Enterprise Resource Planning Systems in Family Firms

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ENTERPRISE RESOURCE PLANNING SYSTEMS IN FAMILY FIRMS
by
James N. Smith

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DEDICATION

Soli Deo Gloria
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ABSTRACT

ENTERPRISE RESOURCE PLANNING SYSTEMS IN FAMILY FIRMS

By

James N. Smith

For organizations that have them, an enterprise resource planning (ERP) system is an organization’s most wide-reaching information system, sitting at the heart of its accounting and operational structure. Thus, successful implementation of an ERP is critical to an organization’s success. Organizations have long struggled with achieving successful implementations of large-scale information systems, and family influenced firms are no exception. In light of unique considerations for family influenced firms as compared with non-family influenced firms, this research examines the relation between the influence of family ownership in family business and success in implementing an ERP system. This research presents a quantitative research study to understand the nature and needs of family influenced businesses by comparing the ERP implementation success of family influenced businesses across the range of family business ownership and control levels. Results from surveying 138 firms indicate organizational fit between a firm’s data processes and users to the standardized ERP system provide a real increase in implementation success as measured in cost, time, performance, and system benefits. Further, that larger firms experience greater levels of organizational fit to the ERP.
Finally, firms with strong family influence on their culture have lower levels of ERP success.
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CHAPTER 1 INTRODUCTION

An enterprise resource planning (ERP) system is an organization’s most wide-reaching information system, sitting at the heart of the accounting and operational structure of firms which choose to implement them (Saraf, Liang, Xue, & Hu, 2013; