capacity. Scenarios may be not allowing forecasters to be tempted by the worst case. The findings in this dissertation indicate that forecasters cannot differentiate their forecasts for the moderate quadrants represented by B and D. If no additional information is presented, forecasters tend to regard these two conditions as almost the same. In this regard, a scenario advisor may consider new techniques on how to better present "moderate" scenarios to advice takers. This study assumes that the impact of two driving forces can never be the same, but one of them must be more influential on the forecast variables employed; i.e., sales and market share forecasts in this dissertation. The affect heuristic might be the reason for this since two moderate scenarios stimulate good and bad emotions simultaneously without any difference corresponding to their own characteristics. ILS developers should consider adding more specific information corresponding to each driving force. This could offer scenario users a better opportunity to consider each driving force more carefully.

Statistical evidence shows that forecasters' confidence does not change based on the quadrant within the study group. Each quadrant stimulates feelings of optimism and/or pessimism; however, it is not so easy to change the confidence level

significantly within a study group. Nevertheless, within the study involving scenario narratives, forecasters' confidence in forecasts-A (i.e., the best case quadrant) is significantly higher than their confidence in B, C and D. The narrative in A may have stimulated optimism, accounting for higher confidence. Reviewing the best case future state only by narratives may have boosted the confidence in this quadrant.

6.3. Comparisons of Confidence

Overall, 20% of the participants stated the same level of confidence for sales forecasts to different quadrants within the test group they attended and 16% stated the same level of confidence in their market share forecasts. They said that their confidence does not change based on the negativity or positivity of scenarios; their uncertainty about the situation is the same with the same type of information. Ten participants, in particular, stated that being asked about how confident they were in their forecasts prompted them to check their forecasts, like an auto-control mechanism. They interpreted the question of confidence as a question of "determination". They also mentioned that this made them revisit the forecasts they had just made. Encountering a question interrogating their confidence prompted them to revise their forecasts if they had a better estimate. Thirty five respondents argued that the negative-negative scenario was the most uncertain among the four. Thirty informants explained that the risks helped them to clarify their forecasts.

Kuhn and Sniezek (1996) pointed to the need to do more detailed investigation on confidence attained with scenarios. This work makes an extension with a focus on intuitive logic scenarios and shows that confidence does not always depend on the content of the scenario.

The statistical results show that confidence increases significantly only in A and B when forecasters review scenario narratives than when they review only conditions. On the other hand, when risk implications are incorporated into the scenarios; forecasters' confidence is not significantly affected. Forecasters' confidence comparisons between the study groups are summarized in Figure-36.

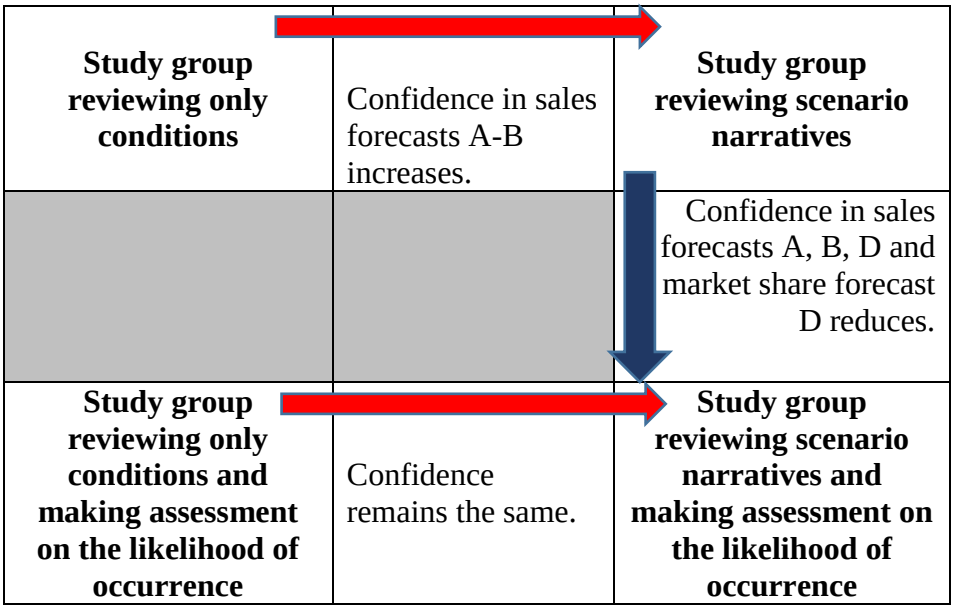


Figure 36. Forecasters' confidence comparisons between G1_NoNar, G2_Nar, G3_PrNoNar and G4_PrNar

The likelihood of occurrence treatment after reviewing scenario narratives caused forecasters' confidence in sales forecasts to fall in A, B and D and the market share forecasts to fall in quadrant-D. This finding is similar to Hirt and Markman's results. Hirt and Markman (1995) suggested that thinking of reasons why any alternate outcome might occur (i.e. reviewing the scenario narratives for the second time for the assessment of likelihood of occurrence) makes individuals realize that the outcome is not as predictable as they initially thought. With the assessment of likelihood of occurrence, forecasters may have lowered their expectations for making

a proximate hit after becoming aware that each scenario represents only a limited probability; in other words, achieving a hit should be more challenging. Digesting the state of the industry in the future through the narratives may have led individuals to better recognize the extent of uncertainty, as there are various alternative futures.

Wang and Lan (2007) mention that a scenario itself is a narrative detailing the occurrence of a potential event as well as its cause and effect. This also supports the fact that scenario developers should consider the effects (for example "risk implications") along with scenario narratives and enrich future scenarios with the effects relevant to the scenario context. Schoemaker (1993) claimed that if people are forced to consider more than one possible future, each rendered plausible by a supporting scenario, they will be unable to place too much confidence in any one case. In this work, forecasters' confidence did not display any significant difference between the study quadrants. The forecasters stated the same level of confidence about the mutually exclusive and collectively exhaustive scenarios within the quadrants. This work supports Schoemaker's claim with evidence in an intuitive logics scenario setting.

6.4. Incorporating Likelihood of Occurrence Assessments before the Use of Advice for Forecasting and Analyses on the Likelihood of Occurrence in ILS framework

Scenario users may be curious to know whether additional treatments in the use of scenario advice may affect forecasters' confidence. The likelihood of occurrence assessment was incorporated as an additional treatment before the forecasting tasks.

During the study design, one concern was that a number of respondents would assign an equal likelihood (25%) to each quadrant of the ILS framework, mainly due to high uncertainty. This did not come to pass. Almost all respondents assigned a greater likelihood to one of the quadrants.

How do users decide on the probability of an event? Newby-Clark et al. (2000) draw attention to the fact that people may assume negative scenarios are less likely to occur than they actually are. Indeed, Quadrant-C is not so popular with a median likelihood of occurrence equal to 20% in both the study group involving only scenario conditions and the study group involving scenario narratives as forecast advice. After reviewing scenario narratives, the difference in the likelihood of occurrence does not change significantly in the polar extreme scenarios A and C. 66% of the participants in the study group involving the assessment of likelihood of occurrence with only scenario conditions assigned the highest probability to quadrant-B, and 44% of study group involving the assessment of likelihood of occurrence with scenario narratives assigned the highest probability to quadrant-B, the one which represents the conditions of low technology adoption rate and weaker economy. Irrespective of reviewing scenario narratives, the analysis showed that the highest likelihood was assigned to quadrant-B. According to Laplace's early book (1816), subjective probabilities are governed by main principles of association: Contiguity (strengthened by repetition) and resemblance. Still, the subjective probabilities are based on everyday experience, resemblance corresponding to the representativeness heuristic (Keren & Teigen, 2004). Participants stated that they took the past as their primary reference, indicating that the quadrant described the typically observed condition in the territory they are in. Even when the task was

involving a distant future i.e., 2021, decision makers made probability assessments mainly based on their past experiences.

Probability assigned to quadrant-A is significantly higher than quadrant-C and D in the study involving only scenario conditions and the study involving scenario narratives. This could be categorized under “wishful thinking”. ILS setting may be not able to remove the wishful thinking in the likelihood of occurrence assessments of quadrants completely.

Kahneman and Tversky illustrated in a study from 1972 that the tendency to use the representativeness heuristic is stronger when the specific information is vivid and compelling. In contrast to this finding, in terms of mutually exclusive and collectively exhaustive (MECE) cases and their likelihood of occurrence, it was observed that less vivid information could activate the representativeness heuristic more for the scenario quadrant representing available past experience. The participants of the study involving only scenario conditions favored quadrant-B with a significantly higher likelihood of occurrence compared to those of the study involving scenario narratives. Quadrant-B’s association with past experience is stronger when it was provided to forecasters without any content. In a setting of MECE, decision makers appear to have a tendency to assign a higher likelihood of occurrence to the case they have experienced before. The conditions of quadrant-B are reversed in quadrant-D: Low technology adoption rate and stronger economy. Quadrant-D is special as forecasters identify it as the “hard to imagine” quadrant. Objects differ in the fluency with which they can be processed (Reber, Schwarz & Winkielman, 2004). Studies by Redden and Frederick (2011) suggest that the

complexity of an event reduces its relative subjective likelihood. Unkelbach (2006) presents evidence that people believe that “the simple” equals “the more likely” and they rely on this naive theory to interpret feelings of “processing ease” or “fluency”. Greenwald, Nosek and Banaji (2003) have found that people naturally associate the concept of likely more with simplicity than with complexity. Although “complexity” is usually accompanied by other factors, it is a factor which should be accounted for. In addition, for motivational reasons, stimuli which are substantially inconsistent with the forecast or plan are ignored by decision makers (Kiesler & Sproull, 1982). The median likelihood of the “hard to imagine” quadrant-D is 10% whereas it increases significantly to 15% after reviewing scenario narratives. This work finds evidence that stories are strongly influential on the quadrant which is either selectively perceived or disregarded the most among the four MECE quadrants. This result also confirms Carroll’s (1978) argument in particular for Quadrant-D. In an ILS setting with MECE quadrants, imagining the occurrence of the least likely quadrant (i.e., quadrant-D in this work) via a scripted scenario may have made images of the event significantly more “available” to individuals. Subsequently, this implies people admitted the possibility of this quadrant after it included the scenario narrative. This finding supports Schoemaker (1991) and Wack’s (1985) statements as well. Schoemaker (1991) points out that scenarios make managers more aware. Wack underlines the value of scenarios (1985), stating that value of scenarios is understood as they warn for important incoming events, and they prompt action. Considering the “hard to imagine” quadrant with scenario narratives and working on likelihood assessments could pave the way to recognizing the “disregarded” and this could prompt action. Millett (2009) argued that assigning probability to scenarios

would dangerously direct scenario users to concentrate on the highest probability condition. This was not observed in the course of reviewing the MECE scenarios. Assessing the likelihood of occurrence appears to trigger a comparatively enhanced thinking. The findings in this work illustrate that scenario narratives could make people conscious of how possible the lowest probability condition is, instead of neglecting it as a consequence of selective perception. The availability heuristic (i.e., simulation bias as this is a probability assessment) may be in place with its benefit for the less likely quadrant (i.e., D) in an intuitive logics scenario setting. Although D is not perceived selectively, the missing information is elicited from the available information; i.e., scenario narrative.

Most of the time the decision maker's own experience and extant world knowledge play a role in judgments. In the study involving only scenario conditions, this process of going "beyond the information given" appears to play a big role during the assessment of likelihood of occurrence. In this process, assessment makers are believed to resort to cognitive simplification processes to make sense of the unpredictable future they are asked to evaluate (Russo, Schoemaker & Russo, 1989; Kahneman & Lovallo, 1993). Organizations and their managers may find it easy to ride the wave of the past even when they are assessing the future. Kiesler and Sproull (1982) explain that managers operate on mental representations of the world, and these representations are likely to be of historical environments rather than of current ones. As such, participants have declared that imagining the future is not as easy as it may seem. Even when they make an effort to visualize an utterly different future, they state that they cannot think independently. They look at the recent history and try to get clues for the future from the past. They mention that they find it

comfortable pointing to history as evidence because it already took place. They need to sense the change, anticipate the possible directions of change and be ready to accept that the future may be different than the past. The use of resemblance, the use of the representativeness heuristics as a "shortcut" facilitates a narrow thinking. Using scenario narratives has proven its significant effect on the most likely quadrant to reduce the "representativeness heuristic". It could be said that the arrival of the "availability heuristic" has alleviated the "representativeness heuristic" for the scenario which is deemed most likely.

Quadrant-A, the fully positive condition appears the second highest ranking quadrant. 36% and 24% of participants respectively in the study involving scenario narratives and the study involving only scenario conditions have assigned the highest probability to Quadrant-A, which represents a high technology adoption rate and stronger economy. Positivity bias is clear here. In the debrifing sessions, the decision makers confirmed their approaches. When I asked why they had assigned the second highest likelihood of occurrence to the fully positive scenario, the respondents were surprised at first. They were asked to do a retrospective study and respond after thinking why. The respondents stated that during the assessment they were unaware they had assigned a high probability to the fully positive scenario. They referred to their wishful thinking, they wished that the condition would occur with high probability. This was their main and hidden motivation for assigning a high likelihood of occurrence to the fully positive scenario. Apparently, decision makers fall into assessment traps. In a healthy decision making environment, "possibility" and "desirability" are two rating dimensions and these two dimensions should not be confused.

Individuals have tendency to rely on rules of thumb or heuristics, in order to decrease the information-processing demands of making decisions. Heuristics help people save energy while making decisions by allowing them to process fewer pieces of information to simplify the weights of different information, and finally consider fewer alternatives while making decisions (Shah & Oppenheimer, 2008). In this dissertation, the findings show that heuristics may be useful as well. With the effect of the availability heuristic, using scenario narratives are good for the selectively less perceived condition (i.e., D in this work). Narratives may enable scenario users not to get automatically dismissed, yet engage more attention. Using scenario narratives could be also good for curbing the exaggregated probability assigned to the most likely scenario (i.e., B in this work).

6.5. Other Biases Identified During Forecasting Tasks

With four forecasting scenarios, the findings signal that decision makers find it easy to get into "auto-pilot" mode and go through the motions of completing various process steps without fully engaging the competing environment generated by the external environmental forces. They appear to automatically latch onto the simplest interpretation; if the condition appears positive, then that specific company's sales figures are bound to go up. Even though market share is very sensitive to the competition in the market, the forecasters were encouraged to run a simple logic: A better condition would bring a higher market share. This attitude could be associated with affect heuristics. Only a small number of the participants said that they were skeptical about the positive conditions mentioned because a good environment could bring about coercive competitional issues. Only 69 participants

out of 251 (27%) made a lower market share forecast for the best case quadrant (A) than the worst case quadrant (C). Only 18 out of 251 individuals provided a lower sales forecast for Scenario-A than Scenario-C. This corresponds only to 7% of the forecasters.

This work assumes that a forecaster who pays attention to the competition would break the habit of making sales or market share forecasts haphazardly and would not impulsively assume "the better the condition, the higher the forecast must be." For instance, we can say that if a respondent's sales forecast for quadrant-A is higher than quadrant-B, similarly A>C, A>D, B>C, D>C and call each item in compliance as "ordinary". Then one can count the items which do not comply with this check; i.e., "extraordinary". Five cases (A>B, A>C, A>D, B>C, D>C) for 251 forecasters will imply 1,255 checks in total for sales forecasts and an additional 1,255 checks for market share forecasts. When all sales forecasts are reviewed this way, only 12% of all sales forecasts were able to go beyond the "ordinary". Only 27% of all market share forecasts was able to go beyond the ordinary; i.e., the forecasters who were able to consider the competition effect; i.e., if the conditions are fine, sales figures and market share do not necessarily have to go up. This finding shows that working on market share forecasts stimulates consideration of the "competition" relatively more frequently than working solely on sales forecasts.

Participants, who ignored any competition but considered sales proportional to the positivity in scenarios, were asked why they did not take the competition into account. They were surprised to hear that there would be any "competition". They agreed with this idea and also stated that it is hard to consider and defend this: In a positive-positive condition it sounds so natural to predict a

relatively higher sales volume and an increased market share. They said that challenging this haphazard assumption with competition arguments was not so easy. One of the challenges was to defend that disruptive opinion to other people. It was like attempting to negate a generally accepted fact. Meissner and Wulf (2013) showed that the use of scenarios reduces the framing bias. This work adds that it cannot offer a full remedy to remove the "framing". Scenario scholars must look for solutions to improve this. Having forecasters produce scenario contents on their own and facilitating a group activity may help reduce this framing effect by stimulating their minds to realize the competition. Working on a plausible set of verbal information; i.e., a scenario, offers the possibility of engaging all stakeholder groups and all interest networks simultaneously. Thus, the scenario environment could ease collaboration between diverse mindsets. To get additional insight, ILS conditions in this dissertation were used as a material in a workshop held in the EMBA classes at Bilkent University. In this workshop, the driving forces were delivered to business practitioners and they were asked to write their scenario narratives as a group. Based on this experience, it was observed that although the groups were not able to produce balanced scripts within a limited time, each group was able to catch competition repercussions related to each scenario condition. They were successful at finding the blind spot: Having a positive condition does not necessarily imply a better outcome for the company, such as achieving higher sales or higher market share.

As an additional insight; the dispersion of forecasts for the best case condition (A) is always significantly larger than those in the worst case condition (C) in the study groups not involving any risk implications. There is no limit for the best case; the forecasters are free to take it as far as they like in their imagination when

they do not have risk implications in sight. On the other hand, with the fact that the minimum sales forecast was restricted to zero, the individuals provided less dispersed forecasts to quadrant-C.

6.6. Credibility of Advice and Willingness to Use Advice

It is noteworthy that the general pattern in professionals' ratings for "willingness to use advice" is low (around 2.0 out of 7.0) within the scope of *Recommend For* type advice. Here the following critical perspective could fall into place: Could there be a dominant attribute of advice source to consider? The debriefing sessions signalled that forecasters were seeking something different within the advice rather than one directional advice as it occurs in *Recommend For* type advice.

Several motives are influential on decision-makers' receptivity to assistance from an advisor. The literature mainly contains motives for maximizing "decision accuracy". The motive to maintain autonomy is likely to relate to the acceptance of the advice (Dalal & Bonaccio, 2010). Many researchers (Caplan & Samter, 1999; Goldsmith, 2000; Goldsmith & Fitch, 1997) showed that people react less positively to interpersonal communications that violate their autonomy. One directional advice leads to a restriction of freedom. Greater autonomy is preserved in *Information* type advice, as they do not explicitly prescribe an alternative (Pilnick, 1999; Dalal & Bonaccio, 2010). Dalal and Bonaccio (2010) emphasize the gap in literature: decision making literature has not systematically studied the provision of "information" by advisors. Wright, Bradfield and Cairns (2013) highlight that the use

of scenarios provides a means of making the best use of information. Önkal, Sayım and Gönül (2013) point out that scenarios offer open and rich platforms for information exchange. This type of forecast advice has received little research attention so far. Study-1a and Study-1b of this work served to fill the gap of *Information* advice with a focus on scenarios. Study-2 contributed to the understanding of how the use of advice occurs for *Recommend For* advice with an emphasis on source credibility.

When the advice is *Information* type, the median rating for willingness to use that advice is computed as 5.0 in a 7.0 point Likert scale. The test results may suggest that *Information* type forecast advice is likely to stimulate more willingness than *Recommend For* type advice. Presenting advice with alternatives (i.e., *Information*) may be more powerful in encouraging forecasters to use the advice, as opposed to the general idea that forecasters would deem a one-directional point (i.e., *Recommend For*) advice as an effective take-away.

When advice takers were provided with the presumption and experience attributes of the advice source, they were sensitive to the advisor's status even though their track record was available as well. The presumed and experienced credibility of an advisor can each have significant effects on the extent to which users revise their prior forecasts, irrespective of whether these are expressed as point or interval forecasts. Presumed credibility was influential on professionals who were perhaps sensitive to their own status – the relative status of the advisor, as reflected in their presumed credibility. Even though the professionals were sensitive to the status of the advisor, their experience of financial forecasting may have caused them to be less surprised when people with high presumed credibility were found to have a

poor track record and vice versa, so they did not react to the contradiction. Both the presumed and experienced credibility of the advisor were influential in determining the weight attached to the advice. Highly accurate or highly inaccurate forecasts would have had a high level of salience for the participants so that the attention paid to an advisor's accuracy would probably have been greater than that paid to their status.

Although managers and planners love to see "to the point advice", this study and other many studies such as Dalal and Bonaccio's (2010) show that decision makers care about "autonomy". Decision makers would like to see the alternatives rather than receive a dry recommendation. The results in this work are in line with Dalal and Bonaccio's results (2010). Autonomy prevails for decision makers even more than decision accuracy; they care about being presented with alternatives and their explanations instead of receiving simple numerical forecast advice.

6.7. Limitations

Scenarios have the potential to offer larger, more diverse perspectives with in-depth information. One critique of this work is that the scenario narratives could have been prepared longer. The length chosen in this work was determined after asking participants' opinions. Managers could use longer scenarios in their daily business lives. Another potential limitation could involve the experimental design of test groups. The experiment did not aim to control forecasters for the time they spent on the tests. In this study, the participants were told to spend as much time as they deemed necessary to comprehend the provided forecast advice and prepare their

forecasts. They spent 19.9 minutes on average. The experiment could force participants to spend at least a predetermined length of time to work on the scenarios: That could be an attempt to make the tests have greater impact yet it is hard to say for certain.

In Study-2, the experiment used stock prices to represent *Recommend For* type advice. While advice for the future value of the stock price could be a good representative of the *Recommend For* type advice, other examples of *Recommend For* advice should also be studied to strengthen the generalization on the results.

One limitation of the study stems from its setting. The results should be generalized within the scope of the intuitive logics scenarios in Study-1a and Study-1b and within the scope of disclosing the two attributes of advisors (i.e., presumed credibility and experienced credibility) in Study-2. The observed pattern cannot be kept regardless of context. Study-1a and Study-1b were conducted based on the market of wearable technology products, which is only two years old as of the end of 2016. The background information was limited and the studies involved forecasts on an annual basis. The frequency of forecasts (e.g., monthly basis) or other markets could give rise to different findings. Study-2 was conducted within the context of the stock market (given that this provided common ground for participants' interests) and the results may not be generalizable to all markets. In this study, the provided data set and the requested data indicated weekly closing prices. Another forecast frequency could bring about other results.

6.8. Future Research

Opportunities for further research abound in the area of forecast advice. Given below is a short list..

One future study could examine forecasters' confidence in their assessments of likelihood of occurrence when they are provided with varying scenario contents. Another future study may involve empirical tests with different content and design for forecasters who utilize *Information* type advice. For instance, scenarios can be enriched using "strategy implications" just as they are enriched by risk implications here. Additional content could include a managerial action plan depicting the exploitation of opportunities or mitigation of risks arising in each condition. This "response" content, individually or accompanied with scenario narratives and risk implications, could be tested for forecasts and confidence. Forecasters' approach to the contents of either scenario could be analyzed. In another future research, as an extension, scholars could test what happens when forecast advice takers are invited to enrich the scenario contents on their own after reviewing a short script provided by the scenario advisors. Decision makers could be encouraged to write their own scenarios as a group before they review scenarios prepared by an external source as well. Forecasters may be invited to make forecasts and make assessments of their confidence after they contribute to the scenario contents themselves. In this way, the influence of reviewing an externally prepared scenario and an internally prepared scenario on forecasts and forecasters' confidence can be examined. Incorporating advice takers' (i.e., forecasters') own imagination into the scenario content may be a good way of testing confidence, since then, the ownership factor is likely to play a role in forecasters' confidence. As an alternative,

forecasters may exchange the scenarios they have developed and their confidence in these exchanged scenarios may be compared in future studies. In addition, the attributes of this external source presenting the *Information* type advice (i.e., scenarios) may be subject to an experiment. Many advisors produce scenarios and present their work to scenario users, yet are not given feedback on how to demonstrate their credibility to scenario users. Advice source credibility for *Recommend For* type advice has been analyzed in this dissertation, yet further studies could investigate the advice source credibility for *Information* type advice. Examining this may contribute to increased awareness related to the relationship between scenarios, advisors and scenario users. In another study, users' trust in scenario work can be examined. Prospective work can explain how scenario advisors may build trust with their advisees.

CHAPTER-7: CONCLUSION

I conclude by highlighting the key features of this study: The research setting and substantive findings. This study can be distinguished from prior studies by its data collected in intuitive logics scenarios with an emphasis on their mutually exclusive and collectively exhaustive quadrants, with varying scenario contents and lastly for examining the credibility factor of the source in the use of advice.

Here, the use of advice has been studied in three distinct ways, Study-1a, Study-1b and Study-2, as prior research has not always been sufficient in explaining findings. Most notably, this work explains the relationship of judgments with scenarios and risks, as well as the credibility of the advisor across forecasting tasks involving *Information* type and *Recommend For* type advice. Study-1 allows the analysis of forecasts and forecasters' confidence generated with different content ILS implementations. It also sheds light on how decision makers assign likelihood of occurrence to scenarios in this framework. The impact of this additional treatment in forecasters' confidence is addressed, and this enables us to make some

recommendations to get the most out of scenario methodology. This work presents evidence that the forecasters' confidence does not change easily with respect to the scenario content. Likelihood of occurrence assessments can be used as a propelling treatment to challenge decision makers' thinking during the scenario workshops as they could prompt forecasters to evaluate the quadrants more carefully. Scenario users should be aware that the ILS structure cannot offer a remedy for the framing bias, yet scenario experts should develop new strategies motivating decision makers to think in indirect associations.

If some awareness can be raised on the possible biases in place during the establishment of the scenario methodology, the opportunity to alleviate biases during judgmental forecasting may emerge. Scenario workshops can be enriched with extended information such as risk implications. This work has shown that despite limited historical data provision, forecasts and forecasters' confidence are not sensitive to change by varying scenario contents, yet various contents have the potential to enhance forecasters' thinking. In this work, the availability heuristics (and simulation bias) is not as strongly identified as it was anticipated during the use of scenario narratives. The content of scenarios may influence forecasters' confidence significantly in only a few cases. Availability heuristics could be considered to serve the good as well, to alleviate the representativeness heuristic in the likelihood assessments of conditions as it could remove the selective perception arising from past experiences. In addition, regardless of the information it presents, the ILS framework could assist forecasters in overcoming the difficulty of differentiating a single negative condition from a double negative condition involving conditions. The evidence the literature presents and the new evidence this

work presents both suggest that the ILS framework enriched with more information on the future's uncertainty may offer an enhanced thinking to its users and could reduce the decision making biases. The ILS method may be resulting in greater awareness and would thus deserve to pervade daily business tools.

The semi-structured interview and debriefing process followed here allowed us to explore each forecaster's inherent motives as fully as possible; the use of questionnaires allowed each forecaster to provide his/her own interpretation of the issues and render the statistical analyses as a whole. This dissertation may suggest incorporating *Information* type advice into forecasting processes more often. Advisors could be advised to turn their reports into *Information* type reports which incorporate scenarios and the rationale, alternative expectations and assumptions if they wish to impress prospective clients into taking their advice.

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APPENDICE

Appendix-1: Wearable Electronic Devices and Historical Data

(Company-S Actual Data, retrieved from Euromonitor International in October 2016)

Brand Shares (Global - Historical Owner) | Historical | Retail Volume | '000 units

Geographies	Categories	Company name (GBO)	2013	2014	2015	2016
Turkey	Wearable Electronics	S Corp	-	-	2.70	13.00

Brand Shares (Global - Historical Owner) | Historical | Retail Volume | % breakdown

Geographies	Categories	Company name (GBO)	2013	2014	2015	2016
Turkey	Wearable Electronics	S Corp	-	-	13.20	15.20

Appendix-2: Full List of Driving Forces

In addition to collecting typical driving forces from field experience and from business magazines, business reports; the prelimilary interview sessions held with professionals were utilized to identify the driving forces which are effective on market share and sales volume of wearable electronic products.

The following key forces were listed:

- State of the economy in the market
- Technology adoption level of the market
- The digitalization level of the education institutions
- The level of connectivity of objects and people (Internet of Things)
- Data security and confidentiality
- The rate of young population in the market
- The environmentalism trend level in the society

Appendix-3: Choosing the Two Primary Driving Forces

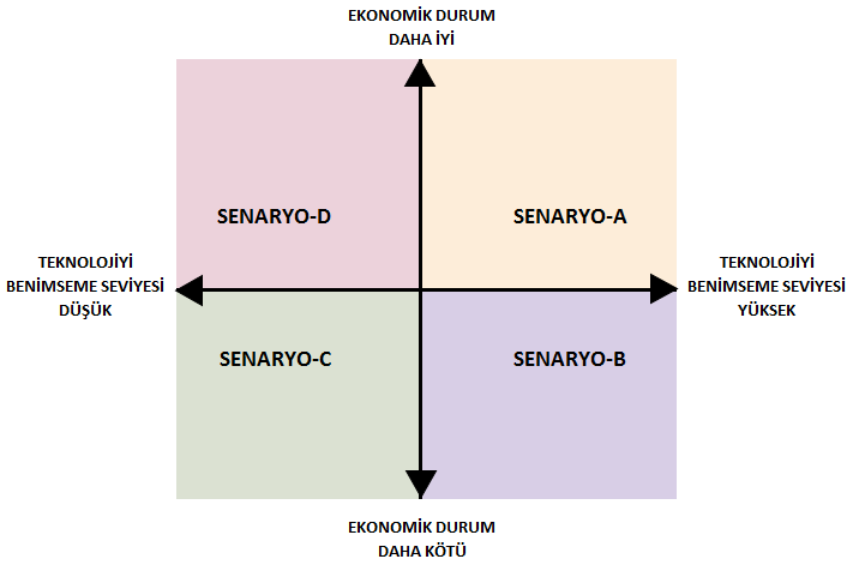
STUDY-1A (Survey)

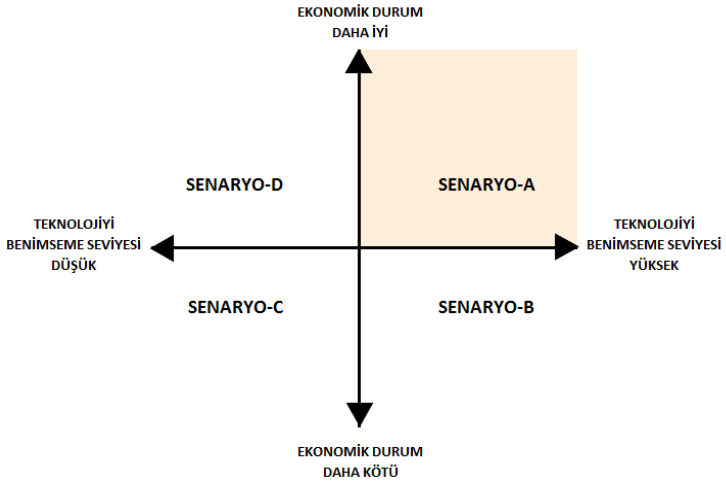
A	Bu tek soruluk anket formu, giyilebilir elektronik ürünleri piyasasında etkili olacak faktörler konusunda fikirlerinizi almayı amaçlamaktadır. Sorunun doğru veya bir yanlış cevabı olmadığı için sadece görüşünüzü almaya ihtiyaç duyuyorum. Kişisel bilgileriniz kaydedilmemektedir ve verileriniz kimse ile paylaşılmayacaktır. Ayırdığınız zaman ve harcadığınız emek çok değerli, çok teşekkür ederim. Saygılarımla, Esra Öz, Sorularınız için: esariarslan@gmail.com □ Sağlayacağım bilgilerin akademik çalışmalarda kullanılmasını kabul ediyorum. □ Araştırmacının iletişim bilgileri hakkında bilgilendirildim. □ Araştırmacı tarafından çalışma hakkında verilen ön bilgiyi anladım ve katılımcı olmayı kabul ediyorum.
1	Bir Avrupa ülkesinde, 2021'de gerçekleşecek giyilebilir teknoloji ürünü satışlarını, sence hangi 2 faktör en çok etkiler? Size göre, 2021 için belirleyici olacak, ürün sahibi firmanın kendi kararları dışında kalan, en önemli 2 faktörü seçiniz. A-(Ülkedeki) Ekonomik durum B-(Ülkedeki) Nüfusun teknoloji kabul etme/adaptasyon seviyesi C-(Ülke) Eğitim kurumlarındaki dijitalleşme seviyesi D-(Ülkedeki) Nesne ve insanların birbiri ile bağlanırlık seviyesi (Internet of Things) E-(Ülkedeki) Veri güvenliği ve veri gizliliği seviyesi F-(Ülkedeki) Genç nesil yüzdesi G-(Ülkedeki) Çevrecilik trend seviyesi H-Diğer

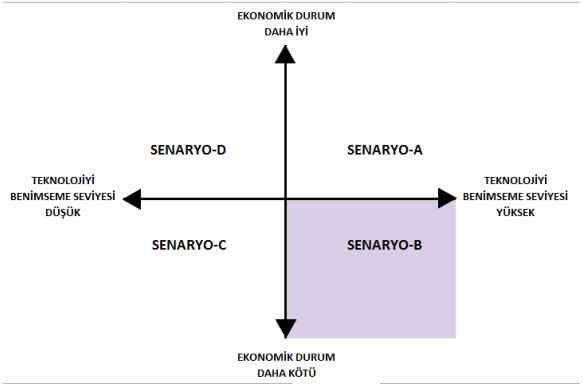
Appendix-4: Experimental Design

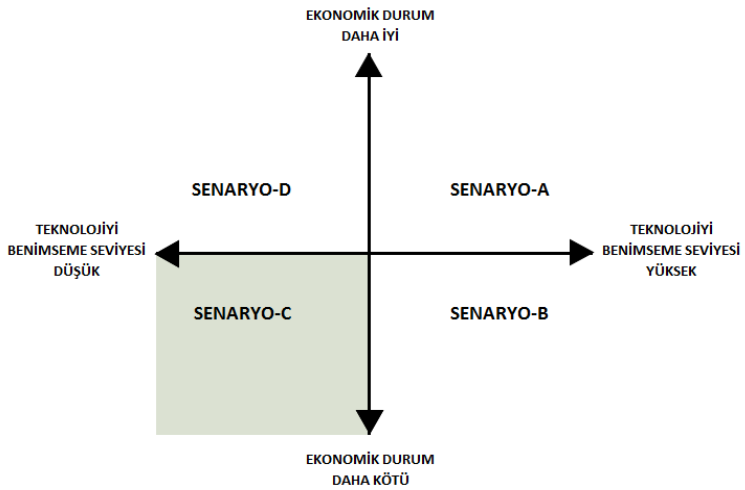
	Satış ve Pazar Payı Tahminleri **GİYİLEBİLİR TEKNOLOJİ ÜRÜNLERİ**
A	Bu anket formu farklı senaryolara göre tahmin ve değerlendirmelerinizi almaya yönelik sorular içermektedir. Çalışmaya katılmak için 18 yaşından büyük olmak gerekmektedir. Katılım gönüllülük esasına dayanmaktadır. Katılımcılar istedikleri takdirde çalışmadan çekilebilirler. Soruların doğru veya yanlış cevabı yoktur. Bu nedenle sadece beklentilerinizi yansıtacak şekilde cevaplamanıza ihtiyaç bulunuyor. Toplanan veriler şifreyle korunan bir bilgisayarda saklanmaktadır. Kişisel bilgileriniz kaydedilmemektedir ve verileriniz kimse ile paylaşılmayacaktır. Araştırmadan beklenen temel fayda, yargısal tahminlerde bulunma sürecini daha iyi anlayabilmektir. Elde edilecek bu bulgular bu süreci iyileştirmek adına iyi bir başlangıç olacak. Soruları dikkatli bir şekilde inceleyerek cevaplar vermeniz, araştırmacının güvenilir sonuçlar elde etmesi adına çok kıymetli. Anketi tamamlamak için ayırdığınız zaman ve harcadığınız emek çok değerli, çok teşekkür ederim. Saygılarımla, Esra Öz, esariarslan@gmail.com □ Sağlayacağım bilgilerin akademik çalışmalarda kullanılmasını kabul ediyorum. □ Araştırmacının iletişim bilgileri hakkında bilgilendirildim. □ Araştırmacı tarafından çalışma hakkında verilen ön bilgiyi anladım ve katılımcı olmayı kabul ediyorum.
B	GİYİLEBİLİR TEKNOLOJİ NEDİR? Adından tahmin edilebilir bir terim olmasına rağmen, sadece okuduğunuzda tüm hikâyeyi anlamak çok zor. Giyilebilir teknoloji, üstünüze giydiğiniz teknolojik aletlerin genel adıdır. Ancak burada belirgin bir ayrım var. Giyilebilir derken günlük hayatta kullandığınız kulaklıklar bu alana girmiyor mesela. Bir ürüne "giyilebilir teknoloji" dememiz için, ürünün akıllı sensörlerden gelen bilgileri akıllı telefonunuza kablosuz veya bluetooth ile bağlanarak aktarması gereklidir. Bu bilgiler fitness, kilo kaybı, gün içi hareketlilik veya işlerinizi organize etme ile ilgili bilgiler olabilir. NASIL GİYİLİR? Ürünlerin çoğu bileklere takılabilen türdedir ama yakın zamanda vücuda tutturulan veya boyna asılan modeller de popüler olmaya başlamıştır. Giyilebilir teknolojilerin çoğu mücevherat gibi takılabilir. Saat, bileklik yüzük ve kolye gibi aklınıza gelebilecek birçok ürün artık bu teknoloji ile kullanılmaktadır.

C	**GİYİLEBİLİR TEKNOLOJİ ÜRÜNLERİ NELERDİR?** 
D	- Nüfusun bu ürün için teknolojiyi benimseme seviyesi - Ülkedeki ekonomik durum Bir teknoloji şirketi, hedeflediği belli bir coğrafyada 2021 yılı için giyilebilir teknoloji ürünü satış miktarı ve pazar payı tahmini yapmak istiyor. Şirket yöneticileri satış yapılacak pazara ait bazı belirsizlikler olduğunu düşünüyor. Şirket gerçekleştirdiği detaylı incelemeler sonucunda, kendi kararları dışında belirsizlik taşıyan en önemli iki faktörün yukarıda verilenler olduğunu değerlendiriyor.
1	Bu iki faktörün, 2X2 Matris üzerinde görünümü şöyle olacaktır:

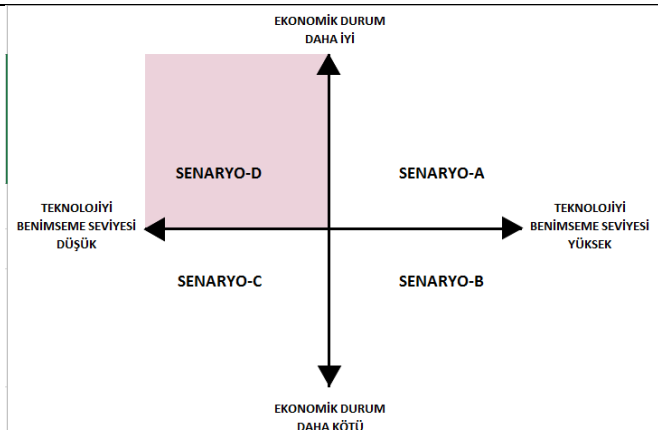
	
1.1.	Şirket, 2021 senaryolarını iki faktör etrafında şöyle grupluyor: Bu dört farklı ortam, birbirinden ayrık ve birlikte %100 olasılığa ulaşan olayları temsil ediyor. Bu doğrultuda sizce 2021'de, ▪ Teknoloji benimseme seviyesinin yüksek ve ekonomik durumun 2016'ya göre daha iyi olduğu ortamın gerçekleşme olasılığı nedir? (0 ile 100 arasında.) ▪ Teknoloji benimseme seviyesinin yüksek ve ekonomik durumun 2016'ya göre daha iyi olmadığı ortamın gerçekleşme olasılığı nedir? (0 ile 100 arasında.) ▪ Teknoloji benimseme seviyesinin düşük ve ekonomik durumun 2016'ya göre daha iyi olduğu ortamın gerçekleşme olasılığı nedir? (0 ile 100 arasında.) ▪ Teknoloji benimseme seviyesinin düşük ve ekonomik durumun 2016'ya göre daha iyi olmadığı ortamın gerçekleşme olasılığı nedir? (0 ile 100 arasında.)
E	Şirket, giyilebilir teknoloji ürün grubu için satış tahminlerini, her 4 durum için ayrı ayrı ele aldığında geleceği daha iyi değerlendirme imkânı olacağına inanıyor. Şirket, uzmanlık alanı teknoloji senaryoları olan bir firmadan 2021 için senaryolar oluşturmasını istiyor. Ayrıca, bu senaryo firmasının risk uzmanından her senaryo

	altında çıkabilecek riskleri listelemesini talep ediyor.
2	**Senaryo A: Teknoloji benimseme seviyesi yüksek olduğunda ve ekonomik durum iyileştiğinde,** 
2.1 .	Uzman senaryo firması tarafından 2021 için yapılan çalışma şu bilgileri içeriyor: Siyasi istikrar, son yıllarda ülkedeki bankacılık ve finans yapısını da olumlu yönde etkilemiş. Ülke, çok sayıda uluslararası platformda boy gösteriyor, iyi bir politika ile ilerliyor. Ülke, birçok ülke ile ticari birlikler geliştirmiş. Ülke hem iç hem dış yatırımcılar için çok cazip bir pazar olarak görünüyor. Pazardaki hareketlilik iş imkânlarını arttırmış. İşsizlik 2016'ya kıyasla daha düşük bir seviyede seyrediyor. İnsanların alım gücü 2016'ya nazaran artmış durumda. Giyilebilir teknoloji ürünlerinin sosyal hayatta ve iş hayatında gerekli olduğuna çok sayıda kişi inanıyor. Bireyler, bu elektronik cihazların kendi hayatlarına sağladığı katma değerin çok olduğunu düşünüyor. İnsanlar teknolojiye bağımlı bir hayattan keyif alıyor, geçmişten farklı yeni bir şeyler deneyimlemenin gerekliliğine inanıyorlar. Etrafta çok sayıda kişinin giyilebilir ürüne sahip olması, bu deneyimi yaşama isteğini çok kişide tetikliyor. Bu ürünlerin kullanımı birçok kişiye kolay geliyor.
2.2 .	2021 için risk uzmanı tarafından yapılan çalışma şu bilgileri içeriyor: Riskler-A: • Yerel para birimi değer kazanabilir, ülke piyasasına çok sayıda firma girebilir. • İnsanların alım gücü yüksek olacağı için, firma talebi zamanında karşılayamayabilir. • Piyasada çok sayıda satıcının yer alması, nitelikli satış kanallarına erişimi

	zorlaştırabilir. • Teknolojiye ilgi çok yoğun olduğunda, ürün çeşitliliği ve ürünlerin sürekli yenilenmesi ihtiyacına firma yetişemeyebilir. • Hatalı herhangi bir ürünün gündeme gelmesi, firma için prestij kaybına sebep olabilir.
2a, 2b	Firma için 2021 yıllık satış tahmini yapar mısınız? Firma için 2015 satış miktarı: 2.700 Firma için 2016 satış tahmini: 13.000 2021'de gerçekleşecek değerin, yüzde kaç ihtimalle tahmin ettiğiniz noktanın ±%5 güven aralığı içinde kalacağını belirtiniz (0 ile 100 arasında.)
2c, 2d	Firma için 2021 pazar payı tahmini yapar mısınız? (0 ile 100 arasında) Firma için 2015 pazar payı:%13.2 Firma için 2016 pazar payı tahmini: %15.2
3	**Senaryo B: Teknoloji benimseme seviyesi yüksek olduğunda ve ekonomik durum kötüleştiğinde,** 
3.1 .	Siyasi istikrarsızlık, son yıllarda ülkedeki bankacılık ve finans yapısını olumsuz yönde etkilemiş. Ülke, az sayıda uluslararası platformda boy gösteriyor, ortalama bir politika ile ilerliyor. Ülke, kısıtlı sayıda ülke ile ticari birlikler geliştirmiş. Ülke hem iç hem dış yatırımcılar için az cazip bir pazar olarak görünüyor. Pazardaki durgunluk iş imkânlarını azaltmış. İşsizlik 2016'ya kıyasla daha yüksek bir seviyede seyrediyor. İnsanların alım gücü 2016'ya nazaran azalmış durumda. Giyilebilir teknoloji ürünlerinin sosyal hayatta ve iş hayatında gerekli olduğuna çok sayıda kişi inanıyor. Bireyler, bu elektronik cihazların kendi hayatlarına sağladığı katma değerin çok olduğunu düşünüyor. İnsanlar teknolojiye bağımlı bir hayattan keyif alıyor, geçmişten farklı yeni bir şeyler deneyimlemenin gerekliliğine inanıyorlar. Etrafta çok sayıda kişinin giyilebilir ürüne sahip olması,

	bu deneyimi yaşama isteğini çok kişide tetikliyor. Bu ürünlerin kullanımı birçok kişiye kolay geliyor.
3.2 .	Riskler-B: • Yerel para birimi değer kaybedebilir, ürün fiyatı yerel para birimi cinsinden artabilir. • Piyasada ürün çeşidinin az olması, ürünün az tanınmasına sebep olabilir. • Piyasada az sayıda satıcının yer alması, nitelikli satış dağıtım kanallarının hayatta kalmasını zorlaştırabilir. • Teknolojiye ilgi çok yoğun olduğunda, ürün çeşitliliği ve ürünlerin sürekli yenilenmesi ihtiyacına firma yetişemeyebilir. • Hatalı herhangi bir ürünün gündeme gelmesi, firma için prestij kaybına sebep olabilir.
3a, 3b	Firma için 2021 yıllık satış tahmini yapar mısınız? Firma için 2015 satış miktarı: 2.700 Firma için 2016 satış tahmini: 13.000 2021 yılında gerçekleşecek değerin, yüzde kaç ihtimalle tahmin ettiğiniz noktanın ±%5 güven aralığı içinde kalacağını belirtiniz (%0 ile %100 arasında.)
3c, 3d	Firma için 2021 pazar payı tahmini yapar mısınız? (0 ile 100 arasında) Firma için 2015 pazar payı:%13.2 Firma için 2016 pazar payı tahmini: %15.2
4	**Senaryo C: Teknoloji benimseme seviyesi düşük olduğunda ve ekonomik durum kötüleştiğinde,** 
4.1	Siyasi istikrarsızlık, son yıllarda ülkedeki bankacılık ve finans yapısını olumsuz yönde etkilemiş. Ülke, az sayıda uluslararası platformda boy gösteriyor, ortalama

.	bir politika ile ilerliyor. Ülke, kısıtlı sayıda ülke ile ticari birlikler geliştirmiş. Ülke hem iç hem dış yatırımcılar için az cazip bir pazar olarak görünüyor. Pazardaki durgunluk iş imkânlarını azaltmış. İşsizlik 2016'ya kıyasla daha yüksek bir seviyede seyrediyor. İnsanların alım gücü 2016'ya nazaran azalmış durumda. Giyilebilir teknoloji ürünlerinin sosyal hayatta ve iş hayatında gerekli olduğuna az sayıda kişi inanıyor. Bireyler, bu elektronik cihazların kendi hayatlarına sağladığı katma değerin az olduğunu düşünüyor. İnsanlar teknolojiye bağımlı bir hayattan öte, doğal ve geleneksel bir hayatın gerekliliğine inanıyorlar. Etrafta az sayıda kişinin giyilebilir ürüne sahip olması, bu deneyimi yaşama isteğini az kişide tetikliyor. Bu ürünlerin kullanımı birçok kişiye zor geliyor.
4.2 .	Riskler-C: • Yerel para birimi değer kaybedebilir, ürün fiyatı yerel para birimi cinsinden artabilir. • Piyasada ürün çeşidinin az olması, ürünün az tanınmasına sebep olabilir. • Piyasada az sayıda satıcının yer alması, nitelikli satış dağıtım kanallarının hayatta kalmasını zorlaştırabilir. • Teknolojiye ilgi az yoğun olduğunda, ikinci el piyasası oluşabilir ve ikinci el piyasası yeni ürünlerin satış miktarını etkileyebilir. • Hatalı herhangi bir ürünün gündeme gelmesi, müşterilerin bu ürüne ilgisini kaybetmesine sebep olabilir.
4a, 4b	Firma için 2021 yıllık satış tahmini yapar mısınız? Firma için 2015 satış miktarı: 2.700 Firma için 2016 satış tahmini: 13.000 2021'de gerçekleşecek değerin, yüzde kaç ihtimalle tahmin ettiğiniz noktanın ±%5 güven aralığı içinde kalacağını belirtiniz (0 ile 100 arasında.)
4c, 4d	Firma için 2021 pazar payı tahmini yapar mısınız? (0 ile 100 arasında) Firma için 2015 pazar payı:%13.2 Firma için 2016 pazar payı tahmini: %15.2
5	**Senaryo D: Teknoloji benimseme seviyesi düşük olduğunda ve ekonomik durum iyileştiğinde,**

	
5.1.	Siyasi istikrar, son yıllarda ülkedeki bankacılık ve finans yapısını da olumlu yönde etkilemiş. Ülke, çok sayıda uluslararası platformda boy gösteriyor, iyi bir politika ile ilerliyor. Ülke, bir çok ülke ile ticari birlikler geliştirmiş. Ülke hem iç hem dış yatırımcılar için çok cazip bir pazar olarak görünüyor. Pazardaki hareketlilik iş imkânlarını arttırmış. İşsizlik 2016 ile karşılaştırıldığında daha düşük bir seviyede seyrediyor. İnsanların alım gücü 2016'ya nazaran artmış durumda. Giyilebilir teknoloji ürünlerinin sosyal hayatta ve iş hayatında gerekli olduğuna az sayıda kişi inanıyor. Bireyler, bu elektronik cihazların kendi hayatlarına sağladığı katma değerin az olduğunu düşünüyor. İnsanlar teknolojiye bağımlı bir hayattan öte, doğal ve geleneksel bir hayatın gerekliliğine inanıyorlar. Etrafta az sayıda kişinin giyilebilir ürüne sahip olması, bu deneyimi yaşama isteğini az kişide tetikliyor. Bu ürünlerin kullanımı birçok kişiye zor geliyor.
5.2.	Riskler-D: • Yerel para birimi değer kazanabilir, ülke piyasasına çok sayıda firma girebilir. • İnsanların alım gücü yüksek olacağı için, firma talebi zamanında karşılayamayabilir. • Piyasada çok sayıda satıcının yer alması, nitelikli satış kanallarına erişimi zorlaştırabilir. • Teknolojiye ilgi az yoğun olduğunda, ikinci el piyasasının oluşması ve ikinci el piyasası yeni ürünlerin satış miktarını etkileyebilir. • Hatalı herhangi bir ürünün gündeme gelmesi, müşterilerin bu ürüne ilgisini kaybetmesine sebep olabilir.
5a, 5b	Firma için 2021 yıllık satış tahmini yapar mısınız? Firma için 2015 satış miktarı: 2.700 Firma için 2016 satış tahmini: 13.000 2021'de gerçekleşecek değerin, yüzde kaç ihtimalle tahmin ettiğiniz noktanın ±%5 güven aralığı içinde kalacağını belirtiniz (0 ile 100 arasında.)

5c, 5d	Firma için 2021 pazar payı tahmini yapar mısınız? (0 ile 100 arasında) Firma için 2015 pazar payı:%13.2 Firma için 2016 pazar payı tahmini: %15.2
6	İsim veya Kod İsim,
7	Cinsiyetiniz ▪ Bay ▪ Bayan ▪ Belirtmemeyi tercih ederim.
8	En son aldığınız eğitim ▪ Lise ▪ Üniversite/Lisans ▪ Yüksek Lisans ▪ Doktora
9	Hangi sektörde çalışıyorsunuz? ▪ Danışmanlık ▪ Giyim ve Tekstik ▪ Otomotiv ▪ Bankacılık ve Finans ▪ Kimya ▪ IT ▪ İnşaat ▪ Savunma ve Uzay ▪ Elektronik ▪ Enerji ▪ Perakende ▪ Telekom ▪ Diğer
10	Kaç yıldır iş hayatındasınız?
11	Şu anda çalışmakta olduğunuz firma yaklaşık olarak kaç personelden oluşuyor? ▪ 2-100 ▪ 101-500 ▪ 501-2000 ▪ 2001-10000 ▪ 10000+
12	ÇIKIŞ ANKETİ

(1) Tahmin yapma konusunda bilgilerinizi nasıl derecelendirirsiniz?

1 **2** **3** **4** **5** **6** **7**

ÇOK KÖTÜ ÇOK İYİ

(2) Bu çalışmadaki tahmin yapma performansınızı nasıl değerlendirirsiniz?

1 **2** **3** **4** **5** **6** **7**

ÇOK KÖTÜ ÇOK İYİ

(3) Bir uzmanın ilgili olduğu alanda size sağlayacağı senaryolara ne ölçüde güvenirsiniz?

1 **2** **3** **4** **5** **6** **7**

OLDUKÇA AZ OLDUKÇA FAZLA

(4) Bir uzmanın ilgili olduğu alanda size sağlayacağı rakamsal tahminlere ne ölçüde güvenirsiniz?

1 **2** **3** **4** **5** **6** **7**

OLDUKÇA AZ OLDUKÇA FAZLA

(5) Bir uzmanın size sunacağı senaryolar geleceğe yönelik tahmin yapmanızı ne ölçüde kolaylaştırır?

1 **2** **3** **4** **5** **6** **7**

ÇOK AZ ÇOK FAZLA

(6) Bir uzmanın size senaryolar sağlaması yapacağınız tahminlere güveninizi ne ölçüde değiştirir?

1 **2** **3** **4** **5** **6** **7**

OLDUKÇA AZ OLDUKÇA FAZLA

(7) Bir uzman, olası riskleri bilgi olarak size sağlasaydı tahmin yapmanızı ne ölçüde kolaylaştırırdı?

1 **2** **3** **4** **5** **6** **7**

ÇOK AZ ÇOK FAZLA

(8) Bir uzman, olası riskleri bilgi olarak size sağlasaydı yapacağınız tahminlere güveninizi ne ölçüde değiştirirdi?

1 **2** **3** **4** **5** **6** **7**

OLDUKÇA AZ OLDUKÇA FAZLA

(9) Aşağıdaki ifade için fikrinizi belirtiniz:
Senaryolar temin etmek yapacağım tahminleri doğrudan etkiler.

1 **2** **3** **4** **5** **6** **7**

KESİNLİKLE KATILMIYORUM KESİNLİKLE KATILIYORUM

(10) Aşağıdaki ifade için fikrinizi belirtiniz:
Olası riskleri temin etmek yapacağım tahminleri doğrudan etkiler.

	1	**2**	**3**	**4**	**5**	**6**	**7**
	KESİNLİKLE KATILMIYORUM						KESİNLİKLE KATILIYORUM
	(11) Aşağıdaki ifade için fikrinizi belirtiniz: Geleceğe dair tahminlerim üzerinde çalışırken, bir senaryo uzmanı tarafından hazırlanmış detaylı senaryo bilgisi kullanmak isterim.						
	1	**2**	**3**	**4**	**5**	**6**	**7**
	KESİNLİKLE KATILMIYORUM						KESİNLİKLE KATILIYORUM
	(12) Aşağıdaki ifade için fikrinizi belirtiniz: Geleceğe dair tahminlerim üzerinde çalışırken, bir senaryo uzmanı tarafından hazırlanmış detaylı senaryo bilgisini satın almak isterim.						
	1	**2**	**3**	**4**	**5**	**6**	**7**
	KESİNLİKLE KATILMIYORUM						KESİNLİKLE KATILIYORUM
F	Katkılarınız için çok teşekkürler.						

The expressions regarding scenario narratives and risk implications were prepared and used in Turkish in accordance with the research rules in this study. English translation is provided in the table below in order to facilitate an idea on the content:

SCENARIO NARRATIVE-A
Political stability has positively influenced the banking and financial structure of the country in recent years. The country is showing up on many international platforms, progressing with a well-off policy. The country has developed trade associations with many countries. The country seems to be a very attractive market for both domestic and foreign investors. The boom in the market increased the job opportunities. Unemployment rate is at a lower level than it was in 2016. The purchasing power of people has increased compared to 2016. Many people believe that wearable technology products are necessary in social life and business life. Individuals think that these electronic devices bring a lot of added value to their lives. People are enjoying a technology-dependent life, believing that it is necessary to experience something new in the past. The fact that a large number of people around have a wearable product triggers the desire to experience it. The use of these products is easy for many people.
RISK IMPLICATIONS-A
• Local currency can gain value, many companies can enter the country market. • Since the purchasing power of people is high, the firm may not meet the demand on time. • Having a large number of sellers in the market can make access to qualified sales channels difficult. • When the technology is very intense, the company may not be able to reach the need for product diversity and continuous replenishment of products. • Any defective product launched to the market can cause loss of prestige for the company.
SCENARIO NARRATIVE-B
Political instability has adversely affected the banking and financial structure of the country in recent years. The country appears on few international platforms, progressing with an average policy. The country has developed trade associations with a limited number of countries. The country appears to be an attractive market for both domestic and foreign investors. The recession in the market has reduced job opportunities. Unemployment rate is at a higher level than in 2016. The purchasing power of people has decreased compared to 2016. Many people believe that wearable technology products are necessary in social life and business life. Individuals think that these electronic devices have a lot of added value to

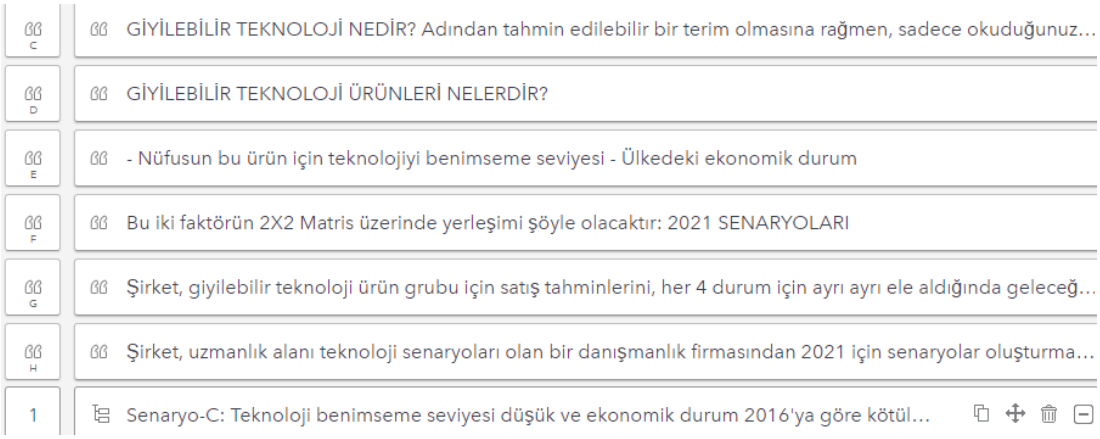
their lives. People are enjoying a technology-dependent life, believing that it is necessary to experience something new in the past. The fact that a large number of people around have a wearable product triggers the desire to experience it. The use of these products is easy for many people.
RISK IMPLICATIONS-B
•The local currency may lose value, the price of the product may increase in local currency. • If there is a small amount of product in the market, it may cause a low recognition of the product. • Having fewer sellers in the market can make it difficult for qualified sales distribution channels to survive. • When the technology is very intense, the company may not be able to reach the need for product diversity and continuous replenishment of products. • Any defective product launched into the market can cause loss of prestige for the company.
SCENARIO NARRATIVE-C
Political instability has adversely affected the banking and financial structure of the country in recent years. The country appears on few international platforms, progressing with an average policy. The country has developed trade associations with a limited number of countries. The country appears to be an attractive market for both domestic and foreign investors. The recession in the market has reduced job opportunities. Unemployment rate is at a higher level than in 2016. The purchasing power of people has decreased compared to 2016. There are few people who believe that wearable technology products are necessary in social life and business life. Individuals think that these electronic devices have little added value to their lives. People believe in the necessity of a natural, traditional life beyond a technology-dependent life. The fact that a small number of people around have a wearable product triggers a few people’s desire to experience it. The use of these products is difficult for many people.
RISK IMPLICATIONS-C
• Local currency may lose value, product price may increase in local currency. • If there is a small amount of product in the market, it may cause a little recognition of the product. • Having fewer sellers in the market can make it difficult for qualified sales distribution channels to survive. • When technology is less intense, second hand market can raise and second hand market can affect sales quantity of new products. • Any defective product launched into the market may cause customers to lose interest in this product.

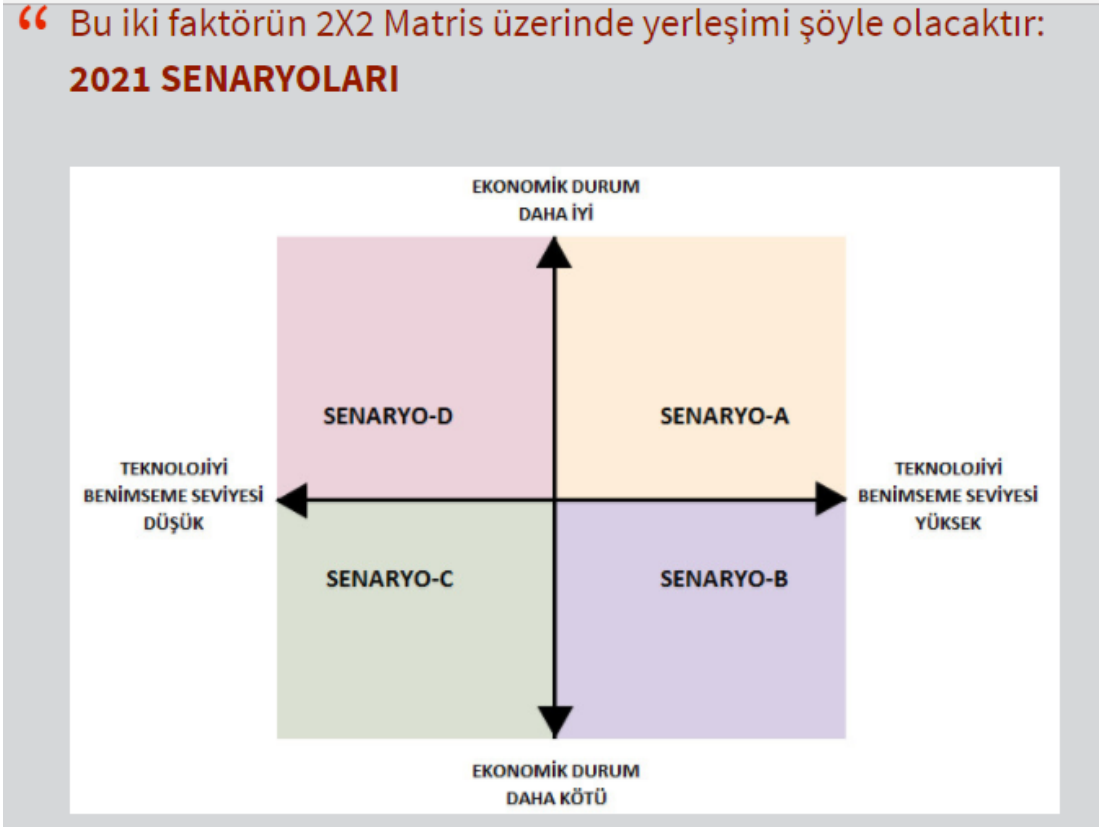
SCENARIO NARRATIVE-D
Political stability has positively influenced the banking and financial structure of the country in recent years. The country is showing up on many international platforms, progressing with well-off policy. The country has developed trade associations with many countries. The country seems to be a very attractive market for both domestic and foreign investors. The boom in the market increased the job opportunities. Unemployment rate is at a lower level compared to 2016. The purchasing power of people has increased compared to 2016. There are few people who believe that wearable technology products are necessary in social life and business life. Individuals think that these electronic devices have little added value to their lives. People believe in the necessity of a natural, traditional life beyond a technology-dependent life. The fact that a small number of people around have a wearable product triggers a few people's desire to experience it. The use of these products is difficult for many people.
RISK IMPLICATIONS-D
•Local currency can gain value, many companies can enter the country market. • Since the purchasing power of people is high, the firm may not meet the demand on time. • Having a large number of sellers in the market can make access to qualified sales channels difficult. • When technology is less intense, the formation of the second hand market and second hand market can affect the sales volume of new products. • Any defective product launched into the market may cause customers to lose interest in this product.

Appendix-5: Skewness of Each Data Set

	G1_NoNar	G2_Nar	G3_PrNoNar	G4_PrNar	G5_NarRisk	G6_Risk
SalesA	5.88	4.73	5.89	6.23	4.51	5.08
SalesB	5.25	5.05	5.31	3.86	3.7	3.93
SalesC	4.67	5.1	4.08	4.02	6.3	3.52
SalesD	5.75	4.54	3.62	6.2	4.88	3.01
ShareA	1.66	1.81	2.73	1.5	1.74	2.06
ShareB	1.35	1.01	1.6	1.08	2.23	2.38
ShareC	2.4	1.42	0.38	2.98	2.52	3.08
ShareD	2.41	1.96	0.27	2.3	1.86	2.69
Conf_SalesA	-0.74	-1.41	-1.43	-0.69	-0.6	-0.65
Conf_SalesB	-0.43	-1.03	-1.44	-0.74	-0.52	-0.4
Conf_SalesC	-0.48	-0.68	-0.92	-0.47	-0.69	-0.4
Conf_SalesD	-0.66	-0.97	-1.08	-0.58	-0.52	-0.52
Conf_ShareA	-0.71	-0.73	-1.16	-0.55	-0.73	-0.82
Conf_ShareB	-0.61	-0.59	-1.29	-0.52	-0.79	-0.6
Conf_ShareC	-0.74	-0.57	-1.12	-0.45	-0.6	-0.63
Conf_ShareD	-0.95	-0.62	-1.22	-0.39	-0.33	-0.51

Appendix-6: Sample Views from Typeforms





3 → **Senaryo-A: Teknoloji benimseme seviyesi yüksek ve ekonomik durum 2016'ya göre iyileştiğinde:...**

a. Firma için 2021 yıllık satış tahmini yapar mısınız? *

Firma için 2015 satış miktarı: 2.700
Firma için 2016 satış tahmini: 13.000

To add a paragraph, press **SHIFT + ENTER**

3 → **Senaryo-A: Teknoloji benimseme seviyesi yüksek ve ekonomik durum 2016'ya göre iyileştiğinde:...**

b. 2021 için yıllık satış tahmininiz : 3

2021'de gerçekleşecek değerin, yüzde kaç ihtimalle tahmin ettiğiniz noktanın ±%5 etrafında kalacağını belirtiniz (0 ile 100 arasında.) *

Örneğin: Tahmin ettiğiniz değer 100 ise, gerçekleşecek değerin 95 ile 105 arasında çıkma olasılığı sizce nedir?

To add a paragraph, press **SHIFT + ENTER**

15 → Değerlendirmeleriniz,

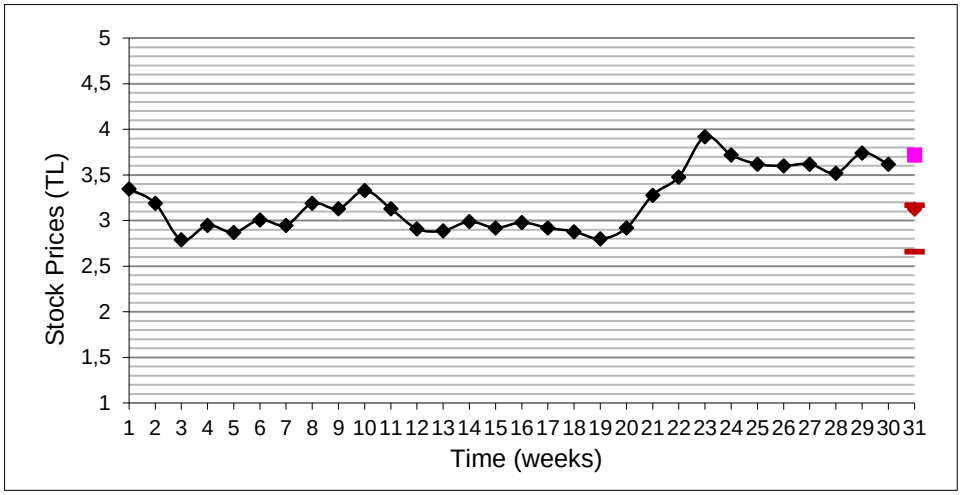
j. Aşağıdaki ifade için fikrinizi belirtiniz:
Olası riskleri temin etmek yapacağım tahminleri doğrudan etkiler. *

1	2	3	4	5	6	7

KESİNLİKLE KATILMIYORUM — KESİNLİKLE KATILIYORUM

Appendix-7: Sample Information to Experienced Credibility

STOCK 1



Please carefully evaluate the given advice and the realized stock price

FORECAST ADVICE FOR WEEK 31:

95% interval forecast upper bound : **3.17**

Point forecast : **3.13**

95% interval forecast lower bound : **2.66**

Realized stock price for week 31 : 3.72

Week	Stock Price
30	3.62
29	3.74
28	3.52
27	3.62

SOURCE OF THE FORECAST ADVICE:

This forecast advice is given by a taxi driver

(This page presents the low experienced credibility group)

POINT FORECASTING PERFORMANCE

FOR THE GIVEN ADVICE

Absolute percentage error (APE)	Percentage of forecasts
0% - less than 15%	58.30%
15% - less than 30%	42.70%
30% or more	0.00%

