

DOCTOR OF BUSINESS ADMINISTRATION

**General Manager Characteristics, Demand Forecast Accuracy,  
and Decision Quality in New Firms**

Document Five

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## Abstract

In today's complex and fast changing business environment, accurate demand forecasting is increasingly important to business decision making. The purpose of this study is to investigate the relationship between general manager (GM) characteristic, demand forecast accuracy and decision quality in new firms. A framework is developed and posits that demand forecast accuracy in new firms is impacted by GM involvement, GM expertise and GM overconfidence. GM involvement in the forecasting process positively influences forecasters' work engagement in the activity. In turn, the effect of GM involvement on forecast accuracy is mediated by employee work engagement. The effect of GM involvement is also moderated by the type of organization culture that exists in the enterprise. Finally, in this model, demand forecasting accuracy is seen having a direct impact on decision quality. Based on survey sample collected from 331 general managers/forecasters in new firms, the analysis results show that GM involvement and GM expertise affect forecast accuracy positively, while GM overconfidence affects forecast accuracy negatively. In addition, the effect of forecast accuracy on decision quality is positively supported. The study also concludes that the three dimensions of work engagement, consisting of vigor, dedication, absorption, partially mediate the effect of GM involvement on demand forecast accuracy. Further, the results show that clan culture or market culture environments that exist within the firm can positively moderate the relationship between GM involvement and forecast accuracy, while adhocracy culture or hierarchy culture produces a negative interaction for GM involvement. The outcome of the research is important in drawing suggestions for organization process redesign that can improve forecast accuracy and enhance decision quality.

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# 1. Introduction

In today's complex and fast changing business environment, accurate demand forecasting is increasingly important to business decision making. In market economies, demand forecasting helps to set short and long term corporate directions, align organization plans, develop new product strategies, and make production decisions. Study of forecasting accuracy and its influence factors is of great importance to development and survival of enterprises.

However, in practical business operations, because of the complexity of the environment, intensity of competition, and volatility of market, conducting demand forecast is not an easy task. There are various factors that impact accuracy of demand forecasts. In the external environment, emerging new products and new technologies, government macro and micro policies, entry and exit of competitors, fluctuations of purchasing trends, and unexpected events together drive market dynamics and cause demand forecasts inaccuracy. In the internal environment, factors including involvement of top management, use of forecasting methods, forecasting period, organization control and even organization size and age impact on forecast accuracy. Scholars have conducted various studies on the factors that have influence on forecast accuracy (Armstrong et al., 1984; Fildes & Hastings, 1994; Gartner & Thomas, 1993; Remus, 1998).

Faced with complicated internal and external environments, companies use a variety of ways to improve prediction accuracy. In large enterprises, planning organizations are highly structured (Das & He, 2006), and tend to have dedicated and full-time forecasters. These companies provide forecasting staffs with trainings, and incentives to motivate them to improve prediction accuracy of the forecasts. New enterprises, especially small and medium ones, exhibit different forecasting processes. New enterprises tend to have less formal organizational structures. Unlike large companies with substantial resources, new firms have only limited financial, manufacturing, and marketing resources, and they do not have abundant internal sources of capital for each department in the firm (Das & He, 2006) and typically allocate limited resources to perform proper market analysis and forecasting. While forecasting is so fundamentally critical for new enterprises, they have funding and resource constraints, and they lack specialized forecasting capabilities. The General Manager of new firms often acts in multiple roles, as forecaster, and as the key decision-maker. He or she needs

to consider internal and external environmental factors, and make full use of available limited corporate resources to maintain accuracy of demand forecasts.

Given the value of forecasting and the importance of decision quality that hinges on demand forecasting accuracy, it is critical that additional studies be conducted to drawing new insights that can apply academically and practically in the business environment. For the DBA thesis, the research topic centers on four key areas. Firstly, in the previous research focusing on factors influencing demand forecast accuracy, it was noted that little research have been focused on the IT and telecommunications industry. Existing studies either took a broad generic research approach (Wacker & Sprague, 1998; Remus, 1998) or focused on a specific segment (Hughes, 2001) such as the finance industry. However, there is little previous research that concentrated on Information and Communications Technology (ICT) enterprises. The competition among ICT enterprises is fierce, which makes it challenging and difficult to conduct demand forecasts. However, those that succeed are often characterized by a set of operating attributes that include excellent planning and effective decision making. The ability to translate market demand into accurate forecast projection is an important means to strengthen competitiveness (Dalrymple, 1987; Elias, 2006; Zotteri & Kalchschmidt, 2007). Good forecasting practice and accurate forecasting enhance decision effectiveness. Elias (2006) noted that, “achieving accurate forecasts of future market demand is crucially important for today’s global manufacturing enterprise. Increasingly competitive pressures force manufacturers to closely match production capacities and mix-dependent run volumes to highly dynamic market conditions; excessive capacity results in a depressed return on assets, while inadequate capacity leads to lost market share. Resulting from the lean operating margins typical in today’s highly competitive global business environment, excessive forecast error on a continuing basis “clogs the arteries” of and enterprise, draining away profitability.” By contrast, based on the research conducted in document 3, the researcher found that demand forecast accuracy of mature and stable industries is relatively high. Therefore, the study of the effect of internal and external environment on demand forecast accuracy means little significance. For example, the interview results in document 3 indicated that forecasting of FMCG (Fast Moving Consumer Goods) products are relatively simpler and can leverage historical data. Further, forecasting of industrial (or B2B) products is less problematic, as the suppliers tend to work closely with the customers to secure the necessary input. The ICT industry is characterized by variable customer demands, which differ greatly from FMCG. However, it does not

generalize to B2B, since there are B2C segments in the ICT industry which present difficulty for suppliers to predict and to accurately master the customer demand. In such circumstances, it is very important to focus on the ICT industry where the researcher has been working for years, to study the factors which influence demand forecast accuracy.

Secondly, in previous research studies for documents 2 and document 4, the author found that most available literature on forecast accuracy focused on investigating factors that impact stock price forecasting accuracy by security analysts. However, there is little research on market demand forecast accuracy, and specifically focusing on new companies. In this new study, only one paper was found which is dedicated to research on the factors affecting the accuracy of the new company's forecasts (i.e. Gartner & Thomas, 1993). Gartner and Thomas (1993) presented both internal and external factors for demand forecast accuracy within this context. It outlined the factors that cause demand forecast accuracy, but it did not conduct in-depth analysis of each factor.

New companies are the life-blood of the economy, with many being established and registered every day. In China, according to China Industry and Commerce News (2013), China registered 1,064,700 new enterprises in the first 6 months of 2013, an increase of 7.67%. This data suggests that the market for new startup is healthy with large number for new companies entering the market. With many new companies, and with the fact that accurate demand forecast is critical for survival of these new entrants, it is both interesting and vital to conduct further research on how new companies generate demand forecasts.

Thirdly, the result of document 4 indicated that top management involvement is a significant factor that influence demand forecast accuracy. However, some of the available studies drew different conclusions. For example, Wacker and Sprague (1995, 1998)'s study showed that involvement of top management is detrimental to demand forecast accuracy. On the other hand, Jain (2007) found that involvement of top management in the forecasting process can improve forecast accuracy. The study from document 4 confirmed that the main reason for the different conclusions is that the researchers did not consider the moderation effect of organization culture. In new enterprises, in particular, it is very common for the general manager to be directly involved in the demand forecasting process. This would suggest that the characteristics of GMs are important considerations that would impact forecasting accuracy and decision quality. Yet, academically, there is limited study investigating this area. As such, it is worthwhile to gain a deeper understanding on



the impact of GM characteristics on demand forecast accuracy.

Lastly, when people make decisions, it is nearly impossible to find complete foreknowledge of all the possible consequences of the decision. In the face of uncertainty, forecasting is a critical element of the decision making process. Having sufficient information in the form of forecasts is very important to evaluate the decision scenarios and options. However, there are opposing opinions for forecast driven decision making. One is approval for forecast driven decision making (Makridakis et al., 1998; Jain, 1993); and the other is criticism of forecast driven decision making (Gigerenzer, 1996; Polat, 2008). Given these inconsistent arguments, it is very relevant to further study the effect of demand forecast accuracy on decision quality.

Therefore, for this DBA thesis, the author will embark on a research journey focusing on new firms in the ICT industry, and studying the impact of GM's characteristics on demand forecast accuracy and decision quality. The research scope and project objectives are delineated in this chapter. This is followed in chapter 2 with a review of related available literature and development of the conceptual framework. Methodology and methods utilized for the quantitative research are described in Chapter 3. Descriptive statistics and correlation analysis results are presented in Chapter 4. Lastly, chapter 5 provides summaries and conclusions of the research, including a discussion on theoretical and practical contributions of the study.

## **1.1 Purpose of the Study**

Building upon results of existing research and from findings in documents 3 and 4, this research will narrow the focus on study of new firms, analyze the ICT industry environment, and study the effect of the General Manager's characteristics on forecast accuracy and decision quality, and analyze the moderating effect of organizational culture and mediating effect of forecaster's work engagement.

The study has two main purposes. The first purpose of this study is to establish a definition and categorization for GM characteristics through literature research and investigate the relationships between general manager (GM) Characteristics and demand forecasting accuracy and decision quality in new enterprises. Further, based on the document 4 research on top management involvement in the forecasting process, the researcher will study the moderation and mediation effect between general manager involvement and demand forecasting accuracy.

The second purpose of this study is to explore the effective approaches for GM to improve demand forecasting accuracy and decision quality in new firms. Unlike GMs in mature and large industrial corporations where responsibilities and roles are defined and structured, the roles of GMs in new firms are broad and dynamic. Results from this study can provide insight for GMs of new firms and provide guidance for GM's in their role in the demand forecast process to maximize forecasting accuracy.

## **1.2 Research Questions and objectives**

The following research questions are proposed in this study:

Q1: What is the relationship between GM characteristics and demand forecasting accuracy and decision quality?

Q2: What is the relationship between demand forecasting accuracy and decision quality?

Q3: To what degree does GM involvement influence on demand forecasting accuracy?

Q3a: Is there a mediation effect between GM involvement and demand forecasting accuracy?

Q3b: Is there a moderation effect between GM involvement and demand forecasting accuracy?

## **1.3 Significance of the Study**

The present study will contribute to the knowledge of demand forecasting accuracy in new firms and seek to demonstrate the importance of GM characteristics in influencing demand forecasting accuracy. Moreover, the study will provide guidance for GMs in new firms to take measures to avoid pitfalls that are detrimental to good forecasting and create organization cultures that foster demand forecast accuracy.

## 2. Literature Review and Theoretical Hypothesis

### 2.1 Literature Review

This section will review existing literature and develop the theoretical hypothesis. Research results from document 2, document 3, and document 4 are referenced to build the framework for this research.

#### 2.1.1 Previous Findings

Document 2 summarized available literature and documented three distinct views of the factors that influence forecasting accuracy. These views included (1) organizational; (2) technological; and (3) economic as illustrated in Figure 1.

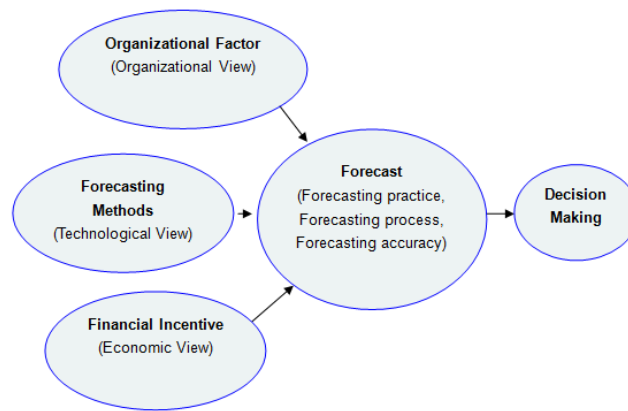


Figure 1: Conceptual framework developed in document 2

These three views consider the motivations and behaviours that influence how forecasts are put together. The organizational view concerns organizational culture and organizational environment that impact forecasting accuracy. The technological view relates to selecting and applying suitable methods to optimize forecast accuracy. The economic view considers forecasting accuracy from the scope of salesman incentive and forecaster incentive respectively. The conceptual framework developed in document 2 included the following key elements:

**Forecasting Practices** – encompass forecasting processes, tools, cooperation and information exchange, control and organization involvement.

Factors likely to influence forecasting practice in an organization include (Zotteri & Kalchschmidt, 2007; Winklhofer et al., 1996; McCarthy et al., 2006):

- (a) Forecast objectives
- (b) Forecast horizon
- (c) Familiarization with forecasting techniques
- (d) Experience with forecasting
- (e) Involvement of suppliers and customers
- (f) Accuracy and control
- (g) Function involvement

**Forecasting Process** – delineates how the data are gathered and analyzed, and how the forecast is presented.

An organization's forecasting process may consist of (Armstrong et al., 1987; Georgoff & Murdick, 1986; Elikai et al., 1999; Reid, 1992; Mentzer & Schroeter, 1994):

- (a) Management support
- (b) Forecast type
- (c) Range and frequency
- (d) Updates
- (e) Data requirement and preparation
- (f) Function sponsorship
- (g) Participants
- (h) Approach (top down versus bottom up)
- (i) Stages – Purpose, Input, information processing (analysis, model selection, error), reporting (results, measurement, updates)

Potential factors which influence forecast accuracy are (Jain, 2007; Wacker & Sprague, 1995):

- (a) Culture
- (b) Forecast purpose
- (c) Number of functions involved
- (d) Top management involvement
- (e) Attention and resources
- (f) Forecasting approaches & methods
- (g) Market environments
- (h) Forecaster experience and expertise
- (i) Contingency (new product, international affairs, natural disaster.. etc)

**Organization Culture** - As forecasting is conducted within a team environment and executed among multiple departments within an enterprise, generation of accurate forecasting necessitate an organization culture that embraces effective forecasting practices. Forecasting behaviour and the accuracy standards to which forecasts are generated would be influenced by the organization norms

and believes.

The organization's forecasting culture may be impacted by (Ribiere, 2001; Hofstede, 1994):

- (a) Behavioural norms
- (b) Espoused values
- (c) Beliefs and underlying assumptions
- (d) Power distance
- (e) Uncertainty avoidance
- (f) Individualism

Organization culture affects forecasting practice in various ways, including (Wacker & Sprague, 1998; Davis & Mentzer, 2007; Jain, 2007):

- (a) Forecast development
- (b) Forecast use
- (c) Top management wishes versus true forecast
- (d) Sales department involvement
- (e) Leadership support versus involvement - enable funding and resources
- (f) Credibility of sales forecasting versus forecasting capability
- (g) Reward alignment – whether target is within reach or at maximum

The organization's environment can also impact forecast accuracy (Diamantopoulos & Winklhofer, 1996; Dalrymple, 1987; Smith III et al., 1996; Gartner & Thomas, 1993):

- (a) Firm size and age – resources, maturity, data availability, expertise
- (b) Market variables
- (c) Promotions and strategic initiatives changes
- (d) Competition

**Forecast Methods** – include qualitative methods such as Delphi and quantitative methods such as times series and causal forecast. Empirical evidence suggests that accuracy of judgmental forecasts is inferior to statistical methods. However, judgmental forecasts are often used as the primary forecasting tool.

The forecast methods/Models applied in an organization may include:

- (a) Qualitative (Georgoff & Murdick, 1986; Makridakis & Wheelwright, 1977)
  - i. Delphi method
  - ii. Market survey method
  - iii. Panel consensus
  - iv. Visionary forecast
  - v. Historical analogy
- (b) Quantitative (Makridakis et al., 1998)
  - i. Moving Average

- ii. Exponential Smoothing
- iii. Box-Jenkins
- iv. Regression Model

Examples of forecasting methods to achieve better accuracy include (Armstrong et al., 1987):

- (a) More frequent updating
- (b) Structured judgmental methods
- (c) Forecasting using econometric methods

**Forecast Biases** – forecaster’s judgment is often biased by various personal and organization factors.

Some of the common bias in forecast generation may include (Makridakis et al., 1998: 500):

- (a) Conservatism
- (b) Recency
- (c) Availability
- (d) Anchoring
- (e) Illusory correlations
- (f) Regression effects
- (g) Attribution of success and failure
- (h) Optimism
- (i) Underestimating uncertainty
- (j) Selective perception

**Financial Incentive** - Financial and non-financial incentives are important to drive proper forecasting behaviour. Incentive schemes, including flat-rate, piece-rate, variable-ratio, and Quota-based incentives affect forecasting behaviour in different ways (Bonner et al., 2000; Ottaviani & Sorensen, 2006).

The qualitative research in document 3 provided the opportunity to further understand the organization dynamics of forecasting processes and forecasting accuracy based on the conceptual framework developed in document 2. The responses collected from the interviews indicated that achieving accurate forecasting in the ICT sector is very difficult, where competition is fierce, the product life cycles are short and each newly launched product is somewhat different from existing ones. This finding agreed with the research of Gartner and Thomas (1993) which showed that environmental uncertainty is negatively related to forecasting accuracy. Similarly, Hughes (2001) also attributed competition and high sector volatility to forecasting difficulty. The Document 3 research also found that forecasting practice differ between small and large enterprises, between industries (FMCG, B2B, Consumer Products), and between distribution and manufacturing enterprises.

Smaller companies use forecasts to guide strategy, but not leveraged to direct day to day activities. Larger enterprises apply processes such as LRP to guide strategy development and S&OP to align the various functions to work together.

While forecasting process is generally in place in the studied firms, the Document 3 study found that forecasting process and accuracy is highly impacted by forecasting climate and senior management involvement and support. Forecast accuracy differs by region, company type, and company size. Small companies are more flexible to adapt to market changes and update their forecasts more frequently, leading to more accurate forecasts. This is consistent with the result reported by Smith III et al. (1996) indicating that when the firm is small, it can react quickly to the market they serve and make fairly accurate forecasts.

Firm size was identified in document 3 as a major factor which influence forecast accuracy. Companies in North America are noted with tendency to collaborate much more with customers in the forecasting process. Tremendous amount of useful retail data is made available for trend analysis. For developing markets, forecasting is more difficult as sales volume is highly sensitive to price and the market conditions are highly dynamic. Forecasting for industrial (or B2B) products is also less problematic due to longer product life cycles. Companies in B2B industries tend to work closer together with customers to understand the issues and jointly develop and agree on forecasts.

Findings suggested that management often assigns top down sales targets. The sales team tends to focus on meeting overall sales target rather than selling based on SKU forecast submitted. The product development team often builds business cases based on forecasts that are generated at the very early stage of development. Product managers mostly do not systematically update the forecast to reflected changes in the market over the course of the long development cycle, as modifications might alter the business case and impact the direction and funding for the project.

Document 4 built upon the conceptual framework discussed in existing research and considered forecast accuracy in the context of organization culture and internal influence factors that include organization characteristics of company age, company size, degrees of top management involvement, organization process, and organization control (see Figure 2). It also considered external influence factors including uncertainty in the technological environment and uncertainty in the market environment. The market uncertainties were further analyzed through demand variability, competition intensity, and supply chain flexibility.

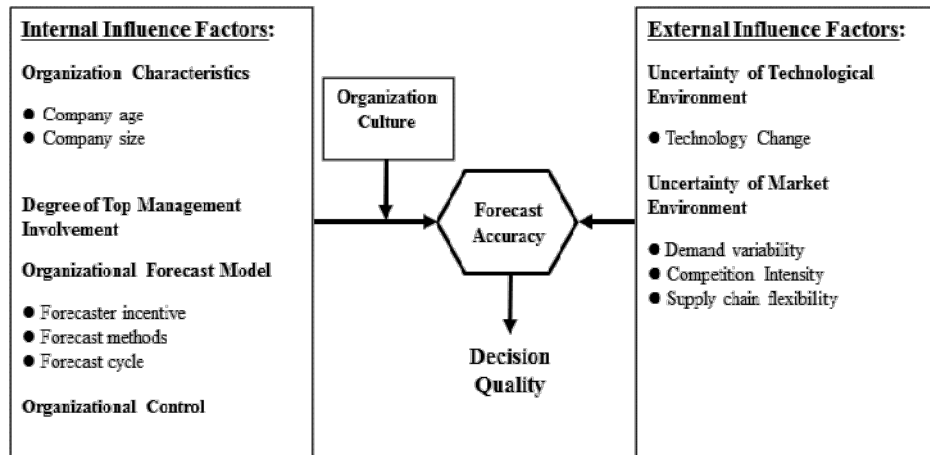


Figure 2: Conceptual framework developed in document 4.

In the document 4 study, based on survey data collected from 256 management respondents, the statistical analysis indicated that majority of the enterprises believed demand forecasting is very important or important. The results also revealed that overall ownership of the forecast process rest with top management and not middle managers. The findings showed that internal influence factors (including company age, company size, top management involvement, forecaster incentives, forecast methods, forecast cycle and organization control) and external influence factors (supply chain flexibility) affected the forecast accuracy positively; while external influence factors (including technology change, demand variability, and competition intensity) affected the forecast accuracy negatively. In addition, document 4 research data confirmed the effect of forecast accuracy on decision quality is positively supported.

The investigation conducted for document 4 found that there is a moderation effect of organization culture on the relationship between company size and top management involvement with forecast accuracy. The study applied the competing values framework developed by Cameron & Quinn (1999), which defined four cultural types: Clan, Adhocracy, Hierarchy, and Market. Aligning to this framework, the document 4 survey analysis results showed that clan culture not only positively moderated the relationship between company size and forecast accuracy, but also positively moderated the relationship between top management involvement and forecast accuracy; adhocracy culture produced a negative interaction for top management involvement, but do not produce a significant interaction for the company size; hierarchy culture produced a negative interaction for the



company size, but do not produce a significant interaction for top management involvement; market culture produced a negative interaction for company size, but a positive interaction for top management involvement.

The document 3 and document 4 findings summarized above are somewhat generic and high level in nature. However, they provided highly valuable insights and confirmed there is value for further research with a narrowed study scope for a deeper dive investigation on the effect of general manager involvement in the forecasting process in new firms. Building on the previous framework and findings, the author will proceed to review literature and develop a new conceptual model for the current research.

### 2.1.2 New Firms

For this research, the author will focus on studying new firms in order to narrow the scope. To start, it is important to list the characteristics that define firms as being “new”. New firms differ from established firms, characterized by limited internal resources and external relations, a lack of legitimacy, and unfamiliarity with new roles and norms created within itself (Das & He, 2006) (summarized in Table 1).

Table 1: Intrinsic differences between new firms and established firms

	New Firms	Established Firms
1. Resources	Short of financial, manufacturing, and marketing resources	Affluent in financial, manufacturing, and marketing resources
2. Innovativeness	More innovative	Less innovative
3. Status in competition	Challengers in competition	Defenders, vulnerable to competition from newcomers
4. Legitimacy	Less	More
5. History/track record	Scarce	Sufficient
6. Economic/ political power	Little influence over the environment	More economic and political power
7. Organizational characteristics	Structure: clan, informal Communication: fewer levels, frequent, informal, more horizontal Decision making: speedy, flexible, informal, centralized from the top, keeping options open, opportunist	Structure: bureaucratic, formal, fragmented Communication: more levels, slower, infrequent, open to distortion, barely horizontal Decision making: slow, consensual,

		decentralized at the intermediate levels, long-term strategies
8. Business focus	Products and services	Expansion in scale and scope
9. Planning horizon	Speedy development	Not in a hurry

*Note: Das and He (2006:114-143)*

Zimmerman & Zeitz's studies (2002) characterize new enterprises into two categories: First, from a new business perspective, new companies often lack sufficient reputation and transaction history to gain the trust of partners, suppliers' and customers. They also lack finance, production and marketing resources. In the early stages, due to limited economies of scale, small firms face high cost in the learning curve. Due to higher risk and uncertainty, new enterprises must pay more attention to opportunity identification, need to be more market-oriented, and place more emphasis on change and innovation. Secondly, from a entrepreneurial business perspective, as new enterprises play the role of challenger in competition, they focus on continuous product innovation. In Zimmerman & Zeitz's (2002) view, new enterprises are more concerned about growth rather than short-term profit. New enterprises are more willing to take risks, more flexible and creative, and often more innovative.

Scholars mainly apply two criteria to define new enterprises: (1) Stage of development, and (2) Time since incorporation. There is little study academically to classify a firm as new based on its age. Biggadike's (1979) research indicated that startups require 8 years to reach profitability and 12 years to finally grow into established firms. Miller and Camp (1985) confirmed Biggadike's (1979) conclusion and used the 8-years point as a cutoff for new ventures and defined 8-to-12 years as adolescent ventures. For this study, the 8-years point is set as the cutoff for new firms as well.

### **2.1.3 GM Characteristics**

For this study, the researcher will consider three aspects of the GM's characteristics in relation to forecasting accuracy. Based on previous literature review, GM's involvement and forecasting expertise were identified as key elements which impact forecasting accuracy (Hughes, 2001; Jain, 2007). Additionally, previous literature indicated that entrepreneurs and senior management tend to be overly optimistic about the prospects of the company's future (Wacker and Sprague, 1995). As such, the researcher will also consider GM over-confidence as one of the key influence factors.

Before reviewing the details of GM's characteristics, it is critical to understand the meaning of GM.

The definition for General Manager varies, yet little literature is available on this topic. The duties and scope for a general manager may differ across geography, industry, function and firms. General Managers can be defined in terms of the control they exercise (Goold and Campbell, 1987), the role they play (Kotter, 1982) or in terms of competency (Spencer and Spencer, 1993) (cited in McCredie and Shackleton, 2000:107). To achieve organization objectives, the GM often has to create and define its own task and be flexible to adapt new skills. McCredie and Shackleton (2000) applied an Index of Overall Success (IOS) to measure and define GM competency in terms of results orientation, intellectual abilities, interpersonal abilities, resilience and adaptability. For the purpose of this study considering new firms, the GM is characterized as the top executive in the surveyed enterprises that has broad and overall responsibility for the organization.

### **GM Involvement**

As the ultimate leader for the company, the GM's key responsibility is to formulate and implement the firm's strategy (Golden, 1992). Literature relating to GM involvement is limited, and available research focuses on the effect of the GM's involvement in the selection of new board members or in information technology management.

Shivdasani & Yermack (1999) investigated the influence of GM involvement in the selection of new board directors and found that stock price reactions to independent director appointments are significantly lower when the GM is involved in director selection. Carello et al. (2011) examined the relationships between restatements and audit committee independence and expertise, conditional on whether or not the GM is formally involved in the director selection process. They found that negative stock market reaction associated with a restatement is mitigated if the firm maintains a completely independent audit committee, but only if the GM is not involved in the director selection process. Feng et al. (2007) examined the relationship between GM entrenchment and dividend policy of real estate investment trusts, and found that GMs are entrenched to pay higher dividends to avoid shareholder sanctions and the threat of takeover.

There is little research focused on investigating the effect of GM involvement on demand forecast accuracy. Although demand forecasting is not typically a high-involvement activity for general managers in mature firms, GMs of new firms play a critical role in this activity.

### **GM Expertise**

GM expertise includes his/her general knowledge, marketing experience, and industrial experience (Buyl et al., 2011; Gartner & Thomas, 1993). Buyl et al. (2011) pointed out that expertise and knowledge should allow the GM to build competence and bring together diverse knowledge domains. Buyl et al. (2011) focused on the integrative role of the GM, postulating that the GM's expertise and background characteristics affect the top management team's functional diversity and firm performance relationship. They argued that GM expertise impacts the exchange and integration of distributed knowledge within the top management team. In addition, Gartner & Thomas (1993) studied the influence of founder expertise in new firms on new product forecast accuracy, and found that founders with greater expertise can generate more accurate forecast for new products.

Cassar (2014) investigated the role of industry and startup experience on the forecast performance of entrepreneurs and found that industry experience is associated with more accurate and less biased forecasts. Interestingly, Cassar (2014) found that there is no significant evidence indicating that startup experience of entrepreneurs can help improve forecast performance.

### **GM Over-Confidence**

Cassar (2014) provided empirical evidence showing that most new businesses do not achieve growth objectives and fail to meet the performance expectations of the entrepreneurs who create them. This forecast gap is caused by cognitive biases including over-confidence. Traditional economics theory and model implied a default hypothesis: enterprise participants are rational and egoistic. These theories do not consider the influence of psychological factors (such as loss aversion, overconfidence, optimistic, ambiguity aversion and so on) to the behaviour of general managers in enterprises. Researchers including Professor Daniel Kahneman of Princeton University have investigated "abnormal" phenomena which cannot be explained by most of the traditional economics theory. They considered psychological factors that have influences on enterprise management and decision-making in the research of enterprise theory.

### Theoretical Study of Overconfidence:

#### (1) Theoretical foundations of psychology overconfidence

Based on experiments and studies, psychologists concluded that people display a range of psychological features, including: loss aversion (Kahneman & Tversky, 1979); representativeness, anchoring, and availability biases (Kahneman & Tversky, 1974); overconfidence and optimism (Weinstein, 1980, cited in Odean, 1998; Lichtenstein et al., 1982, cited in DeBondt and Thaler, 1995).

DeBondt & Thaler (1995) indicated that “the strongest conclusion in the field of psychology research is that people are overconfidence”. People are overconfident with their knowledge, skill and the accuracy of information. Overconfidence is also reflected in “fundamental attribution error” as people tend to attribute their success to their abilities and skills rather than other factors (Hastorf, Schneider & Polifka, 1970). Under normal circumstances, people are overly certain of their judgments and decisions, and attribute their failure to bad luck and uncontrollable factors.

For individual overconfidence, Odean (1998) summarized the following observations: people overestimate the accuracy of their knowledge; people overestimate their ability to perform and over-rate their importance in the task; people tend to highly assess themselves, think that they are above the mean level. In enterprises, senior managers are often obstinate to their judgments and decisions as perfect from their point of view. They are not willing to change their mind when objective environment changes, and reject others opinions, which is a phenomenon of overconfidence.

Forbes (2005) indicated that entrepreneur general managers are more susceptible to overconfidence biases than non-entrepreneur GMs. He defined overconfidence bias as the degree to which people do not know what they do not know. Forbes (2005) measured this bias based on the tendency of people to overestimate the correctness of their estimates in answering moderate to difficult questions. GMs with this overconfidence tendency would likely also overestimate the correctness of their market forecasts.

#### (2) Research evidence and reasons for overconfidence

Psychological research showed that people often exhibit overconfidence in their decisions and activities. Fischhoff, Slovic and Lichtenstein (1977) indicated that people often overestimate the

accuracy of available information – that “must happen” issues have only 80% possibility to happen, and “cannot happen” issues have 20% possibility to happen. Hastorf, Schneider & Polifka (1970) pointed out that people tend to attribute success to their ability and attribute failure to external factors. In addition to Forbes (2005), Cooper, Dunkelberg & Woo (1988) also provided evidence of overconfidence of entrepreneurs. Russo & Schoemaker (1992) and Malmendier & Tate (2005) provided evidence of overconfidence of managers. Busenitz & Barney’s (1997) research concluded that overconfidence is common in both clients and agents. Debondt & Thaler (1995) indicated that “overconfidence is one of the most robust finding in psychology of decision making”. In addition, studies have shown that overconfidence is prevailing in other professional field including physician and nurse (Baumann, 1991).

Kahneman and Lovallo (1993) pointed out that overconfidence for managers stem from the “internal perspective” which emphasis on the particularity and optimism towards project success, regardless of information such as “the possibility of success.” Geol and Thakor (2000) indicated that overconfidence is rooted in the competition among managers. They showed evidence that due to complexity of business processes and uncertain circumstances, managers often over forecast. Geol and Thakor (2000) showed that managers who are overconfident are more likely to be promoted as optimistic managers receive more opportunities. The managers who are more confident and optimistic toward the future are also more likely to be hired, as confidence is characterized as having greater ability.

Forbes(2005) conjectured that entrepreneurs are less formal and rational in their thinking and more inclined to favor instinct and spontaneous insight, and that entrepreneurs often resort to cognitive biases as a response to information overload, high uncertainty and high time pressure.

Available research results suggested that overconfidence is a consistent psychological behaviour. Based on the above analysis, overconfidence is summarized as: people tend to overestimate the accuracy of available data and overestimate the judgment and decision in the decision making process. Although overconfidence is more often studied by psychologists or people researching on related field, this research does not focus on the psychological approach but rather try to gain a better understanding of the impact of overconfidence from a management perspective. In particular, this research will investigate whether overconfidence of the GM would lead to higher forecast errors. The next section will outline the measurement methods for determination of overconfidence.

### Measurement of Overconfidence:

Scholars have explored a variety of method to measure management overconfidence. The measurement methods are summarized below:

(1) Malmendier & Tate (2005) measured manager overconfidence based on their dealing of stock option or stock holdings: (a) the manager holds company stock, and will not sell the stock until the deadline of the stock option; (b) the manager holds company stock, and will not sell the stock even if the earning rate is up to 67%; (c) managers increase the stock holding every year.

(2) Lin et al. (2005) leveraged profit forecast error as a means to measure management confidence. In their study, forecast error is defined as predicted EBIT less actual EBIT. Lin et al. (2005) stipulated that when forecast error is positive and the overestimate is above than 50%, the manager is overconfident. If the probability is below 50%, the manager is moderately overconfident.

(3) Doukas & Petmezas (2007) put forward the frequency for mergers and acquisitions as another measurement method. They defined GM who sponsors five or more M&A as overconfident. They stipulated that more confident managers are more likely to drive mergers and acquisitions. Malmendier & Tate (2008) also agreed with this view.

(4) Another measurement method is based on relative and proportional pay. Hayward & Hambrick (1997) pointed out that higher salary is aligned to higher status and power, and the “control illusion” makes managers overconfident. Brown & Sarma (2007) also suggested that salary is in direct proportion to control proportion and overconfidence.

(5) Brenner et al. (1996), Hsee (2006), Forbes (2005) and Busenitz & Barney (1997) provided a measure for diagnosing over/underconfidence by recording subjects’ responses to general knowledge questions which represent moderate to high level of difficulty.

This study will adopt the general knowledge questions measurement method because it is much more general in applicability than other methods listed above that primarily focused on stock value confidence measurement. This method is also independent on mode of analysis. More details on the measurement will be provided in detail in Chapter 4.

#### **2.1.4 Demand Forecasting Accuracy**

Forecasting is the activity of predicting future events or conditions on the basis of pertinent data analysis. When we make decisions under uncertainty, we all rely on some forms of forecasts. As forecasting is an attempt to find informative data amidst uncertainty, the accuracy of a forecast is as important as the prediction. Dalrymple (1987) reported US company surveys that show accuracy is the primary goal of the forecasting activity. Accuracy has been considered as the most important criteria in evaluation of forecasting performance because of forecast credibility and impact of making false decision based on the projection (Winkhofer et al., 1996).

#### **Demand Forecast Accuracy**

In the context of ICT firms, an important branch of forecasting is demand forecast. Demand forecasting is predicting customer future demand for a firm's product and services.

There is a general recognition that forecasts are not perfect and gaps exist between predicted and actual values. In most cases, "accuracy" means "goodness of fit". Forecast accuracy is a measure of how close the actual outcome is compare to the forecast and how well the forecasting model fits to the data (Makridakis et al., 1998). As forecasted data is an essential input to decision making, the quality of the decision is only as good as the accuracy of the data.

Determining forecast accuracy, like forecasting itself, can never be performed with certainty. To maximize accuracy, it is important to ensure that input data is measured and obtained as accurately as possible, the most appropriate forecasting methods are selected, and the forecasting process is conducted as rigorously as possible.

#### **Measures of Forecast Error**

Various measures of forecast accuracy exist, which include one-step forecast error, standard statistical measures, and relative or percentage error measures (Makridakis et al., 1998; Mentzer & Schroeter, 1994; Reid, 1992). The measures are summarized below:



(1) One-step forecast error

One-step forecast error is the difference between the observation value and the forecasting value.

It can be written as follows:

$$e_t = Y_t - F_t$$

where  $e_t$  is one-step forecast error

$Y_t$  is the observation value for the time period  $t$

$F_t$  is the forecasting value for the time period  $t$

One-step forecast is very easy to calculate. However, it is confined in practical use, because it forecast only one period ahead of the last observation and it becomes un-useful when applied over  $N$  time periods.

(2) Standard statistical measures

Standard statistical measures are good at solving the situation when the observations and forecasts apply over  $N$  time periods. Standard statistical measures include Mean Error (ME), Mean Absolute Error (MAE), Median Absolute Error (MdAE), Mean Squared Error (MSE), Root Mean Square Error (RMSE).

By definition, ME is the average error for  $n$  time periods. MAE is the absolute average error for  $n$  time period. MSE is the average of square of forecast error for  $n$  time period. The formulation of ME, MAE, MSE can be denoted respectively as follows:

$$ME = 1/n (e_1 + e_2 + e_3 + \dots + e_n)$$

$$MAE = 1/n (|e_1| + |e_2| + |e_3| + \dots + |e_n|)$$

$$MdAE = median (|e_1|, |e_2|, |e_3|, \dots, |e_n|)$$

$$MSE = 1/n (e_1^2 + e_2^2 + e_3^2 + \dots + e_n^2)$$

$$RMSE = \sqrt{MSE}$$

Where  $e_t$  is the one-step forecast error

The five measures each have their own characteristics. ME may be smaller than MAE, MSE, MdAE, and MSE as positive and negative errors offset one another (Makridakis et al., 1998). MAE, MdAE, MSE and RMSE are similar ideas because they are defined by making each error positive by taking its absolute value, square value or root value. However, they have different applications: MAE

or MdAE is easier to interpret and is easier to explain to non-specialists; MSE or RMSE is suitable for statistical modeling (Makridakis et al., 1998). Armstrong et al. (1987) discussed that while RMSE and MSE have been favorably received by some researchers for statistical modeling, they are rejected by other researchers in that they are more sensitive to outliers than MAE or MdAE.

However, no matter ME, MAE, MdAE, MSE, or RMSE are used, they are all not suitable for comparing across different time series and for different time intervals. In order to solve this problem, other new measures are needed.

### (3) Relative or percentage error measures

Relative or percentage error measures can be used to make comparison across different time series. The measures include Mean Percentage Error (MPE), Mean Absolute Percentage Error (MAPE) and Median Absolute Percentage Error (MdAPE).

Before studying MPE and MAPE, it is necessary to understand the definition of  $PE_t$ , which defines the percentage error for any time period.

$$PE_t = [(Y_t - F_t) / Y_t] \times 100$$

$PE_t$  is particularly useful for measuring sales forecast accuracy. In Dalrymple's (1987) study, he originally developed the following error measure of forecast accuracy:

$$PE_t = (Actual\ Sales - Forecast\ Sales) / Actual\ Sales$$

This measure was adopted by Gartner & Thomas (1993) in their study "Factors Affecting New Product Forecasting Accuracy in New Firms", because they considered this measurement to be objective and measurable. Mentzer & Schroeter (1994) illustrated that "if the forecast was 110 units and the actual turned out to be 100, the PE would be 10%. This indicates the forecast was off by 10% and the positive sign indicates the forecast was high. If the forecast had been 85 units and the actual turned out to be 100, the PE would be -15%, which indicates the forecast was 15% low. Patterns of PE over time help the user to adjust forecasts.

MPE is the average percentage error over N time period. MAPE is the absolute average of percentage error for n time period. MdAPE is the median value of absolute percent error for n time period. Diamantopoulos & Winklhofer (1999) defined MAPE in terms of the absolute delta between actual and forecasted sales as a percentage and shows the extent to which actual sales are under- or

over-estimated by the forecast. The formulation of MPE, MAPE and MdAPE can be denoted respectively as follows:

$$MPE = 1/n (PE_1 + PE_2 + PE_3 + \dots + PE_n)$$

$$MAPE = 1/n (|PE_1| + |PE_2| + |PE_3| + \dots + |PE_n|)$$

$$MdAPE = median (|PE_1|, |PE_2|, |PE_3|, \dots, |PE_n|)$$

Makridakis et al. (1998) proposed that MAPE is more meaningful to measure the forecasting accuracy than MSE. As an example, they exemplified that knowing that the MAPE of a method is 5% is much more meaningful than knowing that the MSE is a number such as 183. MAPE is the most common measure used by companies in recent years (Mentzer & Kahn, 1995).

In the research conducted for document 3, however, the researcher found that the surveyed respondents indicated that the simple one step forecast error method is more often used to measure forecast accuracy. As this study is not focused on forecasting methods, but rather issues that caused forecasting inaccuracy, effort has not been devoted to investigate forecasting methods.

### **Internal Influence Factors on Forecast Accuracy**

Most researchers have realized that well established firms can achieve higher accuracy forecasts than new companies (Diamantopoulos & Winklhofer, 1999; Makridakis et al., 1998). In general, experience and forecast history play an important role in projecting forecasts. With abundance of historical data, it becomes easier to spot trends and leads to more accurate forecasting. Diamantopoulos & Winklhofer (1999) found that older firms tend to have higher accuracy forecasts than new firms because old firms have long sales history which can be helpful in the preparation of forecasts. This characteristic was also observed and confirmed in the qualitative study in document 3.

In addition to firm age, firm size has an effect on forecasting accuracy (Diamantopoulos & Winklhofer, 1999). Diamantopoulos & Winklhofer's (1999) analysis revealed that large firms have more resources to be allocated to forecasting tasks (e.g. formal training of forecaster, using advanced forecasting methods...). Results from document 4 of the research confirmed that older and larger sized organizations attain higher forecast accuracy. Apart from the factors related to the firm there

are also external factors which affect the accuracy of the demand forecast.

### **External Influence Factors on Forecast Accuracy**

As a key concept in decision making and organizational design framework, environmental uncertainty is defined as “the degree, or variability, of change that characterizes environmental activities relevant to an organization’s operations such as the unpredictability in the actions of the customers, suppliers, competitors and regulatory groups to which probabilities cannot be attached because of their constant change” (Drago, 1998, cited in Ghosh & Olsen, 2009).

Prior research showed that environmental uncertainty is negatively related to forecasting accuracy, which means that the lesser turbulent of an enterprise’s environment uncertainty, the higher accuracy of forecasts (Gartner & Thomas, 1993). The main reason is that organizations are constrained by the nature of their environment which produces uncertainties which can create difficulties for managerial decision making and planning.

Because environment uncertainty is a complex construct, researchers have also studied this topic in terms of dimensions. Chen, Reilly & Lynn (2005) conceptualized environment uncertainty as having two different dimensions: technological uncertainty and market uncertainty. Uncertainty of market environment can be further divided into three sub-dimensions from the aspects of consumer, competitor, and supplier: variable consumer demand, intensity of competition, and supply chain flexibility.

#### **(1) Uncertainty of Technological Environment and Forecast Accuracy**

According to Tsai & Huang’s (2008) study, technological uncertainty results from a lack of knowledge about the state of technological advances and results in perceived complexity of the technology.

Technological uncertainty is commonly caused by the unpredictability of technical advances. It takes a long time from conceiving a new product to releasing it into the market, but during this period both technology and market can undergo fundamental changes. Enterprises in hyper-competitive market suffer not only the lack of full access to constantly updated technology, but it is unable to

comprehend the trend of technology development. As a result of the short cycle of technical advances, it is difficult to determine how long a new technology will last, as it may go out-of-date with the appearance of new innovations. It also becomes harder to determine whether a new technology can achieve a certain market scale to make a good return on its investment. In document 4, research results suggested that demand forecast accuracy is reduced under high technology uncertainty conditions.

## (2) Uncertainty of Market Environment and Forecast Accuracy

### (a) Demand Variability and Forecast Accuracy

Market uncertainty results from changing market structure or competition and causes unpredictability in markets. Nowadays, customers have become increasingly sophisticated, having complex needs and individual consumption preferences which drive competition among enterprises to cater to these needs (Iansiti & MacCormac, 1997). Specifically, the increased competition among enterprises causes the enterprise's focus to shift from internal to customer-centric. Customers have choice and information power, which are factors leading to a decline in customer loyalty (Goldenberg, 2005). Because of decline in customer loyalty, demand forecasts cannot overly rely on historical sales data. Market variability has proved to be more important than other environmental factors in forecasting accuracy (Gartner & Thomas, 1993).

### (b) Supply Chain Flexibility and Forecast Accuracy

Teece and Pisano (1994) stated that the winners in world-wide markets are enterprises that can respond quickly to customer demand, develop new products rapidly and flexibly and possess effective inside/outside coordination capability. Flexibility is a critical success factor for SCM (Supply Chain Management). Intensified global competition and increased environmental dynamics force enterprises to elevate their capability to confront uncertainty by enabling flexibility in their supply chain. A flexible supply chain can better cater to customers, avoid excessive accumulation of safety stock, and enable agility in handling unexpected demands.

### (c) Competition Intensity and Forecast Accuracy

In mature markets, enterprises compete fiercely for customers. The enterprise strategy will drive specific tactical initiatives which vary between firms. The competitive actions and reactions, such as price adjustments, have huge impacts on market response. Increased competition adds complexity to the forecasting processes, and increases error between the forecast and actual sales. In document 4, it is found that increased competition intensity reduces demand forecast accuracy.

## **2.1.5 Decision Making and Decision Quality**

Decision making is a challenging managerial skill and a concept that cannot be easily explained. There have been a few attempts to categorize and conceptualize decision making. Harris (2012) summarized two definitions for decision making. One definition is that “decision making is the process of sufficiently reducing uncertainty and doubt about alternatives to allow a reasonable choice to be made from among them.” The other definition is that “decision making is the study of identifying and choosing alternatives based on the values and preferences of the decision maker.” Kahneman & Tversky (2000) defined decision making from several perspectives in broad sense and proposed that “from a psychological perspective, it is necessary to examine individual decisions in the context of a set of needs, preferences an individual has and values they seek; from a cognitive perspective, the decision making process must be regarded as a continuous process integrated in the interaction with the environment; from a normative perspective, the analysis of individual decisions is concerned with the logic of decision making and rationality and the invariant choice it leads to.” Based on these three perspectives, it implies that decision making is considered as the most important activity for senior, middle or junior managers in all types of organization.

In general terms, decision making can be classified by organizational level and can be divided into: (a) strategic decision making, (b) management decision making, and (c) functional decision making (Hill & Jones, 1992: 21 (cited in Polat, 2008)).

Strategic decision making involves long-term strategic targets, mission of a corporation, and policies of an organization, and is usually made by senior managers who deal with complex, non-routine problems (Hill & Jones, 1992: 21 (cited in Polat, 2008)). To some extent, strategic decision-making can be viewed as a special kind of decision-making under uncertainty and involves

the activities of goal formulation, problem identification, alternatives generation, and evaluation/selection (Schwann, 1984).

Management decision making mainly transfers the general statement of direction and intent from the corporate level into concrete strategies for individual business and concentrate on how to effectively and efficiently utilize resources and execute to plan (Hill & Jones, 1992: 21 (cited in Polat, 2008)).

In contrast to strategic decision making and management decision making, functional level decision making is much more tactical. Functional level decision making “have an important strategic role such as developing functional strategies in marketing, production, research and development, which are the main factors in achieving the objectives set by corporate and business level strategic managers (Hill & Jones, 1992: 22)” (cited in Polat, 2008). This means functional decision making is about how to carry out specific tasks which are in line with the decision direction established by senior and middle level management. It must be noted that the three kinds of decision making are closely connected with each other, because the main strategies developed by the business can be achieved only if the functional level strategic goals are attained (Polat, 2008).

When making decisions, all people are eager to improve decision quality. However, when people make decisions, it is nearly impossible to find complete foreknowledge of all the possible consequences of the decision. For new firms, the general managers play critical roles in applying forecasting data to making business decisions.

The GM’s behaviour in decision making is not the primary focus of this research. This study investigates the underlying issues that impact forecasting and forecasting accuracy, and whether a correlation exists that indicate better forecasts lead to better decision quality. Specifically, the study considers the GM’s characteristics including overconfidence, expertise, and forecast involvement pertaining to demand forecasting activities. These characteristics also represent GM behaviours in the decision making process.

Shepherd et al. (2015) referred to decision making as the “entire process of choosing a course of action.” There are many elements that influence the behaviour of general managers when making decisions, including the GM’s affective state and his/her perceptions of the environment. Given the uncertain and complex environment that exists, biases and heuristics provide an effective and efficient guide to decision making (Busenitz & Barney, 1997). To facilitate decision making, GMs

make use of forecast data to establish decision options. However, knowing that forecasts are inaccurate, the application of forecast data to decision making also requires heuristics. This is a complex topic and requires additional study.

The classical theory of decision making under uncertainty derives beliefs about the likelihood of uncertain events from people's choices between prospects whose consequences are contingent on the uncertainties (Fox & Tversky, 1998). Fox & Tversky (1998) advocated that the classical theory of decision making under uncertainty provides simultaneous measurement of utility and subjective probability. However, empirical evidence indicates that the major assumptions of the classical theory that underlie the derivation of belief from preference are not descriptively valid (Fox & Tversky, 1998). The classical theory does not consider probability judgments or forecasts that is crucial in decision making. In the face of uncertainty, having sufficient information in the form of forecasts is very important to evaluate the decision scenarios and options. It follows that forecasting is a critical element of decision making.

### **2.1.6 Work Engagement**

Available literature relating to work engagement is summarized in the following section. The definition of work engagement as it relates to this research will be discussed in section 2.2.

#### **Theoretical study of work engagement**

Work engagement has been investigated by both theorists and consulting firms, but there is still no universally accepted definition. Related definitions include:

Kahn (1990) defined employee work engagement as "members put themselves into the roles of organization, in which the degree of completing their work emotionally, cognitively and personally and the degree of self-expression." For most members of the organization, the two core roles are job role and member role. Kahn (1990) pointed out there is a dynamic, coordinated relationship between oneself and the role. In this relationship, employees not only put the individual abilities into the role behaviours, but also show themselves in this role. Harter (2002) believed employee work engagement is the degree of an individual's passion, commitment and satisfaction for the work.

Although scholars defined the concept of employee engagement differently, they all generally



considered that there are two aspects to employee dedication: (1) whether the employees enjoy their work and do their best to get the job done; (2) whether the employees have an appreciation for the enterprise and have a sense of belonging.

Kahn (1990) provided a descriptive model for employee engagement. The model proposed three essential psychological conditions that play a decisive role in employee engagement: safety, meaningfulness and availability, and suggested organizational environment factors impacting these three psychological conditions. Among them, the factors impacting safety are organization management patterns, organization dynamics, working procedures and organization's rules and regulations; the factors impacting meaningfulness are task characteristics, and job interactivity; the factors impacting availability are emotional and cognitive resources, job roles security, work psychology and leisure activities. The model considered a number of factors that influence employee engagement, including personal factors, organizational environmental factors, and job factors. The combined effects of these factors and the degree of individual's perception jointly decide the employee engagement levels.

May et al.'s (2004) model of employee engagement includes factors such as individual factors, interpersonal factors, team factors, inner team factors and organizational factors. The joint effects of these factors and the extent of individual perceptions to these factors determine the level of employee engagement.

Britt's (2001) study found that if some aspects of the individual identity recognition are related to ones' career field, even under adverse working conditions, individuals can maintain a high degree of work engagement. Conversely, if aspects of the individual's identity recognition are not career related, then adverse working conditions can significantly reduce their level of engagement. Britt's (2001) pointed out that "the two coping strategies of positive responses and seeking emotional support have a significant positive correlation with engagement."

Welbourne (2003 ) explained employee work engagement from the perspective of role theory, suggesting that staff roles at work are: (1) work execution role: employees generally complete their work in accordance with the requirements of the job description; (2) team members role: employees are more proactive and dedicated, and they will help other members of the team to work toward a common goal; (3) hard worker role: employees exert their creativities, putting forward their own ideas and insights, and try to make them real; (4) professional driver role: employees continue to learn new

knowledge and new technologies consciously to ensure that they have better career prospects in the organization; (5) members of the organization role: employees do a lot of work to help and promote the enterprise's success, even if such work is not their job. In these five job roles, the degree of employees' dedication requires an increasing level of engagement.

Consulting companies have also studied employee engagement. Gallup's recent (Gallup, 2013) 142-country study on employee engagement showed that only 13% of employees worldwide are engaged at work, suggesting that about one in eight workers in the countries studied are psychologically committed to their jobs and likely to be making positive contributions to their organizations. Hewitt Associates' (Bennett & Bell, 2005) research indicated that employee engagement is the extent of the emotional and intellectual investment of the employees to the company and groups. Employee engagement can be used to evaluate employees' energy and enthusiasm invested for their companies, measure whether employees are happy to stay with the company, and the extent of the efforts to serve the company. Hewitt Associates (Bennett & Bell, 2005) listed factors that may affect employee engagement through extensive investigation and summarized 17 driving factors into six areas, as shown in Figure 3. In addition, Hewitt Associates divided influence factors of employee engagement into forward and reverse driving factors. Employee engagement can be enhanced by focusing on positive drivers and minimizing on reverse driving factors. Positive driving factors include career development opportunities, compensation, and performance evaluation.

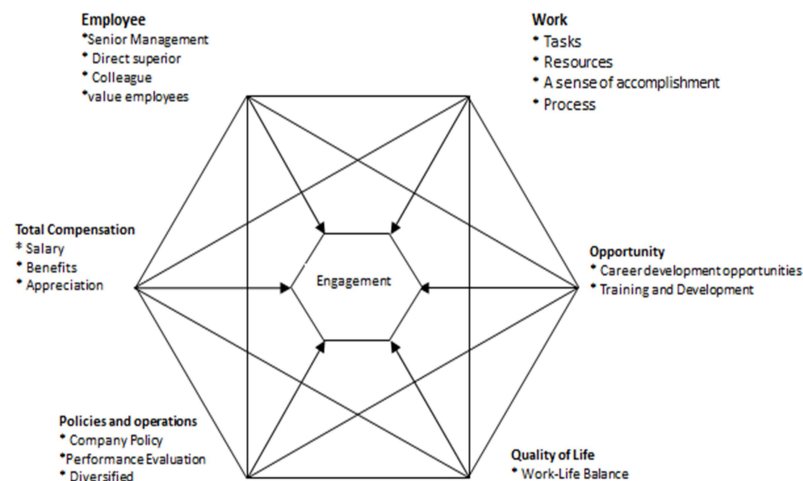


Figure 3: Hewitt Associates - Employee Engagement Factors (Bennett & Bell, 2005)

Overall, previous research findings indicated that factors influencing work engagement can be divided into three categories: (1) job factors, including tasks, resources, achievement and work-life balance; (2) organizational factors, including corporate culture and values, organizational management systems and decision-making, leadership and management, teamwork, personal growth and career development and compensation; (3) personal factors, including personality traits.

### **Dimensions of work engagement**

Kahn's (1990) definition of employee engagement in his study created a starting point for theoretical research considering employee engagement as a multi-dimensional concept. He defined work engagement as an integrated multi-dimensional concept that described an individual's emotion and motivation at work. Kahn (1990) partitioned employee engagement into three dimensions: physical, cognitive and emotional. (1) The physiological engagement means employees maintain a highly excited physiological state in the performance of role tasks. (2) Cognitive engagement means employees maintain a state of highly active cognition and awareness, and is clearly aware of their roles in the context of a particular job and mission. (3) Emotional engagement means employees maintain contact with other colleagues and the sensitivity to others' emotions and feelings.

Following Kahn (1990), Schaufeli et al. (2008), Langelaan et al. (2006) and other scholars studied the dimensions of engagement. Schaufeli et al. (2008) argued that employee engagement included three dimensions: vigor, dedication and absorption. (1) Vigor means employees have good mental toughness, working hard without feeling tired, and be able to persevere in the face of difficulties. (2) Dedication means employees have a strong sense of meaning, pride and are full of enthusiasm, being able to dedicate into work, and have the courage to accept the challenge of the work. (3) Absorption means working with high concentration, concentrating to work and having fun at the same time, feeling time flies and do not want to be off from work. Schaufeli et al. (2008) believes that it is more appropriate to use the word "dedication" rather than "engagement," as "dedication" can be further defined in terms of quality and quantity. From the quality point of view, dedication is a more intense engagement, deeper than the usual recognition layer. From the quantitative point of view, dedication has a wider range, not only refers to the specific cognitive status, but also the emotional

dimension.

Maslach & Leiter (2001) regarded employee engagement and job burnout as the two poles of a three-dimensional continuum, where employee engagement is characterized by energy, involvement and efficacy, while these three aspects were just the directly opposites of job burnout dimensions: exhaustion, cynicism and lack of professional efficacy. Dedicated employees have a high energetic feeling, and can effectively enter the work state, work in harmony with others, and feel fully competent. In contrast, burnout employees have a sense of exhaustion and inefficacy, and are in a state of alienation with the work and with others.

Langelaan et al. (2006) construct a two-dimensional model with an active dimension (poles were burnout and vigor) and a happy dimension (poles are cynical and dedication) to define job burnout and employee engagement, based on the two dimensions of emotion (active, happy) and the two dimensions of personality (neuroticism, outgoing), within which the activation dimension overlaps neuroticism, happy and outgoing dimensions. The results showed that job burnout was negatively correlated with neural activity, balance and flexibility, and work engagement was positively correlated; nervousness is a central feature of job burnout; engagement is characterized by low neuroticism, high extraversion and high flexibility.

Britt (2001) defined the employee engagement as the employee's strong sense of responsibility and commitment to their job performance. He proposed a three-dimensional model, including perceived responsibility, commitment and perceived influence of job performance.

Although there is no unified view of the structure dimensions of employee engagement, consensus is that the structure of employee engagement is multidimensional.

### **2.1.7 Organization Culture**

In the context of forecasting and forecast driven decision making, it is of interest to investigate the role organizational culture plays. In the literature review for document 2, the researcher found that much of the available research on organization behaviour has focused on the influence of culture on organization processes and decision making.

There are various definitions of organization culture in the literature (Henri, 2006; Wu, 2008).

Blake & Mounton (1985) (cited in Ribiere, 2001:32) defined organizational culture as “routinized ways of doing things that people accept and live by. Organizations have norms and values that influence how members conduct themselves. These norms may prevent members from applying a maximum effort or may encourage them to do so”. Schein (1992, 1999) (cited in Ribiere, 2001:32) defined organizational culture as “A pattern of shared basic assumptions that the group learned as it solved its problems of external adaptation and internal integration, that had worked well enough to be considered valid, and therefore, to be taught to new members as the correct way to perceive, think and feel in relation to those problem.”

From the above definition, although organization culture is considered as symbols, language, ideology, beliefs, rituals, and myths, it can shape organizational behavior and communication, influence organizational members how to act, make decisions and strongly affect an individual's behaviour in one organization (Pettigrew, 1979). To a great extent, organizational culture impacts forecasting and forecast accuracy because the forecasting process is carried out by members in an organization and influenced by culture dynamics. The level in which forecasters conduct themselves and the standards to which forecasts are generated would be dictated by the organization norms and believes.

Because there are so many definitions of organizational culture, some researchers have considered organizational culture dimensions. Hofstede et al. (1990) empirically constructed a six-dimensional model of organizational cultures to describe organizational practices in a sample of 20 units from 10 different organizations (five in Denmark and five in the Netherlands). These dimensions include (1) process oriented vs. results oriented; (2) employee oriented vs. job oriented; (3) parochial vs. professional; (4) open system vs. closed system; (5) loose control vs. tight control; and (6) normative vs. pragmatic. Their research enlightened the organizational culture construct and transformed it into an organization management tool (Hofstede et al., 1990). Unfortunately, this model has limitations. Garibaldi de Hilal (2006) criticizes that the six dimensions are descriptive rather than prescriptive and cannot judge whether the described culture is good or bad. Whether it is good or bad depends on the organizational development orientation. Therefore, the organizational culture dimensions cannot be generally applied across all organization types and across geographical regions/markets.

Ribiere (2001) analyzed related literature of organizational culture and summarized into five

critical dimensions: (1) language; (2) tangible artifacts and symbols; (3) patterns of behaviour, rites and rituals, behavioural norms; (4) espoused values; and (5) beliefs and underlying assumptions. Although these dimensions are accepted by some researchers and show high validity and reliability, Ribiere (2001) argued that these dimensions does not reflect the tacit shared assumptions, for example, the history of company, which is very important for the organization.

Based on the document 4 study, it was found that organization culture moderates the effect of management involvement in the forecasting process. Tying together the study on organization culture and work engagement, the author will proceed to develop the theoretical hypothesis for this research.

## **2.2 Theoretical Hypothesis**

### **2.2.1 Impact of GM characteristics**

#### **Effect of GM Involvement on Demand Forecast Accuracy**

GM involvement includes not only subjective psychological engagement, but also behaviors and activities performed (Jarvenpaa & Ives, 1991). There are opposing views on the impact of top management involvement in forecast error. Wacker & Sprague's (1995) study found that the degree of top management involvement is negatively related to forecast accuracy. Wacker & Sprague (1995) explained that because top management is focused on enterprise performance and development and in order to motivate the subordinate to work hard they always tend to depict the future to be hopeful. Thus, it is not surprising that senior management would naturally overestimate the future and lead to increased forecast error. However, Jain (2007) indicated that leadership support can enable funding and resources that would facilitate the forecasting process, and prepare and build an infrastructure to communicate data/information to different stakeholders. Moreover, top management involvement acts as a driver for subordinates, which motivates subordinates to work comparably more diligently in forecasting, and leads to more accurate forecast. According to Jain (2007), majority of companies agree that the leader's support in forecasting has positive influence to forecasting.

The research in document 4 also concluded that with higher degree of senior management involvement, the more accurate the demand forecast. Although the GM may not be an expert on

forecast generation, but as the highest-ranking corporate officer, he/she has access to contacts and abundant information, which is helpful to demand forecasting. Because demand forecasting is very complex, additional information can help to improve demand forecast accuracy. With GM involvement, their abundant information can be positively integrated into the demand forecast. Based on the previous studies, the researcher hypothesizes that:

***H1: Higher the GM involvement, the more accurate of the demand forecast.***

### **Effect of GM Expertise on Demand Forecast Accuracy**

Because new firms can exert little influence over their environment (Das & He, 2006), GM with a broad general knowledge will be multi-faceted in terms of skills and expertise and be better at analyzing technology change, demand variability, competitor's strategy. Moreover, although generalists' functional knowledge is considered as more superficial and less in-depth than that of specialists (Buyl et al., 2011), general knowledge is necessary for demand forecast because forecast is a complex process. Gartner & Thomas's (1993) research confirm the positive relationship between GM expertise and demand forecast. Their study indicated that small amount of knowledge about product and market would seemingly influence forecast accuracy (Gartner & Thomas, 1993). Therefore, the researcher posits that:

***H2: With more GM expertise, the more accurate of the demand forecast.***

### **Effect of GM Overconfidence on Demand Forecast Accuracy**

Available research results suggest that overconfidence is a consistent psychological behaviour. In particular, Malmendier & Tate's (2005) study showed that GMs are overconfident. An overconfident GM tends to overestimate the accuracy of their own judgments and underestimate the variance of random processes (Hribar & Yang, 2010). In this case, GM is more likely to give an overly optimistic demand forecast because they overestimate their ability and vision to choose the right product for the market, and underestimate the probability of unexpected issues, such as technology change in the business cycle. Overconfident GMs also influence the forecaster because of his/her optimistic enthusiasm. According to Finkelstein (1992), formal hierarchical position is an important indication of authority and power and may be a useful indicator of how much authority managers

have in their companies. As such, GM's optimistic enthusiasm will greatly influence the forecaster's judgment, which will lead to forecaster's deviation and generate inaccurate demand forecasts.

However, on the other hand, if the GM is not overconfident, forecasts can be developed with prudence. Non-overconfident GM will exercise more rationality and conduct additional analysis, leading forecasters to determine demand forecast with objectivity, which will increase the accuracy of demand forecasts.

The researcher conjectures that:

***H3: The more GM overconfidence, the less accurate of the demand forecast.***

### **Effect of Demand Forecasting Accuracy on Decision Quality**

Due to increasing market complexity and environment dynamics, more and more companies find that obtaining information about the future is very important to ensuring company success (Polat, 2008). However, managers usually make decisions without a full assessment for what might happen in the future. Waddell & Sohal (1994) gave examples such as stock-piling inventory without certainty as to what the sales volume will be; purchasing new production equipment despite uncertainty about demand for products, and making investments without knowing what profits will be. In the face of uncertainty, managers rely on forecasting input to make decisions. Makridakis et al. (1998) pointed out that forecasting is an integral part of the decision making activities of management and that the need for forecasting is increasing as management become more scientific in dealing with its market environment and decrease its dependence on chance.

Forecast data is an essential input to both planning and business decision making. Forecasting can be directed at short term horizons or span longer time periods (Long Range Planning). It makes use of historical data and judgment to quantify future uncertainty to facilitate organization decision making. As such, generating predictions is not the end, but the means to better decision making. The ultimate goal of forecasting is to assist managers to make informed decisions. As all decisions become operational at a time in the future, the basis for determination should be based on the best projection of the expected conditions that impact decision execution. After observing sales forecasting from hundreds of firms, Moon et al. (1998) proposed there are seven success factors which are essential to successful forecasting and decision making. They are: understanding what



forecasting is and what it is not; forecasting demand and planning supply; communicating, cooperating and collaborating; eliminating islands of analysis; making it important; and suitable measurement. They argued that only recognizing these important seven factors can companies make accurate forecasts and improve this critical process.

After interviewing with a dozen veteran forecasters and from extensive personal experience, Jain (1993) developed guidelines for improving forecasting and decision making by including planners in the forecast development and decision making process. The guidelines follow these steps: making forecasting reports simple and easy to interpret; distributing a preliminary report for suggestions to resolve possible problems before the final presentation; and following up with the forecast to see how forecasts are used. Jain (1993) concluded that group efforts in preparing forecasts typically improve accuracy and acceptability.

Since multiple departments rely on the same forecast data for operational decisions, forecast accuracy would have a systematic effect on the decision-making process within the organization. To gauge the confidence of the decision, it's worthwhile to understand how decision makers judge the risks associated with the data. In the qualitative research in document 3, respondents repeatedly iterated the importance of forecasts on decisions as it is the means to align strategy and actions across functional departments. Based on previous studies results, the researcher hypothesizes that:

***H4: The more accurate of the demand forecast, the higher of the decision quality.***

### **2.2.2 Mediation between GM Involvement and Demand Forecast Accuracy**

Byrne et al.'s (2011) research on "Motivating the industrial sales force in the sales forecasting process", provided ideas that prompted the investigation of mediation between GM involvement and demand forecast accuracy. Byrne et al.'s (2011) developed and tested a conceptual model of industrial sales force forecasting motivation, and identified nine environmental factors that impact an industrial salesperson's level satisfaction with, effort directed towards, and seriousness placed in the sales forecasting process. As such, the researcher proposed that forecaster's work engagement as a mediator between GM involvement and demand forecasting, because GM involvement is an important environmental signals to motivate forecaster's forecasting effort and dedication.

## **Effect of GM Involvement on Forecaster's Work Engagement**

GM involvement means the GM not only participate in the demand forecast process, but also engaged in the provision of information, guidance and emotional exchanges in work and other aspects (Pierce & Newstrom, 2010). Byrne et al. (2011) believed that participation of leaders can bring three benefits, including dedication placed in the forecasting process, forecasting effort, and more vigor.

American psychologist Eisenberger et al. (1986) proposed an Organizational Support Theory based on the social exchange theory in social psychology, as a way to solve organizational and management problems through top-down support from organization to employee. According to the Organizational Support Theory, GM involvement is a type of organization support. If GM is involved in demand forecasts, this support will be helpful for forecasters to overcome negative emotional conflicts, and promote collaboration among departments or between members. The GM and organizations' support and recognition, would enhance forecaster dedication and drive forecasters to do what is best for the organization.

Based on Schaufeli et al.'s (2002) research on work engagement, the author will adopt 3 dimensions as mediation variables: Vigor, Dedication, and Absorption. Therefore, the researcher hypothesizes that:

***H5: GM involvement is positively related to forecaster's vigor.***

***H6: GM involvement is positively related to forecaster's dedication.***

***H7: GM involvement is positively related to forecaster's absorption.***

## **Mediation Effect of Work Engagement of Forecaster between GM Involvement and Demand Forecast Accuracy**

According to the Organizational Support Theory (Eisenberger et al., 1986), GM participation helps to improve forecaster's engagement in the demand forecast process. In turn, forecaster's work engagement helps to enhance demand forecast accuracy. According to Kahn (1990) study, employee engagement drives positive work attitude, and the impact on work performance of employees is direct and significant. Highly engaged employees will put more time and effort into their work. In addition, Harter et al. (2002) pointed out through meta-analysis that employee engagement and business performance has a positive linear relationship, regardless of industry, independent of scale and nature. On average, enterprises whose employee engagement ranks in the top 50% are

characterized by significantly improved customer service quality, employee retention, productivity, and profitability. Combined with previous assumptions, it is reasonable to conjecture that forecaster's work engagement plays a mediating role between GM involvement and demand forecast accuracy. This is consistent with Miller & Monge's (1988) findings, suggesting that leaders' participation not only bring new knowledge and information, but also enhance the emotional exchanges between subordinates, and entice employees to work harder, thus improving their performance.

Therefore, the researcher posits that:

***H8: Forecaster's vigor mediates the effect of GM involvement on demand forecast accuracy.***

***H9: Forecaster's dedication mediates the effect of GM involvement on demand forecast accuracy.***

***H10: Forecaster's absorption mediates the effect of GM involvement on demand forecast accuracy.***

### **2.2.3 Moderation between GM Involvement and Demand Forecasting Accuracy**

From the document 4 study, results suggested that organization culture has a moderation effect on the relationship between internal organizational influences and forecast accuracy).

Researchers have considered organizational culture as having multiple dimensions. Cameron & Quinn (1999) proposed the competing values framework which has a high degree of congruence with well-known and well-accepted categorical schemes that organize the way people think and process information, and their values and assumptions. According to Cameron & Quinn (1999), one dimension differentiates effectiveness on a range from flexibility to stability and the second dimension differentiates effectiveness on a range from internal orientation to external orientation (See Figure 4). Together the two dimensions constitute four quadrants which have distinct sets of organizational effectiveness indicators that represent the organization's core values and what people think about the organization's performance.

From the four quadrants, the competing or opposite values in each quadrant give rise to the name of the model, the Competing Values Framework, with four distinct culture types: Clan or Group, Adhocracy or Developmental, Hierarchical, Market or Rational (Cameron & Quinn, 1999).

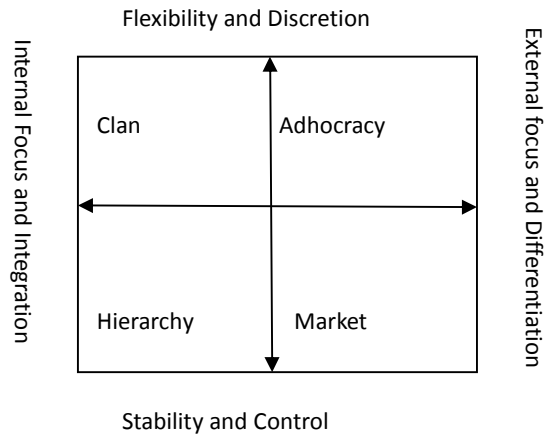


Figure 4: The Competing Values Framework (Cameron and Quinn, 1999:35)

### The Moderation of Clan Culture

Clan culture is in the quadrant which stresses on internal focus and flexibility. Its dominant core values are teamwork, openness, participation, and employee development. Cameron and Quinn (1999) believed organizations with clan culture focus on developing a humane work environment where employees' participation, commitment, and loyalty are facilitated.

In an organization with high clan culture, leadership style of the GM is inclined to care and support. Organizational structure is similar to family or closely connected clique. Power within the organizations does not come from the position, but from the role of interaction between members of the group. When the GM gets involved in the forecasting process, members of the group will think forecast is very important, and they are willing to invest more effort on the forecasting activities, which make forecasts more accurate.

In organizations with low clan culture, the relationship between leaders and company members are less harmonious. Even if the GM gets involved in the forecast process, the subordinates do not perceive forecasts as being important. In turn, the subordinates would not conduct forecast to the best of their abilities. Therefore, forecast accuracy would be impaired as a result of low clan culture.

The researcher considers the hypothesis that:

***H11: Clan culture positively moderates the effect of GM involvement on demand forecast accuracy.***

## **The Moderation of Adhocracy Culture**

According to Cameron and Quinn (1999), the Adhocracy culture is in the external focus and flexibility quadrant. Its core values are adaptability, flexibility, and creativity. The adhocracy culture is found in organizations where specialized or temporary teams are required for tasks that are highly technical, with high levels of uncertainty, and ambiguity. Adhocracy culture stresses individuality, risk taking, and anticipation of the future (Cameron and Quinn, 1999).

In an organization with high adhocracy culture, the GM is willing to take risks because of their pursuit of innovation and growth. Thus, the GM tends to be optimistic about the prospects for the future. As described in document 3, management is focused on enterprise performance and development and would naturally overestimate the future which leads to increased forecast error. Just as Wacker and Sprague's (1995) study indicated, the degree of GM involvement is negatively related to forecast accuracy). Wacker and Sprague (1995) explained that because top management stress optimism to motivate subordinate to work hard, they always tend to depict the future to be hopeful.

However, in an organization with low adhocracy culture, the GM conducts operations in a much more arms-length like manner. On one hand, they will communicate with subordinates about their suggestion on demand forecast truthfully, and would not be over-optimistic about the future. On the other hand, the GM would conduct forecast from the viewpoint of strategy and at a macroscopic angle. Therefore, GM involvement will bring about more accurate demand forecasts. As Wacker and Sprague's (1998) analysis indicated, top management exhibit a distinct characteristic of influencing forecasting.

Therefore, GM involvement can work to bring important information to the forecast in a low adhocracy culture; while in high adhocracy culture, GMs are only willing to give a "hopes and wisher" forecast. Taking together, the researcher posits that:

***H12: Adhocracy culture negatively moderates the effect of GM involvement on demand forecast accuracy.***

## **The Moderation of Hierarchy Culture**

Hierarchy culture is situated in the internal focus and stability quadrant. According to Cameron

and Quinn (1999), the core values of the hierarchy culture are predictability, stability and efficiency. They believed that the hierarchical culture exists in formalized and structured organizations and governed by formal rules and policies.

In an organization with high hierarchy culture, organization structure is characterized by bureaucratic administration; there may be multiple layers of hierarchies. Because performance appraisals of employees are based on loosely worded goals, employees are not driven to work to their utmost ability, while not making mistakes is very important. Previous research shows that in large hierarchy cultures, employees are inclined to be conservative and play safe, and they do not openly communicate with other employees. Thus it is very difficult for them to reach consensus on forecasting due to potentially conflicting goals. In an organization with high hierarchy culture, the GM would not openly engage with the forecaster. In an organization with low hierarchy culture, when the GM gets involved in forecasting, the employees have more chance to communicate with the GM openly without intimidation, thus can also lead to accurate forecasts. Therefore, the researcher conjectures that:

***H13: Hierarchy culture negatively moderates the effect of GM involvement on demand forecast accuracy.***

### **The Moderation of Market Culture**

Within the Competing Values Framework, market culture is situated in the external focus and stability quadrant. According to Cameron and Quinn (1999), the core values of the market culture are competitiveness, goal achievement and productivity. The organizations that embrace this culture have a competitive orientation towards rivals and are driven by customer focus and premium returns on assets.

In an organization with high market culture, because most of new firms are medium and small enterprises, the founders of the firm are deeply involved in all aspects of the firm and communicate openly and react quickly to the market they serve (Smith III et al., 1996). In an organization with high market culture, managers would be more likely to openly collect feedback from subordinates to make forecasts reflecting true market dynamics. Therefore, demand forecast becomes more accurate.

In an organization with low market culture, even if the GM involves deeply in the forecasting

process, the GM do not attach great importance to market data because the organization do not focus on market trends. This leads to the hypothesis that:

***H14: Market culture positively moderates the effect of GM involvement on demand forecast accuracy.***

## 2.3 Conceptual Framework

Taken together, the summary conceptual framework is depicted in Figure 5. Demand forecast accuracy in new firms is impacted by GM involvement, GM expertise and GM overconfidence. GM involvement in the forecasting process positively influences forecasters' work engagement in the activity. In turn, the effect of GM involvement on forecast accuracy is mediated by employee work engagement. The effect of GM involvement is also moderated by organization culture that exists in the enterprise. Organization culture is partitioned into clan, adhocracy, hierarchy, and market dimensions. Finally, in this model, demand forecasting accuracy is seen as having a direct impact on decision quality.

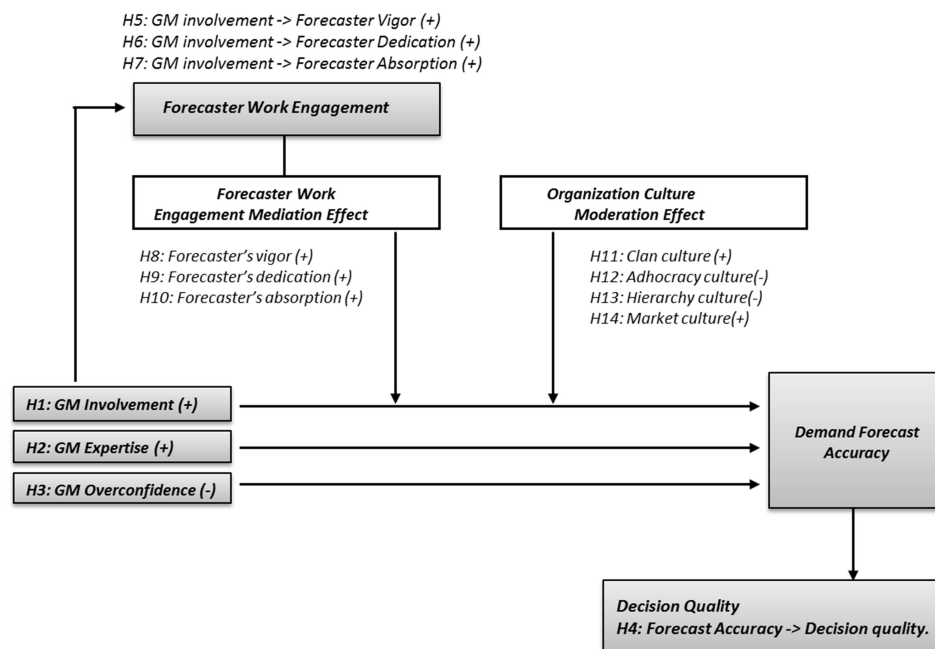


Figure 5: Conceptual Framework for this research project

## **3.0 Methodology and Methods**

### **3.1 Research Methodology**

There are three main methodologies widely accepted in business and management subject research: positivism, realism and interpretivism (Fisher et al, 2007). Different methodological approaches can be applied during the research process. The realism approach recognizes that behaviour cannot be measured in the same way as physical processes (Fisher et al, 2007:17-21, 46-52, 62). Applying this methodology, the researchers focus on discovering the mechanisms that bring about events.

The goal of the study is to investigate patterns of forecasting related behaviour exhibited by general managers and forecasters. As general manager and forecaster behaviour represent mostly behaviour choices, the realist approach is most applicable for the research project. The mechanisms that drive under-forecasting or over-forecasting can best be investigated using the realist research methodology. The realist approach was applied as a way to allow for presentation of the general manager and forecaster behaviours from the perspective of engagement in the forecasting process, and provided good insights into the issues that impact forecast accuracy.

The realist approach makes use of cause and effect statistical analysis to test hypotheses about associations between selected data (Fisher et al, 2007). Hypotheses are developed and tested to seek possible explanation to patterns of behaviour. For this research, the realist approach is applied to test developed hypothesis to understand the effect of GM involvement, GM expertise, and GM overconfidence on demand forecast accuracy.

### **3.2 Research Methods**

Based on the realist approach, quantitative method is used for data collection and analysis. For this quantitative investigation, it is important to establish a research design. The first step is transforming the research questions into research hypothesis (i.e.: conceptualization). The second step is operationalization. In this step, all concepts are transcribed into real world observable variables, and the exercisable plan of data observation is designed (Fisher, 2007). In order to conduct a



comprehensive and effective analysis on the relationship between GM involvement and accuracy of prediction and decision making variables, empirical research is conducted to inspect the hypothesis suggested in theoretical derivations. The necessary data for empirical research is collected from sample questionnaire surveys.

The quality of this research depends on questionnaire design, whether the data collection step is reasonable, and whether the data collected accords with requirements. This section will state the method and process of questionnaire design and the measurement of variables, and the data collection and statistical methods of empirical research (see Table 2).

Table 2: Research Process

Steps	Description
<b>Phase 1: Preparation</b>	
Select Methodology	Based on the research purpose, the realist approach is used.
Select Target Group and Sample	The target enterprises are new firms within the Information and Communications Technology (ICT) Industry. The participants are GMs and forecasters from these enterprises.
Determine Variables	<p><b>Control Variables:</b></p> <ul style="list-style-type: none"> <li>i. Company age</li> <li>ii. Company size</li> <li>iii. Technology change</li> <li>iv. Demand variability</li> <li>v. Competition intensity</li> <li>vi. Supply chain flexibility</li> </ul> <p><b>Independent Variable:</b></p> <ul style="list-style-type: none"> <li>i. GM involvement</li> <li>ii. GM expertise</li> <li>iii. GM overconfidence</li> </ul> <p><b>Intermediate variable:</b> Demand forecasting accuracy</p> <p><b>Dependent Variables:</b> Decision quality</p> <p><b>Mediating Variables:</b> Work engagement of forecaster</p> <p><b>Moderating Variables:</b> Organization culture</p>
Develop Questionnaire	<p><u>The Questionnaire is listed in Appendix II.</u></p> <p>To ensure focus and investigation relevance, the survey is conducted completely within China with Chinese organizations or MNC organizations that have operations in China. To cater to the language preference of most interviewees, the questionnaire is translated into Chinese and the translation is doubled-checked to maintain consistency.</p> <p>The questionnaire is divided into two parts, “GM Section” which is filled</p>

	in by GMs of the company and “Forecaster Section” which is completed by forecasters in the company.
<b>Phase 2: Data Collection</b>	
Distribute Questionnaire	Questionnaire is distributed to GMs either face to face or by email.
Collect Questionnaire	<p>For face to face distributed questionnaires: GM filled out the questionnaire for the “GM section” and submitted the finished questionnaire section directly, and the GM would took the questionnaire section specific for the “Forecaster” back to the company and asked the forecaster to fill out and subsequently return to the researcher.</p> <p>For questionnaire distributed by email: the GM is responsible for filling out the questionnaire for the “GM section” and delivering the unfinished questionnaire for the “Forecaster section” to the forecaster. When the forecaster completes the questionnaire, the survey document is returned back to the researcher by email.</p>
<b>Phase 3: Data Reporting</b>	
Analyze data	<p>To understand forecasting practices within organizations, the study used descriptive statistics to describe the forecast state via SPSS software.</p> <p>To establish the relationship between GM characteristics (including GM involvement, GM expertise, GM overconfidence) and forecast accuracy and decision quality, Structural Equation Modeling is employed to explore the relationship via LISREL software.</p> <p>To consider the mediating effect of work engagement of forecaster on the relationship between GM involvement and demand forecast accuracy, multiple regressions is employed to explore the mediating relationship via SPSS software.</p> <p>To consider the moderator effect of organization culture on the relationship between GM involvement and demand forecast accuracy, multiple regressions is employed to explore the moderation relationship via SPSS software.</p>
Report	Discussions and conclusions drafted.

### 3.3 Data Collection

Before conducting the formal survey, the standards of choosing the sample enterprises is established: (1) the sample enterprises are within the IT/telecommunication industry; (2) the sample

enterprises are new firms, with company age less than 8 years; (3) the sample enterprises perform demand forecasts. The researcher made great effort to obtain a representative sample of the companies that can meet the three criteria.

The questionnaire is divided into two parts, the “GM section” which is filled in by GMs and “forecaster section” which is completed by forecasters in the company. The survey questionnaire is distributed to GMs either face to face or by email. The GM and forecaster in the company are asked to complete the corresponding part of the questionnaire.

For the face to face survey, while participating in Training Workshops, GMs fill out the questionnaire for “GM section” and submit the finished questionnaire section. The GM would then take the remaining questionnaire for the “forecaster section” back to the company and ask the forecaster to complete before mailing back to the researcher.

For the electronic survey, the questionnaire is sent to the GM by email. The GM is responsible for filling out the questionnaire for the “GM section” and delivering the “forecaster section” to the forecaster. Once the forecaster has completed the corresponding section, the completed questionnaire is returned to the researcher by email.

The survey was conducted in the fall of 2013. By the two methods, a total of 465 questionnaires were sent out and 331 qualified questionnaires were returned. The ratio of returned valid questionnaire is 71.2%.

### 3.4 Data Analysis

#### 3.4.1 Control Variables

The control variables are listed below:

**Company Age:** Participants are asked to denote their company’s current age. To qualify as a new company, the cut-off age of 8 is adopted based on the study by Miller and Camp (1985). The 3-point scale is used to code the input: 1= “0-3 years”, 2 = “4-5 years”, 3 = “6-8 years”.

**Company Size:** Company size may be defined by total assets, total sales, and total number of employees. For the purpose of this study, the categorization referenced the total employee partitions used by Gartner and Thomas (1993). Company size is measured with a 5-point scale where “1 = Very small (< 10)”, “2 = Small (10-24)”, “3 = Medium (25-49)”, “4 = Large (50-99)”, “5 = Very

large (>100)".

**Technological Change:** This variable referenced Jaworski & Kohli (1993) and Grewal & Tansshaj (2001) where technology change are referenced through two indicators: (a) the technology in this industry is changing rapidly, and (b) a large number of new product ideas have been made possible through technological breakthrough in this industry.

**Market Environmental Uncertainty.** Market environment uncertainty includes elements of market turbulence and competitive intensity which were studied by Jaworski & Kohli (1993) and Grewal & Tansshaj (2001). **Demand Variability** is measured through: (a) In your kind of business, customer's product preferences change quite a bit over time, and (b) customers tend to look for new product all the time. **Competitive Intensity** is measured through: (a) competition in this industry is cut-throat, and (b) "Price Wars" and other promotion tactics are frequent in this industry. Scales adapted from the work of Zhang et al. (2005) are used to measure **Supply Chain Flexibility**, which include (a) "We can deliver multiple kinds of products/materials in response to operation requirements", (b) "Our *logistics system* can deliver the variety of shipments on time", (c) "Our *logistics system* is effective for all shipments", and (d) "We can quickly move materials to *required* production location". Specifically, a 5-point Likert scale asked respondents to rate the market environmental uncertainty measures.

### 3.4.2 Independent Variables

**GM Involvement:** Participants were asked the degree to which the GM is involved in the forecasting process. Applying the methods of Pierce & Newstrom (2010), three items are used to measure GM involvement, including "GM can provide the information about demand forecast to the forecaster", "GM not only focus on result, but also focus on process", and "GM contacts with forecaster." This is measured by a 5-point scale (1: "totally disagree" to 5: "totally agree").

**GM expertise:** GM expertise is measured using the method developed by Gartner & Thomas (1993). There are three items in the measurement:

(a) Participant's degree of general expertise and general knowledge using a 4-point scale: 1 = Leading expert/extensive general knowledge; 2 = Expert/above average general knowledge; 3 = Amateur/average general knowledge; 4 = Novice/average general knowledge.

(b) Participant's years of experience in marketing, and

(c) Participant's years of experience in the industry.

**GM overconfidence:** overconfidence is measured using a procedure similar to that used in Forbes (2005), Brenner et al. (1996), Hsee (2006) and Busenitz & Barney (1997). Busenitz & Barney (1997)'s procedure involved recording the subjects' responses to general knowledge questions which represent moderate to high levels of difficulty. Busenitz & Barney (1997)'s study used five such questions relating to death rates from various diseases and accidents in America. Hsee (2006)'s study used ten such questions relating to USA and China. In this study, the researcher adopted Hsee's (2006) method based on ten questions developed. Example of the questions includes "Which cause of death is more frequent in China? a) Cancer of all types; or b) Heart disease." GMs are asked to choose one of the two available answers for each question based on his/her best guess, and indicate their confidence on a scale ranging from 50% to 100%. The participant is informed that 50% confidence means that the answer is a total guess, whereas 80% means that the answer has eight chances in 10 of being correct (Busenitz & Barney, 1997).

This procedure is not for testing the GM's knowledge but for testing GM's awareness of the limits of their own knowledge. Forbes (2005) pointed out that "the measurement technique is better able to capture this general estimation ability when the influence of variations in the underlying knowledge bases of the subjects is minimized. Therefore, difficult general knowledge questions about which few subjects are likely to be highly knowledgeable, or about which the possession of deep knowledge is likely to be randomly distributed, are for this purpose, preferable to subject-specific questions, such as those about business management, about which certain respondents are likely to have accumulated in-depth expertise."

The researcher then calculated two indicators for each GM, including "the average confidence levels indicated for all questions", and "the percentage of items answered correctly". Measurement of GM overconfidence is:

$$GM \text{ overconfidence} = \text{average confidence level} - \text{the percentage of correct answers}$$

The range of GM overconfidence varies from -50 to 100. When the score of GM overconfidence is negative, it signifies that the GM is under-confident. When the score of GM overconfidence is positive, it shows that the GM is over-confident. When the score of GM

overconfidence is zero, it means GM's confidence is equal to his knowledge.

For analysis purposes, confidence levels are grouped into one of six probability categories: 50-59, 60-69, 70-79, 80-89, 90-99, 100 (Fischhoff, Slovic & Lichtenstein, 1977). For the analysis, these categories are coded, with 50-59 range as 1, 60-69 range as 2, etc.

### 3.4.3 Intermediate Variables

**Demand Forecast accuracy:** As the key variable in this study, the measure of forecast accuracy follows Gartner & Thomas's (1993) study. Forecast accuracy is measured as  $\% \text{ Error} = (\text{Actual Sales} - \text{Forecast Sales}) / \text{Actual Sales}$ . In the survey questionnaire, respondents are asked to indicate the forecast accuracy within their enterprise. According to Gartner & Thomas (1993), companies with  $\pm 25\%$  error measures are defined as accurate, companies that achieve 25%-50% accuracy are defined as inaccurate, and companies with accuracy outside 50% are defined as completely inaccurate.

### 3.4.4 Dependent Variables

**Decision quality:** Decision quality is measured based on three items developed by Amason (1996), which includes (a) "The effect of the decision has had on the company is good", (b) "Relative to what we expected, the results of the decision have been good", and (c) "Overall, the group members feel that the decision was good". The respondents are asked to rate the decision quality using the 5-point Likert scale.

### 3.4.5 Mediating Variables

**Work engagement of forecaster:** Work engagement is measured with the Utrecht Work Engagement Scale (UWES; Schaufeli et al., 2002). The UWES includes three dimensions, including Vigor, Dedication, and Absorption.

For the dimension of Vigor, the scale includes six items: "When I get up in the morning, I feel like going to work", "At my work, I feel bursting with energy", "At my work I always persevere, even when things do not go well", "I can continue working for very long periods at a time", "At my job, I am very resilient, mentally", "At my job I feel strong and vigorous". For the dimension of Dedication, the scale includes five items: "To me, my job is challenging", "My job inspires me", "I am enthusiastic about my

job”, “I am proud of the work that I do”, “I find the work that I do full of meaning and purpose”. For the dimension of Absorption, the scale includes six items: “When I am working, I forget everything else around me”, “Time flies when I am working”, “I get carried away when I am working”, “It is difficult to detach myself from my job”, “I am immersed in my work”, “I feel happy when I am working intensely”.

### 3.4.6 Moderating Variables

#### Organization Culture

Cameron and Quinn (1999) validated the Organizational Culture Assessment Instrument (OCAI) based on the Competing Values Framework (CVF). The OCAI (shown in Table 3) used a five points Likert scale and contains six questions that address various components of organization culture, including the organization’s dominant characteristics, organizational leadership, employee management, organization glue, strategic emphasis, and the organization’s criteria of success. Each question presents four alternatives that represent the characteristics of each quadrant of the CVF framework. The prevailing culture of the sampled firms is assessed based on the OCAI.

Table 3: The Organizational Culture Assessment Instrument (Cameron & Quinn (1999:66))

Dimensions	Items
1. Dominant Characteristics	My organization is a very personal place. It is like an extended family. People seem to share a lot of themselves
	My organization is a very dynamic and entrepreneurial place. People are willing to stick their necks out and take risks
	My organization is very results oriented. A major concern is with getting the job done. People are very competitive and achievement oriented
	My organization is a very controlled and structured place. Formal procedures generally govern what people do.
2. Organizational Leadership	The leadership in my organization is generally considered to exemplify mentoring, facilitating or nurturing.
	The leadership in my organization is generally considered to exemplify entrepreneurship, innovating, or risk taking.
	The leadership in my organization is generally considered to exemplify a no-nonsense, aggressive, results-oriented focus.
	The leadership in my organization is generally considered to exemplify coordinating, organizing or smooth-running efficiency
3. Management of	The management style in my organization is characterized by teamwork, consensus, and

Employees	participation
	The management style in my organization is characterized by individual risk-taking, innovation, freedom, and uniqueness
	The management style in my organization is characterized by hard-driving competitiveness high demands, and achievement
	The management style in my organization is characterized by security of employment, conformity, predictability, and stability in relationships
4. Organization Glue	The glue that holds my organization together is loyalty and mutual trust. Commitment to this organization runs high.
	The glue that holds my organization together is commitment to innovation and development. There is an emphasis on being the cutting edge.
	The glue that holds my organization together is the emphasis on achievement and goal accomplishment. Aggressive and winning are common themes.
	The glue that holds my organization together is formal rules and policies. Maintaining a smooth-running organization is important.
5. Strategic Emphasis	My organization emphasizes employee development. High trust, openness, and participation persist.
	My organization emphasizes acquiring new resources and creating new challenges. Trying new things and prospecting for opportunities are valued.
	My organization emphasizes competitive actions and achievement. Hitting stretch targets and winning in the marketplace are dominant
	My organization emphasizes permanence and stability. Efficiency, control and smooth operations are important.
6. Criteria of Success	My organization defines success on the basis of the development of human resources, teamwork, employee commitment, and concern for people.
	My organization defines success on the basis of having the most unique or newest products. It is a product leader and innovator.
	My organization defines success on the basis of winning in the marketplace and outpacing the competition. Competitive market leadership is the key to success.
	My organization defines success on the basis of efficiency. Dependable delivery, smooth scheduling, and low-cost production are critical.

### 3.4.7 Summary of Variables and Test Methods

For clarity, table 4 summarizes and links the original research questions to the hypotheses, and mapping them to the corresponding independent and dependent variables.

Table 4: Summary of Variables and Test Methods in this Study

Question	Hypotheses	Independent Variables	Dependent Variables	Mediate/Moderate Variable	Statistical Test
Q1: What is the relationship between GM	H1: The more GM involvement, the more accurate of the demand forecast.	GM characteristics: GM	Demand forecasting accuracy	N/A	t test or Chi-square, Pearson correlation coefficient, multiple



characteristics and demand forecasting accuracy?	H2: The more GM expertise, the more accurate of the demand forecast.  H3: The more GM overconfidence, the less accurate of the demand forecast.	involvement,  GM expertise,  GM overconfidence			regression analysis
Q2: What is the relationship between demand forecasting accuracy and decision quality?	H4: The more accurate the demand forecast, the higher the decision quality.	Demand forecasting accuracy	Decision quality	N/A	t test or Chi-square, Pearson correlation coefficient, multiple regression analysis
Q3a: Is there a mediation effect between GM involvement and demand forecasting accuracy?	H5: GM involvement is positively related to forecaster's vigor.  H6: GM involvement is positively related to forecaster's dedication.  H7: GM involvement is positively related to forecaster's absorption.  H8: Forecaster's vigor mediates the effect of GM involvement on demand forecast accuracy.  H9: Forecaster's dedication mediates the effect of GM involvement on demand forecast accuracy.  H10: Forecaster's absorption mediates the effect of GM involvement on demand forecast accuracy.	GM involvement	Demand forecasting accuracy	Forecaster's work engagement consisting of vigor, dedication, absorption	t test or Chi-square, Pearson correlation coefficient, multiple regression analysis
Q3b: Is there a moderation effect between GM involvement and demand forecasting accuracy?	H11: Clan culture positively moderates the effect of GM involvement on demand forecast accuracy.  H12: Adhocracy culture negatively moderates the effect of GM involvement on demand forecast accuracy.  H13: Hierarchy culture negatively moderates the effect of GM involvement on demand forecast accuracy.  H14: Market culture positively moderates the effect of GM involvement on demand forecast accuracy.	GM involvement	Demand forecasting accuracy	Organizational culture: Clan culture, Adhocracy culture, Hierarchy culture, Market culture;  GM overconfidence	t test or Chi-square, Pearson correlation coefficient, multiple regression analysis

### 3.4.8 Descriptive Statistical Analysis

Descriptive statistics are used to summarize the characteristics of the data set including company size, and company age in order to understand the distribution of the samples.

### 3.4.9 Reliability and Validity Tests

Before proceeding to analyze the data and test the hypothesis, data reliability and validity are

considered. **Reliability** is the consistency of a set of measurements, while **Validity** is the ability of a test to measure what it is purports to measure.

**(a) Reliability**

According to Miller (1998), “reliability is defined as the extent to which a questionnaire, test, observation or any measurement procedure produces the same results on repeated trials. In short, it is the stability or consistency of scores over time or across raters”. Internal consistency can be used to measure reliability. Internal consistency concerns the extent to which items on the test or instrument are measuring the same thing. If the individual items are highly correlated with each other we can be highly confident in the reliability. In this study, internal consistency is estimated via the *coefficient alpha* (Cronbach, 1951) index.

Generally speaking, the higher the reliability value the more reliable the measure. Nunnally (1994) prescribed the general convention in research that reliability values should be 0.70 or higher.

**(b) Validity**

Validity is defined as the extent to which the instrument measures what it purports to measure. In 1954, the American Psychological Association advocated four types of validity including content validity, predictive validity, concurrent validity, and construct validity. Among them, content validity and construct validity tests are commonly applied.

Content validity refers to the degree to which the instrument fully assesses or measures the construct of interest and experts in the field are asked to judge whether the instrument is content valid in accordance with the researched theme (Kerlinger, 1999). Construct validity refers to the degree to which an instrument measures the trait or theoretical construct that it is intended to measure and involves the test of the hypothesized constructs which represent the concept that researchers try to measure (Kerlinger, 1999).

Factor analysis provides a statistical technique to establish data validity. It statistically explains the variations and covariations among variables. Factor analysis is discussed in the following section.

### **3.4.10 Factor Analysis**

Factor analysis is a multivariate method used for data reduction purposes, as a mean to

represent a set of variables by a smaller number of unobserved, uncorrelated variables called factors.

This study uses the SPSS software package to run the factor analysis. There are two main steps in factor analysis. The first step is to calculate initial factor loadings. This study uses principal component method to account for most of the variance in the observed variables. The second step is factor rotation which works towards maximizing the loading of each variable on the extracted factors while minimizing the loading on all other factors. There are several rotation methods and for this study, the Varimax method is used. As a guide for determining significance, Hair et al. (1998) suggested that factor loading less than 0.4 should not be displayed because these loadings should be suppressed.

#### **3.4.11 Correlation Analysis**

Correlation analysis assesses the relationship between variables, which measures the extent of correspondence between two variables. Pearson's correlation coefficient will be used to express the strength of the relationship. Pearson's correlation coefficient between two variables is defined as the covariance of the two variables divided by the product of their standard deviations. The absolute value of Pearson's correlation coefficient lies between 0 and 1. If the coefficient is closer to 1, it indicates higher correlation between the two variables.

#### **3.4.12 Regression Analysis**

Regression analysis of this study uses both Structural Equation Model (SEM) and multiple-regression methods.

Firstly, SEM is used to analyze the effect of GM characteristics (including GM involvement, GM expertise, and GM overconfidence) on forecast accuracy, and the effect of forecast accuracy on decision quality. Structural equation model (SEM) is a multivariate regression model. Fox (2002) indicated that "unlike the more traditional multivariate linear model, the response variable in one regression equation in an SEM may appear as a predictor in another equation; indeed, variables in an SEM may influence one-another reciprocally, either directly or through other variables as intermediaries. These structural equations are meant to represent causal relationships among the variables in the model".

#### SEM Variables:

**Latent variables:** Variables that cannot be observed directly. Examples are preferences, attitudes, behavioural intentions, and personality traits. Such constructs can only be measured indirectly by means of observable indicators.

**Manifest variables (observable indicators):** variables that can be observed directly, such as questionnaire items designed to elicit responses related to an attitude or preference.

**Exogenous variables:** independent variables, whose values are treated as conditionally fixed; an additional defining characteristic of exogenous variables is that they are assumed to be independent of the errors.

**Endogenous variables:** dependent variables, whose values are determined by the model.

#### SEM Models:

The variables are modeled by specifying a measurement model and a structural model.

The measurement model specifies the relationships between the observed indicators and the latent variables while the structural model specifies the relationships amongst the latent variables.

Kline (2005:55) stated that “the measurement model for SEM is a multivariate regression model that describes the relationships between a set of observed dependent variables and a set of continuous latent variables. The observed dependent variables are referred to as factor indicators and the continuous latent variables are referred to as factors.

The LISREL software package is used in this study to test the structural model.

Secondly, this study uses multiple-regression to test the mediating effect of work engagement of forecaster on the relationship between GM involvement and demand forecast accuracy. Per Baron and Kenny's (1986) suggestion, the mediating effect is tested in three steps. After consideration for control variables consisting of company age, company size, technology change, demand variability, competition intensity and supply chain flexibility, Step 1 would test whether the independent variable, such as GM involvement, is correlated with the dependent variable, such as demand forecast accuracy. Step 2 would test whether the independent variable, such as GM involvement, is

correlated with the mediator, such as work engagement of forecasters. Step 3 would test the mediating effects, by using GM involvement and work engagement of forecaster as predictors, and demand forecast accuracy as the dependent variable. Maximum mediating effect holds if the independent variable has no effect on the dependent variable when the mediator is controlled. That is to say, to establish that work engagement of forecasters completely mediates the relationship between GM involvement and demand forecast accuracy, the effect of GM involvement on demand forecast accuracy after controlling for work engagement of forecaster should equal to zero. If the independent variable has weaker effect on the dependent variable in Step 3 than in Step 1, then partial mediation is indicated.

Thirdly, this research uses multiple-regression to test the moderation effect of organization culture on the relationship between GM involvement and forecast accuracy. The variables are tested in three steps: Step 1 includes the control variables consisting of company age, company size, technology change, demand variability, competition intensity and supply chain flexibility; Step 2 includes the two main effect variables of GM involvement and organization culture dimensions; Step 3 tests the interactions between different dimensions of organization culture with GM involvement.

## 4. Findings and Analysis

### 4.1 Descriptive Statistics

From the survey samples, all of the enterprises are new firms with incorporation age of less than or equal to 8 years. Enterprises' age with less than 3 years accounted for 36.25%, enterprises' age between 4 and 5 years accounted for 41.69%, while enterprises' age with between 6 to 8 years accounted 22.05% (see Figure 6). The relatively young age for majority of the sampled firms correlates with the predominately small firm size of the observed sample population.

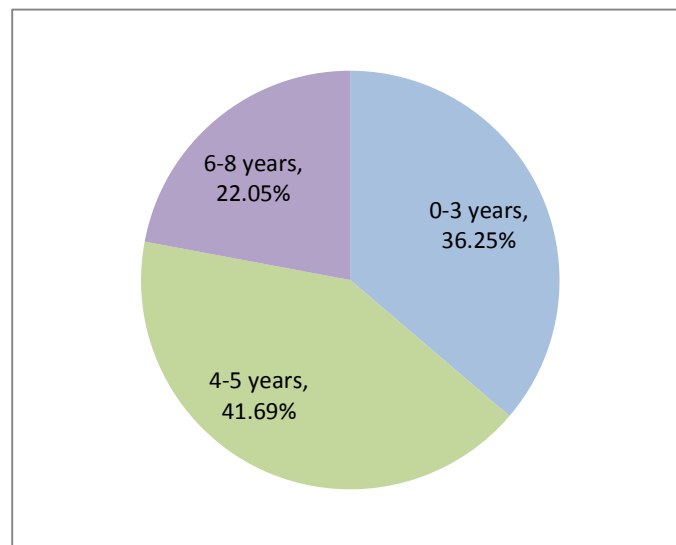


Figure 6: Age of Sampled Companies

For the sampled enterprises, majority are medium-small enterprises, which accounted for 83.39% including very small enterprises, small enterprises and medium enterprise (Figure 7). This shows that new enterprises are more likely small. In the referenced Gartner and Thomas (1993) study, 70.2% of their original samples fall in the same size categories. Thus, the sampled firm size distribution is in line with previous research for comparison.

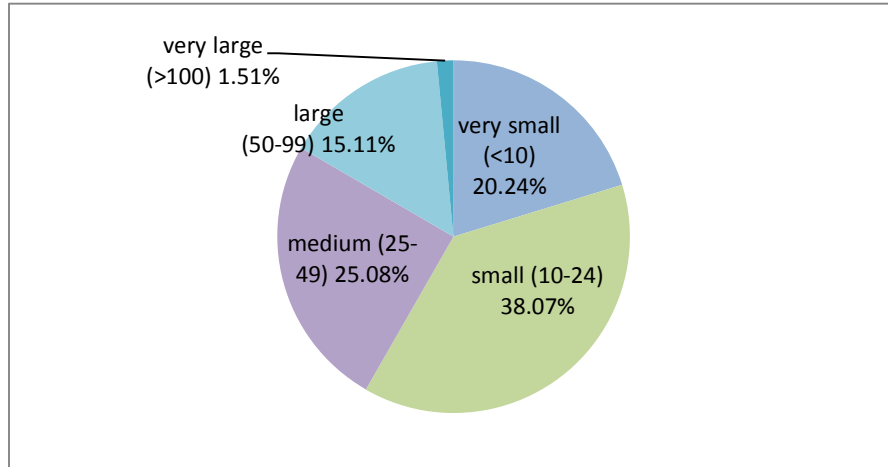


Figure 7: Size distribution of Sampled Companies (based on total employees)

When asked whether demand forecasting is important within the sampled enterprises, 30.51% respondents think demand forecast is extremely important, and 65.56% respondents think demand forecast is somewhat important. None of the enterprises think demand forecast is not important (see Figure 8), which proves this study is very significant and essential. The result is not surprising, as demand forecasting data is a necessary input to the decision making process. The finding is consistent with data from the document 2 qualitative study which suggests that demand forecasting and forecasting accuracy is particularly critical to new firms, as smaller companies rely on forecasts to guide overall business strategy.

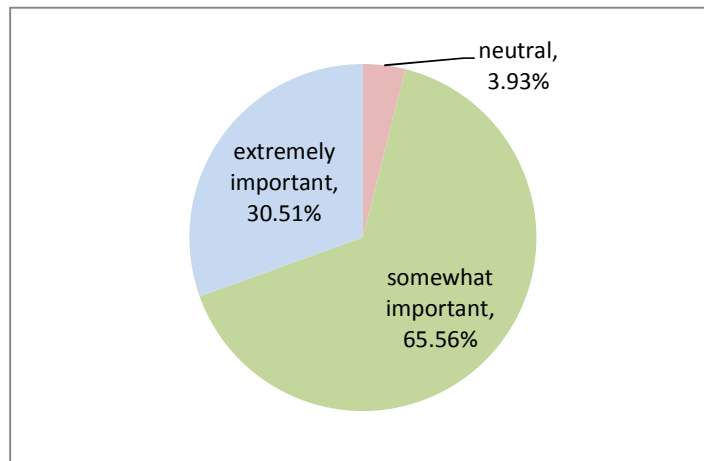


Figure 8: Perceived Importance of Demand Forecast in Sampled Companies

The survey results indicate that multiple functional departments are engaged in the forecasting

process. Beyond the forecasting department, other functional teams are also involved in the forecasting activities. At the top of the list: sales department (84.89%), planning department (65.58%), marketing department (61.93%), supply chain department (57.70%), product management department (54.68%), finance department (30.21%) and R&D department (16.62%). This signifies that forecasting is typically conducted as a team activity and among multiple departments within an enterprise (summarized in Figure 9). This finding is consistent with qualitative research results and academic literature review, where effective forecasting practices rely on cross functional team execution (Dalrymple, 1975; Moon et al., 1998).

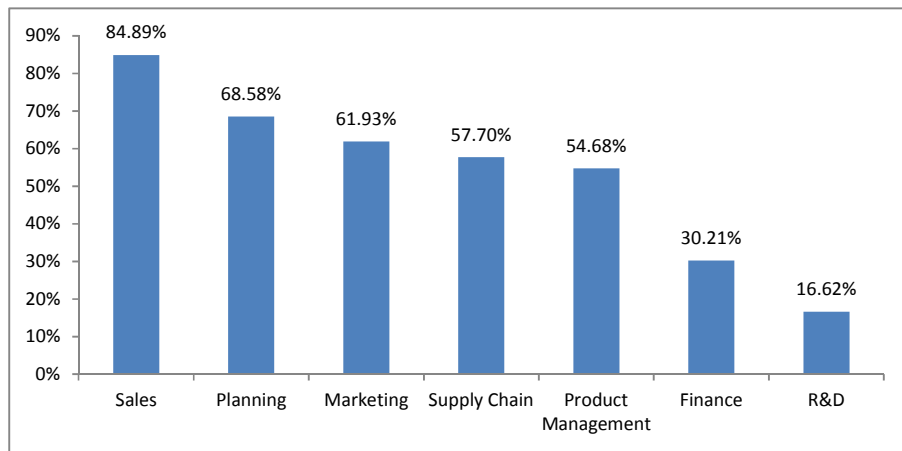


Figure 9: Department Involved in Demand Forecast in Sampled Companies

Figure 10 summarizes the forecasting process responsibility owners within the sampled enterprises. In majority of surveyed enterprises, this task falls on the GM (13.29%), vice general managers (25.68%), and planning director (22.96%). This indicates that forecasting is a high level strategic activity, yet the GM is not the ultimate owner of the forecasting process in majority of the firms surveyed. Thus, the study on the effect of the GM's involvement in the forecasting process is particularly relevant, especially the influence on forecaster engagement.



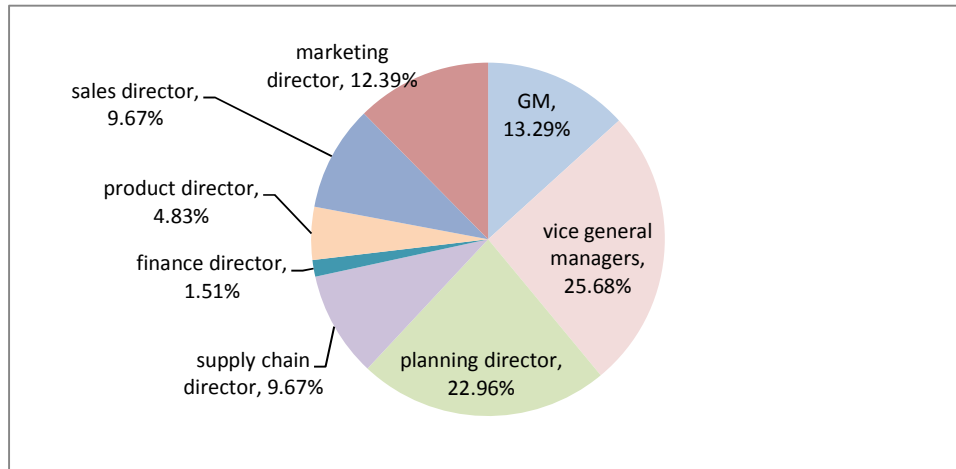


Figure 10: Executive Owner of Demand Forecasting in Sampled Companies

As for the usage of demand forecasting data, it is applied in setting sales targets (74.92%), developing new products (64.49%), determining purchasing plans (63.75%), and developing annual or long range plans (55.59%). Only a small number of enterprises indicate the use of demand forecasting data to establish production plans (34.44%) and for factory location/capacity planning (6.34%) (See figure 11). The survey does not contain sufficient data to indicate the key reasons. Since a significant percentage of China's manufacturing is outsourced to contract manufacturers, it is possible that the surveyed companies are more focused in Research and Development or Sales and marketing. This is consistent with the finding of Gilley et al.'s 2004 study where they found that newer firms engage in more manufacturing outsourcing when the environment is perceived to be more dynamic (Gilley et al., 2004).

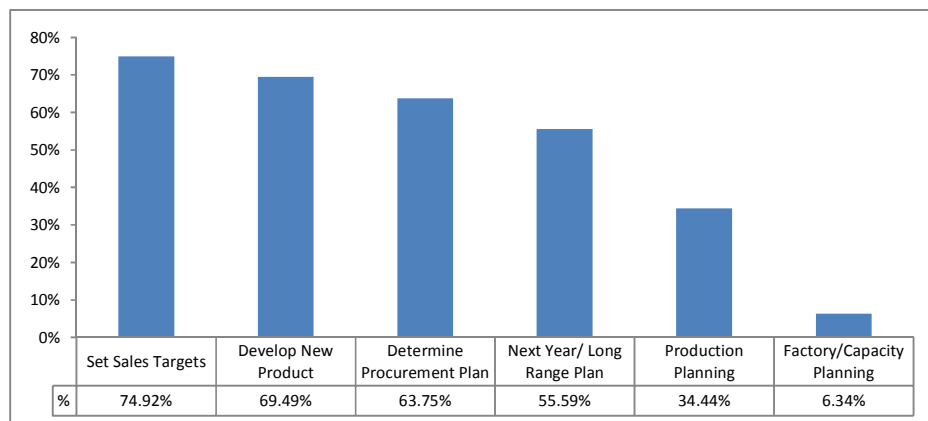


Figure 11: Usage of Demand Forecasts in Sampled Companies

In the surveyed enterprises, a significant 58.61% of companies do not have full-time forecasters. Further, 26.28% of companies have full-time forecasters, but do not have formal training in this discipline. Enterprises that have full-time forecasters and invest in occasional training account for 12.39%. Only 2.72% of enterprises have full-time, professional, and regularly trained forecasters (see Figure 12). It may be because most of the new enterprises are medium-small enterprises, they do not have enough budgets to afford full-time forecasters, which necessitate employees without forecasting skills to participate in demand forecasting activities and to act as part-time demand forecasters.

On one hand, most of new firms do not have full-time forecaster because of limitation of budget; on the other hand, most of GMs believe that demand forecasting is extremely or somewhat important for the enterprises. The lack of dedicated resources to coordinate the forecasting activities would signify that the GM would need to be much more involved in the forecasting process in new firms. Without this facilitation, it is likely that the individual functions would provide functionally biased projections. As an example, the Winklhofer et al. (1996) study showed by empirical evidence that the sales department acting alone would provide notoriously inaccurate forecasts (cited in Makridakis et al., 1998, p. 490-491). As such, involvement of the GM is important to the forecasting process in new firms. In turn, the influence of the GM's involvement in the process would also come into play.

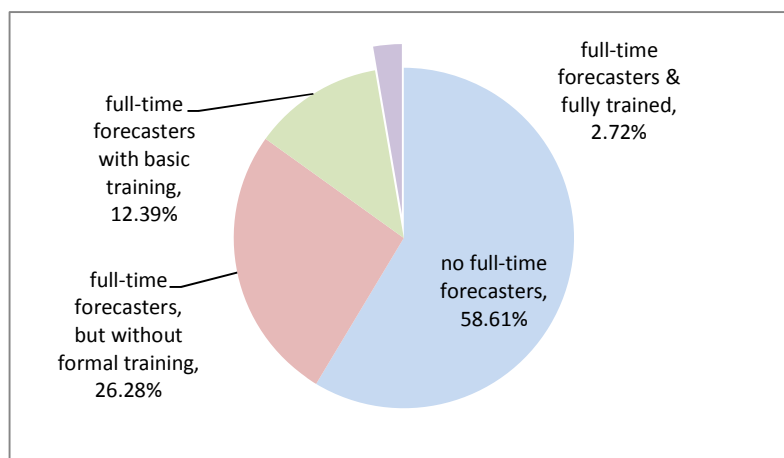


Figure 12: The State of Forecasters within Sampled Companies

## 4.2 Establishment of Reliability

The internal reliability and validity of the data, and relationships between the variables are presented in the following sections. To obtain measures of the internal reliability of scales used in this research, Cronbach alpha coefficients are calculated for each variable measuring GM involvement, work engagement, organizational culture, demand forecast accuracy, decision quality, technology change, demand variability, and competition intensity (Refer to Table 5).

Cronbach alpha serves as a measure of how well a set of variables measures a single, one-dimensional construct (Hair et al., 1998). The greater the consistency in responses among items, the higher the alpha coefficient would be (Williams & Monge, 2001). Generally, an alpha coefficient of greater than 0.70 is considered acceptable for scale reliabilities (Nunnally, 1994).

In this study, all variables produce reliability coefficients that are in excess of 0.7 (refer to Table 5). The results indicate that the internal reliability for the three scales of work engagement ranges from 0.760 to 0.905, four organization culture scales ranges from 0.740 to 0.897. The internal reliability for GM involvement is 0.859, GM expertise is 0.760, decision quality is 0.849, technology change is 0.778, demand variability is 0.775, competition intensity is 0.708, and supply chain flexibility is 0.896. This means that reliability for all variables is acceptable.

Table 5: Reliability Coefficients of Latent Variables

Latent Variables		Cronbach $\alpha$
GM involvement		0.859
GM expertise		0.760
Work engagement	Vigor	0.905
	Dedication	0.883
	Absorption	0.892
Organizational culture	Clan culture	0.760
	Adhocracy culture	0.897
	Hierarchical culture	0.740
	Market culture	0.858

Decision quality	0.849
Technology change	0.778
Demand variability	0.775
Competition intensity	0.708
Supply chain flexibility	0.896

### 4.3 Establishment of Validity

Through the use of SPSS, factor analysis extraction with principal components method and Varimax rotation method are applied.

The variables represent measurable work engagement factors based on the study of Schaufeli et al. (2002). The three factors of the Utrecht Work Engagement Scale explain 68.06% of the variance. The next step is to rotate the three-factors using a Varimax rotation. The first factor accounts for 24.364% of the variance, the second factor accounts for 23.457%, and the third accounts for 20.240%. Table 6 shows factor loading values, and the correlation between each of the variables. The results in Table 3 are ordered and grouped by size of loading to facilitate interpretation. According to Stevens' suggestion (1992), the factor loadings with an absolute value should be greater than critical value of 0.4. The observed factor loading values in this study indicate that they are all significant.

Table 6: Factor Analysis of Work Engagement – Factor Loading

Measurable Characteristics of Work Engagement	Factors		
	Vigor	Absorption	Dedication
VI1	0.932		
VI6	0.863		
VI2	0.859		
VI3	0.841		
VI4	0.744		
VI5	0.717		
AB6		0.924	
AB5		0.834	

AB1		0.807	
AB3		0.798	
AB4		0.756	
AB2		0.732	
DE3			0.844
DE1			0.830
DE2			0.826
DE5			0.823
DE4			0.803

Note. Extraction method: Principal component analysis. Rotation method: Varimax.

The organization cultural characteristics are measured based the OCAI advanced by Cameron and Quinn (1999) (see Table 7. The Encoded Variables are listed in Appendix A - Q17). The four cultural factors explain 54.941% of the variance. The next step is to rotate the four-factors using a Varimax rotation. The first factor accounts for 16.590% of the variance, the second factor accounts for 15.038%, the third accounts for 11.710%, and the fourth accounts for 11.603%. Table 7 shows factor loading values, and the correlation between each of the variables. The results in Table 7 are ordered and grouped by size of loading to facilitate interpretation. All of the organizational culture factor loading values are over 0.4, thus they can be accepted.

Table 7: Factor Analysis of Organization Culture – Factor Loading

Measurable Cultural Characteristics	Factors			
	Hierarchy Culture	Adhocracy Culture	Clan Culture	Market Culture
HC1	0.807			
HC2	0.617			
HC3	0.602			
HC6	0.600			
HC5	0.598			
HC4	0.586			
AC3		0.867		
AC4		0.855		

AC5		0.789		
AC1		0.777		
AC2		0.766		
AC6		0.640		
CC4			0.737	
CC2			0.684	
CC6			0.679	
CC1			0.667	
CC3			0.634	
CC5			0.600	
MC2				0.884
MC3				0.823
MC5				0.740
MC1				0.730
MC4				0.704
MC6				0.686

Note. Extraction method: Principal component analysis. Rotation method: Varimax.

#### 4.4 Correlation Analysis

Correlation analysis is performed to investigate the relationships between the variables of interest and to test the hypotheses proposed in this research (Table 8).

Hypothesis 1 and 2 conjectures that GM involvement and GM expertise positively affect demand forecast accuracy. Hypothesis 3 predicts GM overconfidence negatively affects demand forecast accuracy. Hypothesis 4 states that demand forecast accuracy positively affects decision quality. Hypothesis 5, 6, 7 predicts that GM involvement affects forecaster's work engagement (including vigor, dedication, and absorption).

Results of the analysis investigating these relationships are shown in Table 8. The table indicates that according to the Pearson  $r$  analysis: GM involvement and GM expertise correlate positively with demand forecast accuracy; GM overconfidence correlates negatively with demand forecast accuracy; Demand forecast accuracy correlates positively with decision quality; and GM involvement positively correlates with forecaster's work engagement (including vigor, dedication, and absorption).

Specifically, the analysis reveals significant positive influence of GM involvement ( $r = 0.748, p < 0.01, N = 331$ ) and GM expertise ( $r = 0.464, p < 0.01, N = 331$ ) on demand forecast accuracy; negative influence of GM overconfidence ( $r = -0.494, p < 0.01, N = 331$ ) on demand forecast accuracy; and positive influence of demand forecast accuracy ( $r = 0.695, p < 0.01, N = 331$ ) on decision quality.

A positive relationship is found between GM involvement and forecaster's work engagement, including vigor ( $r = 0.542, p < 0.01, N = 331$ ), dedication ( $r = 0.225, p < 0.01, N = 331$ ), and absorption ( $r = 0.207, p < 0.01, N = 331$ ).

For this analysis, the p-values are all less than 0.01. Therefore, Hypotheses 1, 2, 3, 4, 5, 6 and 7 are supported by this exploratory research.

## 4.5 Test of Primary Hypothesis

LISREL software is used to establish the effect of GM characteristics (including GM involvement, GM expertise, GM overconfidence) on demand forecast accuracy and decision quality, and SPSS software is used to establish the mediating and moderating effect of forecaster engagement and organization culture respectively of GM involvement on demand forecast accuracy.

### 4.5.1 Overall Fit Measures for the Structural Model

Jöreskog and Sörbom (1993) explained that researchers must form an assumed theoretical framework of cause and effect to verify the precision of assumptions before processing LISREL. LISREL is used to confirm the assumed model for the goodness-of-fit test and relationships between GM characteristics, demand forecast accuracy, and decision quality. Browne & Cudeck (1993) recommended that frequently-used indicators attain specific thresholds, including: NCI ( $\chi^2/df$ )  $< 3$ , SRMR or RMR  $< 0.08$ , RMSEA  $< 0.08$ , AGFI  $> 0.8$ , NNFI  $> 0.9$  and CFI  $> 0.9$ . Based on the corresponding values listed in Table 9, the statistic of the structural model in this study is acceptable, where NCI ( $\chi^2/df$ ) = 1.29; SRMR or RMR = 0.028; RMSEA = 0.027; AGFI = 0.96; NNFI = 0.99; CFI = 1.00.

Table 8: Means, Standard Deviations, Zero-order Correlations of Variables (Note: \*\*:  $p \leq .01$  \*:  $p \leq 0.05$ )

	GM involvement	GM expertise	GM overconfidence	Vigor	Dedication	Absorption	Clan culture	Adhocracy culture	Hierarchical culture	Market culture	Demand forecast accuracy	Decision quality	Company age	Company scale	Technology change	Demand variability	Competition intensity	Supply chain flexibility
GM involvement	1																	
GM expertise	.447	1																
GM overconfidence	-.494	-.480**	1															
Vigor	0.542**	.390**	-.359**	1														
Dedication	0.225**	.002	-.211**	0.07	1													
Absorption	0.207**	.361*	-.270**	0.041	-0.068	1												
Clan culture	-0.536**	-.117*	.183**	-0.333**	-0.07	-0.081	1											
Adhocracy culture	0.441**	.381**	-.466**	0.329**	0.33**	0.188**	-0.162**	1										
Hierarchical culture	-0.086	-.285**	.354**	-0.071	-0.347**	-0.121**	-0.065	-0.446**	1									
Market culture	0.457**	.095	-.156**	0.217**	0.101	-0.01	-0.202**	0.123**	0.099	1								
Demand forecast accuracy	0.748**	.464**	-.494**	0.481**	0.377**	0.305**	-0.291**	0.661**	-0.582**	0.199**	1							
Decision quality	0.662**	.054	-.124*	0.36**	0.222**	0.254**	-0.312**	0.404**	-0.228**	0.171**	0.695**	1						
Company age	0.032	.075	-.066	-0.008	0.107	0.034	0.082	0.052	-0.082	-0.076	0.112**	0.121**	1					
Company scale	0.036	-.109*	.145**	0.058	0.013	0.055	0.04	-0.011	-0.022	0.103	0.087	0.089	-0.061	1				
Technology change	-0.06	-.134*	.170**	-0.066	0.001	-0.055	0.067	-0.095	-0.006	-0.059	-0.058	0.051	0.022	0.055	1			
Demand variability	-0.082	-.045	.018	-0.1	0.02	-0.117**	0.02	-0.072	0.056	0.015	-0.141**	-0.104	0.008	0.097	0.112**	1		
Competition intensity	-0.09	.012	.084	-0.13*	0.014	-0.003	0.103	0.076	-0.047	-0.077	-0.03	-0.06	0.065	0.068	-0.007	-0.026	1	
Supply chain flexibility	-0.049	0.012	0.084	-0.006	-0.094	-0.009	0.023	0.022	0.025	0.054	-0.012	0.023	0.013	0.052	0.05	0.037	0.137**	1
Mean	3.314	4.308	4.973	2.923	4.471	2.373	3.097	3.190	3.055	3.409	2.130	3.096	1.858	2.396	3.470	3.289	3.449	3.174
SD	0.925	0.537	1.013	1.167	0.872	0.992	0.526	0.838	0.747	0.984	0.650	0.883	0.751	1.020	0.945	1.021	0.907	1.076



Table 9: Overall Fit Measures for the Structural Model

Test Statistic	Standard Indices	Statistic of Structural Model in this Study
NCI ( $\chi^2/df$ )	< 3	1.29
SRMR or RMR	< 0.08	0.028
RMSEA	< 0.08	0.027
AGFI	> 0.8	0.96
NNFI	> 0.9	0.99
CFI	> 0.9	1.00

Note. \* $p < 0.05$

#### 4.5.2 The Structural Relationship of the Model

Previous studies have indicated that GM involvement, GM expertise and GM overconfidence have a direct impact on demand forecast accuracy and an indirect impact on decision quality. Along that line, demand forecast accuracy has a direct impact on decision quality. To test, decision quality in structural equation modeling is considered as an exogenous latent construct, while forecast accuracy and GM involvement, GM expertise and GM overconfidence are considered as endogenous latent constructs. The hypotheses for this structural model include Hypotheses 1, 2, 3 and 4.

When the overall fit measures for the structural model is acceptable, the structural relationship can be assessed to see whether the hypotheses proposed are supported.

Based on the SEM regression coefficient estimates listed on Table 10 and the Standardized Parameters of the Structural Model illustrated in Figure 13, it can be seen that all T-values are greater than 1.96 (95% confidence interval). Thus, hypotheses 1, 2, 3 and 4 are supported.

Table 10: Regression Coefficient Estimates of the SEM Model

Hypothesis	Path	Standardized Coefficient		T-value
H1	GM involvement → Demand forecast accuracy	$\beta_1$	0.56	12.06
H2	GM expertise → Demand forecast accuracy	$\beta_2$	0.28	6.21

H3	GM overconfidence → Demand forecast accuracy	$\beta_3$	-0.27	-7.20
H4	Demand forecast accuracy → Decision quality	$\gamma_1$	0.80	16.19

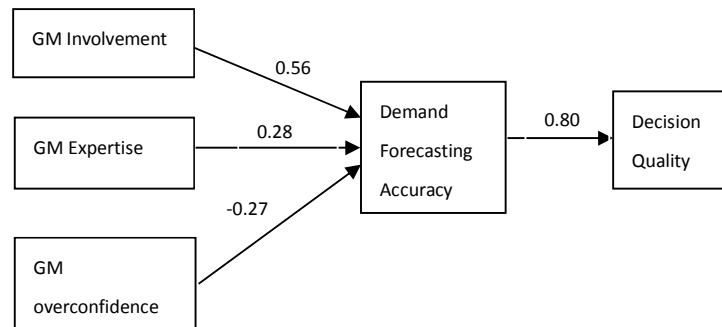


Figure 13: Standardized Parameters of the Structural Model

The data strongly indicates that GM involvement in the forecasting process and the GM's expertise contribute positively to forecasting accuracy, while GM overconfidence impact negatively on forecasting accuracy. In terms of GM involvement, most of the previous studies suggested that management involvement in the forecasting process will result in decreased forecast errors (Jain, 2007; Pierce & Newstrom, 2010). GM involvement will motivate forecasters and facilitate dialogue among the teams to work towards process driven forecast generation.