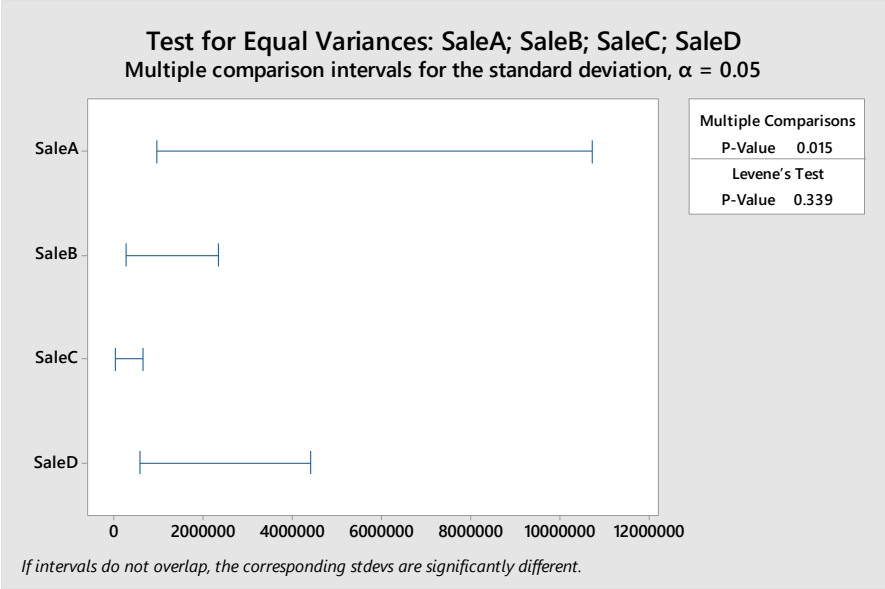
INTERVAL FORECASTING PERFORMANCE

FOR THE GIVEN ADVICE

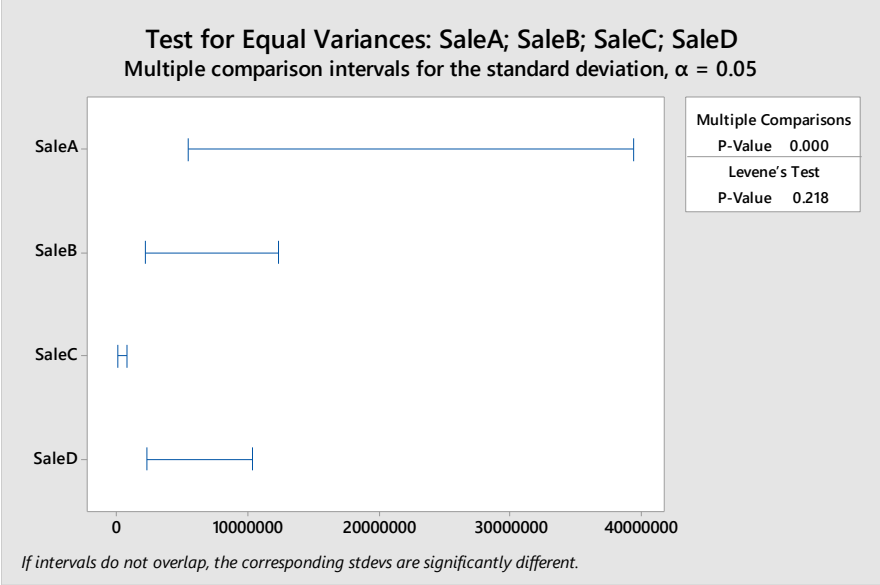
Proportion of cases when the realized value falls in the given interval	16.66%
Proportion of cases when the realized value DOES NOT fall in the given interval	83.34%

Appendix-8 Test for Equal Variance of Sales Forecasts

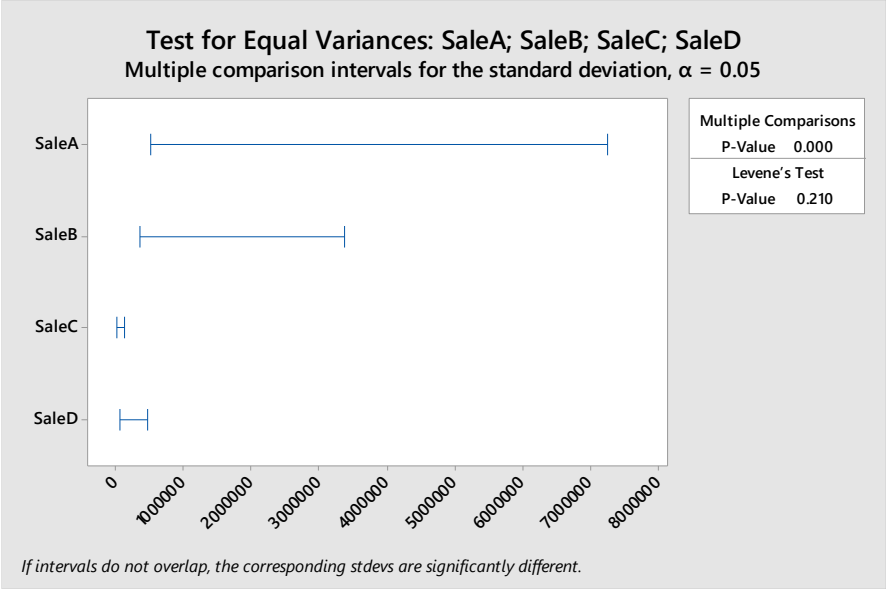
Variance of sales forecasts in G1_NoNar



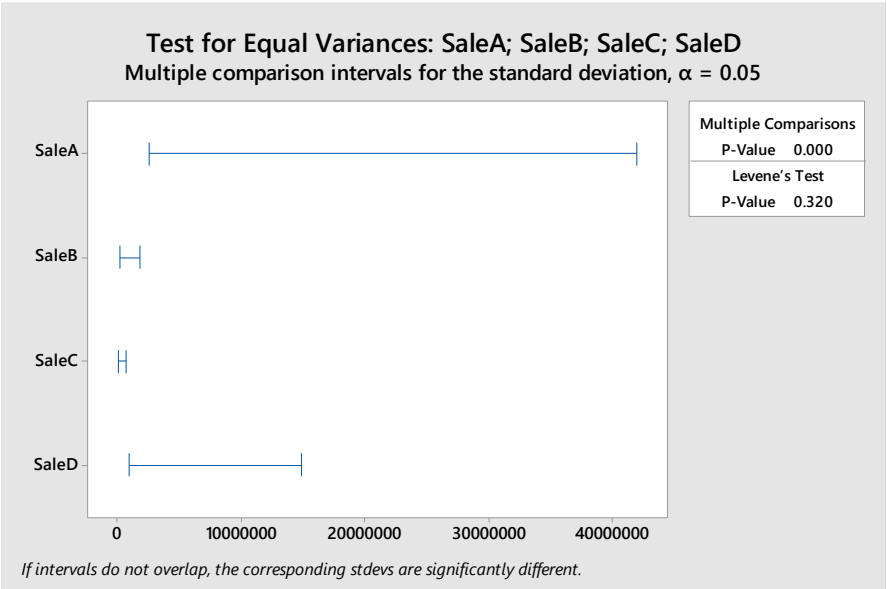
Variance of sales forecasts in G2_Nar



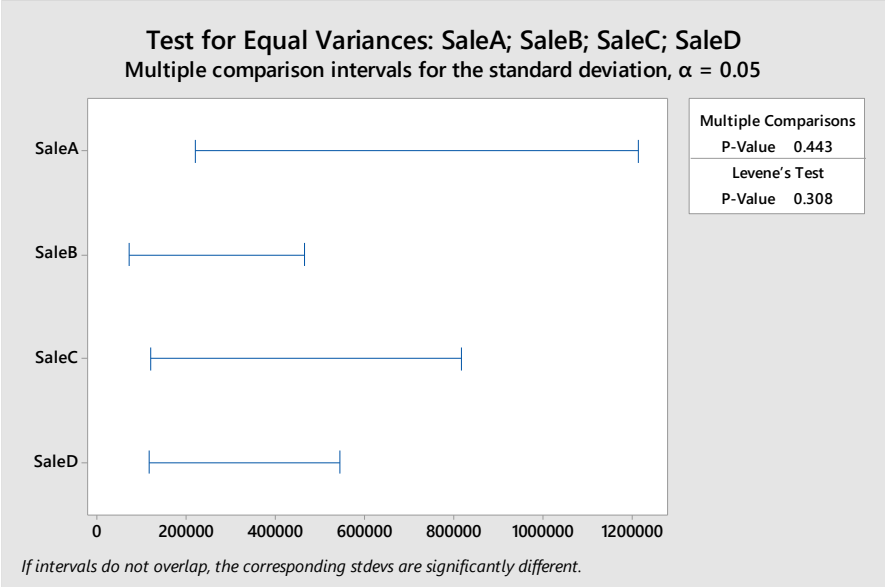
Variance of sales forecasts in G3_PrNoNar



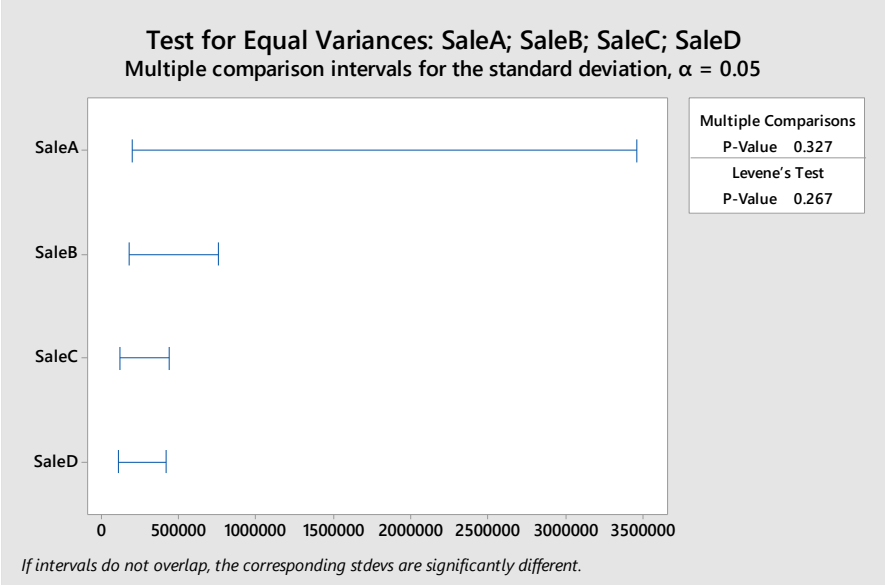
Variance of sales forecasts in G4_PrNar



Variance of sales forecasts in G5_NarRisk



Variance of sales forecasts in G6_Risk



If the interval pertaining to any dyad quadrants do not overlap, their corresponding standard deviations are significantly different.