The alternative view, based on Wacker and Sprague's (1995) research, indicated that GM involvement was detrimental to forecasting accuracy due to management overconfidence. For the current research, the negative correlation associated with overconfidence reconfirms this finding. The negative effect of overconfidence on forecast accuracy is also consistent with the study of Hribar and Yang (2010) that overconfident managers are more likely to issue optimistically biased forecasts. Overconfidence behaviours cause GMs to be less prudent with the forecasting process, and when coupled with over-optimism, the forecast errors increase significantly.

The research also reconfirmed that GM expertise, measured based on overall general knowledge, industry and marketing experience, is positively correlated with forecast accuracy and consistent with the result of Gartner and Thomas (1993) and Buyl et al. (2011).

Managers rely on good data to make good decisions. The study indicates that better data is associated with better decisions (demand forecast accuracy strongly leads to better decision quality).

However, while regression analysis points to this effect, the process of applying data to decision making is not investigated in this study. Additional research is required to answer the question why demand forecast accuracy can lead to decision quality.

#### **4.6 Mediating Effect Analysis**

According to Schaufeli et al.'s (2002) research, forecaster's work engagement can be divided into three dimensions, which are Vigor, Dedication, and Absorption. In this section, the mediating role of forecaster's work engagement with GM involvement and demand forecast accuracy are tested. Following Baron and Kenny's (1986) suggestion, the mediating effect analysis is conducted in four steps. After including the control variables, Step 1 uses GM involvement as the independent variable and shows that GM involvement is positively related to demand forecast accuracy as the dependent variable. Step 2 shows that GM involvement (as the independent variable), is correlated with forecaster's work engagement as the mediator. Step 3 tests GM involvement and forecaster's work engagement as independent variables, and demand forecast accuracy as the dependent variable, to show the mediating effects. In Step 4, to establish that work engagement mediates the GM involvement relationship with demand forecast accuracy, work engagement is controlled and tested whether the effect between GM involvement and demand forecast accuracy is significant.

As seen in Table 11, in Step 2, GM involvement ( $\beta=0.737$ ,  $p<0.001$ ) is positively related to demand forecast accuracy. GM involvement has positive correlation to the three dimensions of forecaster's work engagement (Vigor:  $\beta=0.527$ ,  $p<0.001$ ; Dedication:  $\beta=0.224$ ,  $p<0.001$ ; Absorption:  $\beta=0.194$ ,  $p<0.001$ ), which means Hypotheses 5, 6 and 7 are supported. Lastly, as shown in Step 4, when forecaster's work engagement is controlled, the effect of GM involvement on demand forecast accuracy weakens, but still significant, which means that partial mediation of forecaster's work engagement is indicated. Thus, Hypotheses 8, 9 and 10 are supported.

Table 11: Results of Regression Analysis Testing on the Mediating Effects of Forecaster's Work Engagement with GM Involvement & Demand Forecast Accuracy

	Work engagement			Demand Forecast Accuracy			
	Vigor	Dedication	Absorption	Step 1	Step 2	Step 3	Step 4
<b>Control variables</b>							
Company age	-0.016	0.098	0.033	0.125*	0.092*	0.07	0.064
Company size	0.051	0.009	0.062	0.115*	0.073*	0.05	0.052
Technology change	-0.033	0.012	-0.036	-0.05	-0.011	-0.01	-0.003
Demand variability	-0.062	0.04	-0.103	-0.149**	-0.088*	-0.075	-0.07
Competition intensity	-0.092	0.041	0.005	-0.049	0.021	0.009	0.022
Supply chain flexibility	0.034	-0.092	0.002	-0.005	0.02	0.026	0.038
<b>Independent variable</b>							
GM involvement	0.527***	0.224***	0.194***		0.737***		0.572***
<b>Mediator variables</b>							
Vigor						0.435***	0.14***
Dedication						0.363***	0.248***
Absorption						0.298***	0.185***
N	331	331	331	331	331	331	331
df1, df2	7, 323	7, 323	7, 323	6, 324	7, 323	9, 321	10, 320
R <sup>2</sup>	0.294	0.051	0.038	0.032	0.571	0.445	0.656
ΔR <sup>2</sup>	-	-	-	-	0.539***	0.413***	0.085***

Note:\*p<0.05, \*\*p<0.01, \*\*\* p<0.001, n=331.

Working towards the goal of generating better demand forecasts, the GM's willingness to provide needed information to the forecasters, to participate in the process, and to actively communicate with forecasters have a profound effect on the forecasters work engagement as demonstrated by the collected data. This result aligns well with the findings of Byrne et al. (2011) that participations of leaders significantly impact the motivational dimensions of sales force forecasting from a different context. The observed mediating effect of forecaster work engagement on the effect of GM involvement on forecasting accuracy suggests that team work is required for improved forecast accuracy. Forecasters and GM should work together jointly to reinforce the forecasting process. The specific reasons for the mediating effect would require further study.

## 4.7 Moderating Effect Analysis

Organization culture was postulated to moderate the effect of GM involvement on demand forecast accuracy. Organization culture can be divided into four independent variables based on the Competing Values Framework conferred by Cameron and Quinn (1999): Clan/Group, Adhocracy/Developmental, Hierarchy, and Market/Rational. This section will describe the test for the moderator role of different dimensions of organization culture against GM involvement and forecast accuracy. This study is conducted in three steps. Step 1 includes entering the six control variables consisting of company age, company size, technology change, demand variability, competition intensity and supply chain flexibility. Step 2 includes the two main effect variables of different dimensions of organization culture and GM involvement. Step 3 tests the interaction term of different dimension of organization culture with GM involvement.

### 4.7.1 Clan Culture Moderation

As seen in Table 12, the six control variables included in Step 1 account for significant portion of variance in predicting forecast accuracy ( $\Delta R^2=0.032$ ,  $p<0.05$ ), indicating that the control variables are significant predictors of forecast accuracy as shown in previous research. After controlling for the effect of control variables, adding GM involvement and clan culture in Step 2 yield a significant increment in variance in predicting forecast accuracy ( $\Delta R^2=0.551$ ,  $p<0.001$ ). Further, a significant portion of the incremental variance in Step 2 is due to the main effect of GM involvement ( $\beta=0.811$ ,  $p<0.001$ ). These results are consistent with previous correlation analysis, further supporting the conjecture of Hypothesis 1. Testing for the moderator role of clan culture, the interaction term of GM involvement is added with clan culture in Step 3. The results show that it is significant in predicting forecast accuracy ( $\Delta R^2=0.018$ ,  $p<0.001$ ). The  $\Delta R^2$  produced by the interaction terms are within the typical range for moderator effect in non-experimental studies (Champoux & Peters, 1987), and as predicted, a positive interaction for GM involvement ( $\beta=0.290$ ,  $p<0.001$ ) is observed, which means that Hypothesis 11 is supported.

Cameron and Quinn (1999) believed organizations with clan culture focus on developing humane work environments where employee's participation, commitment, and loyalty are facilitated. The observed Clan culture moderation effect validated by hypothesis 11 works to foster willingness of

cross-functional employees to spend more time collaborating in the forecasting process, which naturally leads to more accurate forecasts. When the GM gets involved in the forecasting process, it will show the importance of forecast to the group members who may be willing to invest more effort on the forecasting activities, which makes forecasts more accurate. Clan culture positively moderates the effect of GM involvement on demand forecast accuracy.

Table 12: Results of Regression Analysis Testing on the Interacting Effects of GM Involvement with Clan Culture

Steps	Demand Forecast Accuracy		
	Standardized Coefficients		
<b>Step 1: Control Variables</b>			
Company Age	0.125*	0.079*	0.079*
Company Size	0.115*	0.064	0.07
Technology Change	-0.05	-0.015	-0.022
Demand Variability	-0.149**	-0.083*	-0.095**
Competition Intensity	-0.049	0.015	0.01
Supply Chain Flexibility	-0.005	0.022	0.024
<b>Step 2: Main Variables</b>			
GM Involvement		0.811***	0.945***
Clan Culture		0.136**	0.436***
<b>Step 3: Moderator Variables</b>			
GM Involvement × Clan Culture			0.29***
<b>R2</b>	0.032	0.583	0.601
<b>F</b>	2.810*	58.703***	56.282***
<b>df1</b>	6	8	9
<b>df2</b>	324	322	321

Note: \*p<0.05, \*\*p<0.01, \*\*\* p<0.001, n=331.

#### 4.7.2 Adhocracy Culture Moderation

Consistent with the previous section, the moderating effect of adhocracy culture on the relationship with GM involvement and forecast accuracy is demonstrated in three steps in

accordance with the methods of Baron and Kenny (1986).

As seen in Table 13, the six control variables included in Step 1 account for significant portion of variance in predicting forecast accuracy ( $\Delta R^2=0.032$ ,  $p<0.05$ ), indicating that the control variables are significant predictors of forecast accuracy. With addition of adhocracy culture in Step 2, the results also exhibit significant increment in variance in predicting forecast accuracy ( $\Delta R^2=0.674$ ,  $p<0.001$ ). Again, a significant portion of the incremental variance in Step 2 is due to the main effect of GM involvement ( $\beta= 0.554$ ,  $p<0.001$ ). These results support Hypothesis 1, confirming that GM involvement helps to improve forecast accuracy. Testing for the moderator role of adhocracy culture in Step 3, the result shows that it is significant in predicting forecast accuracy ( $\Delta R^2=0.003$ ,  $p<0.001$ ). As predicted, a negative interaction for GM involvement is observed ( $\beta= -0.067$ ,  $p<0.001$ ), which means that Hypothesis 12 is supported. Adhocracy culture stresses individuality, risk taking, and anticipation of the future (Cameron and Quinn, 1999). In organizations with high adhocracy culture, GMs are willing to take risks and would be less methodical in conducting forecasts. Consistent with hypothesis 12, within organizations having adhocracy culture, the GM and the forecasters would have a propensity for risk and overconfidence which would lead to over-optimism and increased forecast errors. Adhocracy culture negatively moderates the effect of GM involvement on demand forecast accuracy.

Table 13: Results of Regression Analysis Testing on the Interacting Effects of GM Involvement with Adhocracy Culture

Step	Demand Forecast Accuracy		
	Standardized Coefficients		
<b>Step 1: Control Variables</b>			
Company Age	0.125*	0.08**	0.079**
Company Size	0.115*	0.084**	0.091**
Technology Change	-0.05	0.016	0.01
Demand Variability	-0.149**	-0.078**	-0.084**
Competition Intensity	-0.049	-0.025	-0.028
Supply Chain Flexibility	-0.005	0.007	0.012
<b>Step 2: Main Variables</b>			
GM Involvement		0.554***	0.551***

Adhocracy Culture		0.411***	0.416***
<b>Step 3: Moderator Variables</b>			
GM Involvement x Adhocracy Culture			-0.067*
<b>R<sup>2</sup></b>	0.032	0.706	0.709
<b>F</b>	2.810*	99.901***	90.439***
<b>df1</b>	6	8	9
<b>df2</b>	324	322	321

Note: \*p<0.05, \*\*p<0.01, \*\*\* p<0.001, n=331.

#### 4.7.3 Hierarchy Culture Moderation

Similarly, the moderating effect of hierarchy culture on the relationship with GM involvement and forecast accuracy is demonstrated. As seen in Table 14, the six control variables included in Step 1 account for significant portion of variance in predicting forecast accuracy ( $\Delta R^2=0.032$ ,  $p<0.05$ ). Step 2 analysis based on GM involvement and hierarchy culture also yield a significant increment in variance in predicting forecast accuracy ( $\Delta R^2=0.803$ ,  $p<0.001$ ). With incremental variance relating to GM involvement ( $\beta= 0.695$ ,  $p<0.001$ ), the results are consistent and support Hypothesis 1. Testing for the moderator role of hierarchy culture in Step 3, the results show that it is significant in predicting forecast accuracy ( $\Delta R^2=0.014$ ,  $p<0.001$ ). As predicted, adding this interaction term of GM involvement with hierarchy culture yield a significant negative increment in variance in predicting the forecast accuracy ( $\beta= -0.142$ ,  $p<0.001$ ), which means that Hypothesis 13 is supported. Hierarchy culture negatively moderates the effect of GM involvement on demand forecast accuracy.

Table 14: Results of Regression Analysis Testing on the Interacting Effects of GM Involvement with Hierarchy Culture

Step	Demand Forecast Accuracy		
	Standardized Coefficients		
<b>Step 1: Control Variables</b>			
Company Age	0.125*	0.052*	0.047*
Company Size	0.115*	0.059**	0.051*
Technology Change	-0.05	-0.019	-0.015



Demand Variability	-0.149**	-0.061**	-0.051*
Competition Intensity	-0.049	-0.005	-0.008
Supply Chain Flexibility	-0.005	0.035	0.023
<b>Step 2: Main Variables</b>			
GM Involvement		0.695***	0.683***
Hierarchy Culture		-0.514***	-0.594***
<b>Step 3: Moderator Variables</b>			
GM Involvement x Hierarchy Culture			-0.142***
<b>R<sup>2</sup></b>	0.032	0.835	0.849
<b>F</b>	2.810*	210.094***	206.647***
<b>df1</b>	6	8	9
<b>df2</b>	324	322	321

Note: \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\*  $p < 0.001$ ,  $n = 331$ .

#### 4.7.4 Market Culture Moderation

The moderating effect of market culture on the relationship with GM involvement and forecast accuracy is also demonstrated. As seen in Table 15, the six control variables included in Step 1 account for significant portion of variance in predicting forecast accuracy ( $\Delta R^2 = 0.032$ ,  $p < 0.05$ ). Including GM involvement and market culture in Step 2 again yield a significant increment in variance in predicting forecast accuracy ( $\Delta R^2 = 0.564$ ,  $p < 0.001$ ). Testing the moderator role of market culture in Step 3, the results show that it is significant in predicting forecast accuracy ( $\Delta R^2 = 0.020$ ,  $p < 0.001$ ). A positive interaction for GM involvement is observed ( $\beta = 0.164$ ,  $p < 0.001$ ), which means that Hypothesis 14 is supported.

Organizations with market culture are highly competitive and focus on premium returns on assets in the short term (Cameron and Quinn (1999)). In organizations with high market culture, managers would be more likely to openly collect feedback from customers and subordinates to make forecasts that better reflect true market dynamics. Therefore, demand forecast becomes more accurate when management is involved. This is validated by hypothesis 14, finding that market culture positively moderates the effect of GM involvement on demand forecast accuracy.

Table 15: Results of Regression Analysis Testing on the Interacting Effects of GM Involvement with Market Culture

Step	Demand Forecast Accuracy		
	Standardized Coefficients		
<b>Step 1: Control Variables</b>			
Company Age	0.125*	0.077**	0.071**
Company Size	0.115*	0.087**	0.082**
Technology Change	-0.05	-0.019	-0.02
Demand Variability	-0.149**	-0.079**	-0.066
Competition Intensity	-0.049	0.012	0.003
Supply Chain Flexibility	-0.005	0.035	0.039
<b>Step 2: Main Variables</b>			
GM Involvement		0.82***	0.886***
Market Culture		-0.181***	-0.166***
<b>Step 3: Moderator Variables</b>			
GM Involvement × Market Culture			0.164***
<b>R<sup>2</sup></b>	0.032	0.596	0.616
<b>F</b>	2.810*	61.750***	59.842***
<b>df1</b>	6	8	9
<b>df2</b>	324	322	321

Note: \*p<0.05, \*\*p<0.01, \*\*\* p<0.001, n=331.

## 5. Conclusion and Discussion

The purpose of this study is to investigate the impact of GM characteristics on demand forecast accuracy and decision quality in new firms in the ICT industry in China. The outcome of the research can help understand the significance of GM characteristics on demand forecast accuracy and decision quality in new firms and identify critical variables of GM characteristics that can help the firms to redesign and improve forecast accuracy, and enhance decision quality. To achieve this objective, a framework is developed based on literature research and on previous findings drawn from documents 3 and 4. A set of hypothesis is developed to test the model and to draw interference from the investigation. A realist approach is used to conduct this research based on 311 survey responses collected from general managers/forecasters in new firms. The results are presented in section 4. This part will provide an overview of the study, interpretation of the findings, implications, limitations of the study, and recommendations for further research.

### 5.1 Overview of the Study

Based on the collected data, descriptive statistical analysis indicates that majority of the new firms believed demand forecasting is very important or important. This data further highlights the importance and significant of this research. Moreover, descriptive statistical analysis shows that multiple departments in the enterprises are involved in the forecast process, which means that forecasting is a collaborative activity. The results also reveal that overall ownership of the forecast process rest with top management and not middle managers. Usage of forecast data cover many aspects, including setting sales goals (74.92%), developing new product (69.49%), establishing procurement plans (63.75%), and devising long range plans (55.59%). Only 6.34% of respondents indicate use of demand forecasting data for factory or capacity planning purposes. This is not surprising, as newer firms engage in more manufacturing outsourcing than their mature counterparts (Gilley et al., 2004). Most (96%) of the respondents indicate that forecasting is important to the business. However, although forecasting and forecast accuracy is important, many new firms do not employ fulltime forecasters. This result coincides with the study of Diamantopoulos and Winklhofer (1999), where they found that smaller firms allocate less resource

and employ more rudimentary forecasting methods.

This study applies the SEM model to understand the relationship between GM characteristics, forecast accuracy and decision quality. The results show that GM involvement affects forecast accuracy positively (hypothesis 1); which is consistent with Jain's 2007 study (Jain, 2007). Further, GM expertise affects forecast accuracy positively as posited (hypothesis 2). The result agrees with Gartner and Thomas's 1993 research which found that general managers with higher expertise generate more accurate forecasts. Moreover, regression analysis via SEM finds that GM overconfidence affects forecast accuracy negatively (hypothesis 3). This outcome coincided with Culter et al.'s 1989 study where they found that management overconfidence led to more mistakes being made (Culter et al., 1989). Lastly, the SEM analysis shows that the effect of forecast accuracy on decision quality is positively supported (hypothesis 4).

In the hypothesized model developed for this research, the researcher conjectures that GM involvement leads to positive forecaster work engagement. Aligning to Schaufeli et al.'s (2002) research, forecaster's work engagement is partitioned into three dimensions, which are Vigor, Dedication, and Absorption. The analysis shows that GM involvement is positively correlated to all three work engagement dimensions of the forecaster. Hypothesis 5, 6, and 7 corresponding to these dimensions are positively demonstrated. This result agrees with Eisenberger et al.'s organizational support theory where the researchers postulated that GM participation helps to improve forecaster's engagement (Eisenberger et al., 1986) in the demand forecast process which in turn helps to enhance demand forecasting accuracy. This study also examines the mediating effect of forecaster's work engagement on the relationship with GM involvement and demand forecast accuracy. The mediating effect analysis shows that GM involvement is correlated with forecaster's work engagement as the mediator. As posited by hypotheses 8, 9, and 10, the results show that the three dimensions of work engagement, consisting of vigor, dedication, absorption, mediate the effect of GM involvement on demand forecast accuracy.

This study also tests the moderation effect of organization culture on the relationship with GM involvement and forecast accuracy. In document 4, the author found that the organization culture moderation effect was responsible to explain conflicting research results in the literature that point to different effects between top management involvement and forecast accuracy. Based on the competing values framework developed by Cameron and Quinn (Cameron and Quinn, 1999), the

four organization culture types of Clan, Adhocracy, Hierarchy, and Market are categorized. The dimensions of these four cultures are tested against GM involvement using regression analysis to determine moderation interaction effect. The results show that clan culture positively moderated the relationship between GM involvement and forecast accuracy (hypothesis 11). In new firms with high clan culture, the GM is more inclined to support forecasting activities and forecasters are more likely to invest more effort into the process. The enhanced engagement leads to better forecasting accuracy. In contrast, the results show that adhocracy culture produce a negative interaction for GM involvement (hypothesis 12). Referencing the work of Cameron and Quinn (1999), in new firms with adhocracy culture, the GM is willing to take risks and tend to be overly optimistic which can lead to greater forecasting errors. Similarly, the results show that hierarchy culture produces a negative interaction for GM involvement (hypothesis 13). In new firms with hierarchy culture, bureaucratic administration would suppress open communications which would be detrimental to forecast accuracy. Lastly, the results indicate that market culture produce a positive interaction for GM involvement (hypothesis 14). Most new firms should fit the profile for market culture where the organization culture encourage open communications and the firm react quickly to the market it serves (Smith III et al., 1996). All of the stated hypotheses are supported as predicted, as summarized in Table 16.

Table 16: Supported Hypothesis

	<b>Supported Hypothesis</b>
H1	The more GM involvement, the more accurate of the demand forecast.
H2	The more GM expertise, the more accurate of the demand forecast.
H3	The more GM overconfidence, the less accurate of the demand forecast.
H4	The more accurate the demand forecast, the higher the decision quality.
H5	GM involvement is positively related to forecaster's vigor.
H6	GM involvement is positively related to forecaster's dedication.
H7	GM involvement is positively related to forecaster's absorption.
H8	Forecaster's vigor mediates the effect of GM involvement on demand forecast accuracy.
H9	Forecaster's dedication mediates the effect of GM involvement on demand forecast accuracy.
H10	Forecaster's absorption mediates the effect of GM involvement on demand forecast accuracy.
H11	Clan culture positively moderates the effect of GM involvement on demand forecast accuracy.
H12	Adhocracy culture negatively moderates the effect of GM involvement on demand forecast accuracy.
H13	Hierarchy culture negatively moderates the effect of GM involvement on demand forecast accuracy.
H14	Market culture positively moderates the effect of GM involvement on demand forecast accuracy.

## 5.2 Theoretical Contributions

This study focuses on new firms, analyzes the IT/telecommunication industry environment, investigates the effect of GM characteristics (i.e., GM involvement, GM expertise, GM overconfidence) on forecast accuracy, and analyzes the moderating effect of organizational culture and mediating effect of forecaster's work engagement. Moreover, this study analyzes the influence of accuracy forecast on decision quality. The present study contributes to the knowledge of demand forecasting accuracy in new firms by demonstrating the effects of GM characteristics (i.e., GM involvement, GM expertise and GM overconfidence) on demand forecasting accuracy, validating the impact of GM involvement on forecaster work engagement, and establishing moderation effect of culture on GM involvement. While this research is focused on GM's in China, it is the first study to consider the impact of GM characteristic on demand forecast accuracy in new firms.

## 5.3 Practical Contributions

GMs play a key role in the demand forecasting process in new firms as confirmed in this research. Based on this study, the findings suggest several managerial strategies and tactics that can improve forecast accuracy within new organizations. The managerial implications include:

### (1) GMs shall actively involve in the demand forecast process

The research conclusion shows that GM involvement improves demand forecast accuracy, which means GMs shall actively engage in the demand forecast process to maximize forecast results. In particular, GMs shall leverage his/her knowledge and information relating to demand forecasting. GMs have a broad range of responsibilities, including establishing vision, strategy decision making, developing organization structure, and managing production and operation (House & Aditya, 1997). These activities and engagements provide GMs with access to information highly valuable and inaccessible otherwise by the forecasters. Secondly, GMs shall not only focus on the forecast result, but also on the forecast process. As demand forecasting is a continuous process, GMs shall provide on-going support to the forecast process. Thirdly, GMs shall work to motivate forecasters to optimize accuracy. The study shows that GM involvement clearly increases work engagement of forecasters.

(2) GMs shall strengthen general knowledge

Demand forecast accuracy is very important for decision quality, which is critical to new firm's survival and growth. In the era of knowledge economy, it is very important for GMs to constantly update their knowledge through reinforcement learning, in order to lend their expertise to help improve demand forecast accuracy. As the present study shows, GM expertise is positively correlated to demand forecast accuracy. General knowledge relating to market, business models, competition, technology, forecasting techniques and methods, and forecasting process will help to enhance accurate forecast generation.

(3) GMs shall overcome overconfidence

Landier & Thesmar's (2009) research on French entrepreneurs found that more than half of the company founders and senior managers in new enterprises are overly optimistic of future business conditions. The study showed that while less than ten percent of the managers held concerns in year one, the proportion of concerned managers increased to 20% three years later. Further, the proportion of managers who still remain optimistic dropped to less than 40%. Overconfidence is a common psychological characteristics existing in enterprise management. Managers tend to be excessively certain of their ability, and underestimate the probability of failure. This overconfidence, coupled with incomplete information and inaccurate forecasts can lead to critical decision errors.

In China, traditional culture is often reflected in business organizations, with highly hierarchal structures where top management exercise near complete control. And in these enterprise organizations, the lack of transparency may lead to illusions that everything is under control. Based on the research result, it is apparent that Chinese GMs are overconfident in the new firms studied. The correlation analysis clearly shows that GM overconfidence is negatively related to forecast accuracy. GMs and managers shall be mindful of their overconfidence tendency, exercise caution and make decisions based on facts.

(4) New firms shall work to build clan culture or market culture

In competitive markets, where rapid new technology and new products introduction defines company success, enterprises tend to regard innovation as an important culture without regard to

finding an optimal balance that enables sustainable development of the enterprise. Enterprises shall establish a culture that foster mutual trust inside the organization, which can foster collaboration and drive important activities such as forecasting and planning.

With a clan culture, the working environment is friendly and open, where everyone is well aware of each other. Leaders behave as mentors, emphasizing and providing guidance to promote and develop subordinates. Employees openly communicate and cooperate with one another. The enterprise unites employees towards a common purpose based on loyalty and trust. Leadership is defined by their acute focus on customers and employees, and they encourage teamwork, participation and consultation. Within a clan environment, employees are compelled to improve their own performance in order to improve team efficiency. In addition, there will be more communication, solidarity and cooperation between employees. In particular, as it relates to forecasting, when the enterprise creates a relaxed and harmonious organizational environment for forecasters, demand forecast accuracy will be improved significantly.

With a Market culture, the organization is goal-oriented, with employees concern with market share and market leadership and achievement of measurable goals. As external objectives cannot be accomplished without effective internal cooperation, open communication and team work are prerequisites. In this enterprise environment, employees are motivated to out-perform and continuously improve the performance of their tasks. For forecasters within enterprises with market orientations, GM behaviour would drive employee engagement which would bring about more accurate demand forecasts.

##### (5) New firms shall implement a structured forecasting process

It is understood that forecasting driven decision making is crucial for new firms for all levels of planning, including sales and new product development decision. As summarized in this study, the sampled new firms have limited resources to dedicate to the forecasting activity, and lack trained personnel and sophisticated tools. Unlike mature firms that have access to historical, market, and external analyst studies, new firms often rely on management “gut-feel” for demand estimates. GMs shall move away from ad hoc based forecasting and adopt structured forecasting processes. The process will drive a culture of discipline towards method based forecasting and process driven decision making.



## **5.4 Limitations and Future Research**

### **5.4.1 Limitations**

This research study has several limitations due to the narrow scope and the locale of the study. Firstly, although the researcher tries to sample from a diverse participant base, this study is limited by convenience sampling only in China. As culture differ across geography and can impact the level of understanding and appreciation for specific activities (Casey, 2009), the results of this research may not be generalized to other countries outside of China. As such, the impact of GM's characteristic on the forecasting process would differ. Thus, it would be worthwhile to expand the study to cover additional countries to gain additional cultural perspectives.

Secondly, because new firms generally do not have full time forecasters, staffs in other disciplines such as marketing or sales may act as part-time forecasters. As consistency in expertise or training and discipline is not considered in the participant selection, there might be variability in the selected participant's capability and capacity to fill in the corresponding part of the questionnaires. Although it confirms to research protocol, it would be better if a consistent set of "forecasters" fill in the questionnaires from a functional role perspective.

Thirdly, the sample industry is limited to the ICT/IT industry. Because of the researcher's work experience, this study focuses on the IT/telecommunication industry and selects IT/telecommunication enterprises as survey objects in the empirical study. Whether the conclusion can be generalized to other industries requires further study.

### **5.4.2 Future Research**

The first of four recommendations for future research is to examine the relationship between GM characteristics and demand forecast accuracy in other industries, beyond the IT/telecommunication industry. The expanded scope will allow for a more generalized view of GM characteristics on demand forecast accuracy across multiple sectors.

Second, this study focuses on new firms and investigates the relationship between GM characteristics and demand forecast accuracy. However, in established or mature companies,

conditions and influence factors may be different. There may be other factors that influence demand forecast accuracy. Future research can examine those influences in mature companies.

Thirdly, this study does not explore the mediating effects and moderating effects between demand forecast accuracy and decision quality. Future research can further explore these relationships.

Fourthly, as this study does not differentiate between entrepreneur general managers and non-entrepreneur GMs, additional research is required to determine whether entrepreneur general managers are more susceptible to overconfidence biases in establishing forecasts.

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## Appendix I: Summary of Terms

**New firm:** New firm is defined as generally young and small firms (Das & He, 2006) with limited resources, highly innovative focus, and flexible organizational structure. In general, the age of new firms is less than or equal to 8 years.

**GM involvement:** GM involvement in demand forecasting means GM not only gives support, but also engages in the forecasting process. This includes that GM providing information about demand forecast to the forecaster, driving both process and result, and engaging with forecasters (Pierce & Newstrom, 2010).

**GM expertise:** GM expertise means the necessary skills and knowledge for his or her position relating to forecasting data, which include general knowledge, marketing knowledge, and industrial knowledge (Gartner & Thomas, 1993).

**GM overconfidence:** People are overconfident with their knowledge, skill and the accuracy of information concerning the market. Overconfidence bias of GMs refers to the tendency of leaders to overestimate the correctness of their initial estimates in answering moderate to difficult questions, which reveals the existence of this bias provide a measure of the degree to which people “do not know what they do not know” (Forbes, 2005).

**Demand forecasting accuracy:** Forecast accuracy is a measure of how close the actual outcome is compare to the forecast and how well the forecasting model fits to the data (Makridakis et al., 1998).

**Decision quality:** Decision quality is defined as the criterion for judging group output; based on issues of quality, quantity, and/or timeliness leveraging meaningful and reliable information. It is more perceptual than objective (Amason, 1996).

**Work engagement of forecaster:** Work engagement is defined as an attempt to cover the entire spectrum running from employee unwellbeing (burnout) to employee wellbeing (Maslach et al., 2001). Work engagement of forecaster refers to forecaster’s vigor, absorption, and dedication to their work.

**Organization culture:** Schein (1992, 1999) (cited in Ribiere, 2001, p.32) defined organizational culture as: “A pattern of shared basic assumptions that the group learned as it solved its problems of external adaptation and internal integration, that had worked well enough to be considered valid, and therefore, to be taught to new members as the correct way to perceive, think and feel in relation to those problem”.

## Appendix II: Survey Questionnaire

The following section is completed by company GM.

Dear Sir/Madam:

Thank you for taking time out of your busy schedule to fill in the following questionnaire. It will require just a few minutes. Please truthfully complete the questionnaire in accordance with your assessment of your organization. This is an academic research questionnaire, and we will guarantee that your personal information will be kept strictly confidential. Thank you very much for your help!

### Part One: Basic information of Your Enterprise

1. The age of your company is \_\_\_\_\_.

- ☐ 0-3 years
- ☐ 4-5 years
- ☐ 6-8 years

2. The size of your enterprise is \_\_\_\_\_ (Total Employees).

- ☐ Very small (Under 10)
- ☐ Small (10-24)
- ☐ Medium (25-49)
- ☐ Large (50-99)
- ☐ Very large (100+)

3. Demand forecasting in your enterprise is \_\_\_\_\_.

- ☐ Extremely important
- ☐ Somewhat important
- ☐ Neutral
- ☐ Somewhat Not important
- ☐ Completely Not important

4. Which departments are involved in demand forecast in your enterprise (Check All that Applies)?

- ☐ Planning department
- ☐ Supply Chain department
- ☐ Finance department
- ☐ Product Management department
- ☐ Sales department
- ☐ Other (Please specify \_\_\_\_\_)

5. The individual Responsible for Demand forecasting in your enterprise is \_\_\_\_\_?

- ☐ GM
- ☐ VGM
- ☐ Planning Director
- ☐ Supply Chain Director
- ☐ Finance Director
- ☐ Product Director
- ☐ Sales Director
- ☐ Other (Please specify \_\_\_\_\_)

6. Demand forecast data are used to \_\_\_\_\_ in your enterprise (Check all that applies).

- ☐ Develop next year's plan/next five years plan
- ☐ Develop new products
- ☐ Set factory location/capacity
- ☐ Determine Procurement Plan
- ☐ Set Sales Targets
- ☐ Other (Please specify \_\_\_\_\_)

7. In your enterprise, what best describe the forecasting function/resources?

- ☐ No fulltime forecasters
- ☐ Fulltime forecasters, but forecasters do not have formal training
- ☐ Fulltime forecasters, and forecasters have basic training
- ☐ Fulltime forecasters, and forecasters are fully trained

8. Forecasting cycle is conducted \_\_\_\_\_ in your enterprise.

- ☐ Weekly
- ☐ Monthly
- ☐ Quarterly
- ☐ Semi-annually
- ☐ Annually
- ☐ Once in More than a year

9. After making demand forecasts, how often does your enterprise adjust the demand forecast?

- ☐ Weekly
- ☐ Monthly
- ☐ Quarterly
- ☐ Semi-annually
- ☐ Annually
- ☐ More than a year

## Part two: The external environments of your enterprise

### 10. Technology and Market Change, Competitive Intensity and Supply Chain Flexibility

Please use the following rating scale for your response:

5-Strongly Agree      4-Agree      3- Neither Agree nor Disagree      2-Disagree      1-Strongly Disagree

	<b>External influence factors on demand forecasts</b>	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
TC1	The technology in your industry is changing rapidly	5	4	3	2	1
TC2	A large number of new product ideas have been made possible through technological breakthrough in your industry	5	4	3	2	1
DV1	In your industry, customer's product preferences change substantially over time	5	4	3	2	1
DV2	Customer tend to look for new product all the time	5	4	3	2	1
CI1	Competition in your industry is cut-throat	5	4	3	2	1
CI2	"Price wars" and other promotion tactics are frequent in your industry	5	4	3	2	1
SCF1	We can deliver multiple kinds of products /materials in response to operation requirements	5	4	3	2	1
SCF2	Our logistics system can deliver the variety of shipments on time	5	4	3	2	1
SCF3	Our logistics system is effective for all shipments	5	4	3	2	1
SCF4	We can quickly move materials to required production location	5	4	3	2	1

### Part three: GM Characteristic

#### 11. GM involvement

Please use the following rating scale for your response:

5-Strongly Agree      4-Agree      3- Neither Agree nor Disagree      2-Disagree      1-Strongly Disagree

GM involvement	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
GM provide needed information for demand forecast to the forecaster	5	4	3	2	1
GM not only focus on result, but also focus on process	5	4	3	2	1
GM actively contact with forecaster	5	4	3	2	1

#### 12. GM expertise

(1) Please rate your degree of general expertise and knowledge:

- ☐ Leading expert/extensive general knowledge
- ☐ Expert/above average general knowledge
- ☐ Amateur/average general knowledge
- ☐ Novice/average general knowledge

(2) The number of years of your experience in marketing is \_\_\_\_\_.

(3) The number of years of your experience in the industry is \_\_\_\_\_.

#### 13. GM overconfidence

Please read through the following ten questions and select your answer, then think about how confident you feel about your answer. Indicate the degree of confidence of your answers based on a scale of 0-10. Rating of 0 refers to totally no confidence (My answer is probably only 50% correct and you are just guessing) and 10 refers to totally confident (You are 100% confident the answer is correct).

(1) Distance from Shanghai to Chicago is between 10000 and 15000 km.

[yes]    [no]    Degree of confidence (0-10)\_\_\_\_\_

(2) Beethoven was born in 1760-1789.

[yes]    [no]    Degree of confidence (0-10)\_\_\_\_\_

(3) Yale University was founded in 1700-1750s.

[yes]    [no]    Degree of confidence (0-10)\_\_\_\_\_

- (4) Between 0-50 Nobel Prize winners are/have had teach or study at the University of Chicago as professors or students.  
[yes] [no] Degree of confidence (0-10)\_\_\_\_\_
- (5) Total sales of various types of China Welfare Lottery are between 10 to 15 billion in 2002.  
[yes] [no] Degree of confidence (0-10)\_\_\_\_\_
- (6) The number of students in junior high school in China is between 55 to 63 million in 2002.  
[yes] [no] Degree of confidence (0-10)\_\_\_\_\_
- (7) The number of mobile phone users in China is between 200 to 250 million before 2002.  
[yes] [no] Degree of confidence (0-10)\_\_\_\_\_
- (8) Total retail sales revenue in China is between 2.5 trillion yuan to 2.8 trillion yuan in 2002.  
[yes] [no] Degree of confidence (0-10)\_\_\_\_\_
- (9) Shanghai and Shenzhen Stock Exchange combined raised total of 92 billion yuan to 96 billion yuan by issuing stocks and share rights in 2002.  
[yes] [no] Degree of confidence (0-10)\_\_\_\_\_
- (10) On average, between 0-5 people are killed by lethal shark in United States each year.  
[yes] [no] Degree of confidence (0-10)\_\_\_\_\_

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*Confidence index =  $0.5 \times \text{Average Confidence} + 5$  = \_\_\_\_\_*



#### Part four: Demand Forecast Accuracy

14. Please apply the following equation to estimate forecast accuracy in your enterprise:

$$\text{Demand forecast error} = (\text{Actual Sales} - \text{Forecast Sales}) / \text{Actual Sales} \times 100\%$$

In your enterprise, the absolute Demand forecast error is:

- ☐ 0-25%
- ☐ 26-50%
- ☐ >50%

#### Part five: Decision quality

15. Decision quality

Please use the following rating scale for your response:

5-Strongly Agree      4-Agree      3- Neither Agree nor Disagree      2-Disagree      1-Strongly Disagree

Decision quality	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
The effect of the decision has had on the company is good	5	4	3	2	1
Relative to what we expected, the results of the decision have been good	5	4	3	2	1
Overall, the group members feel that the decision was good	5	4	3	2	1

#### Part Six: Organizational Culture

16. Organizational Culture

Please use the following rating scale for your response:

5-Strongly Agree      4-Agree      3- Neither Agree nor Disagree      2-Disagree      1-Strongly Disagree

1. Dominant Characteristics		Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
CU1A	My organization is a very personal place. It is like an extended family. People seem to share a lot about themselves.	5	4	3	2	1
CU2A	My organization is a very dynamic and entrepreneurial place. People are willing to stick	5	4	3	2	1

	their necks out and take risks.					
CU3A	My organization is very results oriented. A major concern is with getting the job done. People are very competitive and achievement oriented.	5	4	3	2	1
CU4A	My organization is a very controlled and structured place. Formal procedures generally govern what people do.	5	4	3	2	1
<b>2. Organizational Leadership</b>		Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
CU1B	The leadership in my organization is generally considered to exemplify mentoring, facilitation or nurturing.	5	4	3	2	1
CU2B	The leadership in my organization is generally considered to exemplify entrepreneurship, innovating, or risk taking.	5	4	3	2	1
CU3B	The leadership in my organization is generally considered to exemplify a no-nonsense, aggressive, results-oriented focus.	5	4	3	2	1
CU4B	The leadership in my organization is generally considered to exemplify coordinating, organizing or smooth-running efficiency.	5	4	3	2	1
<b>3. Management of Employees</b>		Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
CU1C	The management style in my organization is characterized by teamwork, consensus, and participation.	5	4	3	2	1
CU2C	The management style in my organization is characterized by individual risk-taking, innovation, freedom, and uniqueness.	5	4	3	2	1
CU3C	The management style in my organization is characterized by hard-driving competitiveness high demands, and achievement.	5	4	3	2	1
CU4C	The management style in my organization is characterized by security of employment, conformity, predictability, and stability in relationships.	5	4	3	2	1
<b>4. Organization Glue</b>		Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
CU1D	The glue that holds my organization together is loyalty and mutual trust. Commitment to this organization runs high.	5	4	3	2	1
CU2D	The glue that holds my organization together is commitment to innovation and development. There is an emphasis on being at the cutting	5	4	3	2	1

	edge.					
CU3D	The glue that holds my organization together is the emphasis on achievement and goal accomplishment. Aggressive and winning are common themes.	5	4	3	2	1
CU4D	The glue that holds my organization together is formal rules and policies. Maintaining a smooth-running organization is important.	5	4	3	2	1
<b>5. Strategic Emphasis</b>		Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
CU1E	My organization emphasizes employee development. High trust, openness, and participation persist.	5	4	3	2	1
CU2E	My organization emphasizes acquiring new resources and creating new challenges. Trying new things and prospecting for opportunities are valued.	5	4	3	2	1
CU3E	My organization emphasizes competitive actions and achievement. Hitting stretch targets and winning in the marketplace are dominant.	5	4	3	2	1
CU4E	My organization emphasizes permanence and stability. Efficiency, control and smooth operations are important.	5	4	3	2	1
<b>6. Criteria of Success</b>		Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
CU1F	My organization defines success on the basis of the development of human resources, teamwork, employee commitment, and concern of people.	5	4	3	2	1
CU2F	My organization defines success on the basis of having the most unique or newest products. It is a product leader and innovator.	5	4	3	2	1
CU3F	My organization defines success on the basis of winning in the marketplace and outpacing the competing. Competitive market leadership is key.	5	4	3	2	1
CU4F	My organization defines success on the basis of efficiency. Dependable delivery, smooth scheduling, and low-cost production are critical.	5	4	3	2	1

**The following section is completed by company forecaster.**

Dear Sir/Madam:

Thank you for taking time out of your busy schedule to fill in the following questionnaire. It will require just a few minutes. Please truthfully complete the questionnaire in accordance with your assessment of your organization. This is an academic research questionnaire, and we will guarantee that your personal information will be kept strictly confidential. Thank you very much for your help!

**Work Engagement**

Please use the following rating scale for your response:

5-Strongly Agree      4-Agree      3- Neither Agree nor Disagree      2-Disagree      1-Strongly Disagree

Vigor		1	2	3	4	5
VI1	When I get up in the morning, I feel like going to work.					
VI2	At my work, I feel bursting with energy.					
VI3	At my work I always persevere, even when thing do not go well.					
VI4	I can continue working for very long periods at a time.					
VI5	At my job, I am very resilient, mentally.					
VI6	At my job I fell strong and vigorous.					
Dedication		1	2	3	4	5
DE1	To me, my job is challenging.					
DE2	My job inspires me.					
DE3	I am enthusiastic about my job.					
DE4	I am proud on the work that I do.					
DE5	I find the work that I do full of meaning and purpose.					
Absorption		1	2	3	4	5
AB1	When I am working, I forget everything else around me.					
AB2	Time flies when I am working.					
AB3	I get carried away when I am working.					
AB4	It is difficult to detach myself from my job.					
AB5	I am immersed in my work.					
AB6	I feel happy when I am working intensely.					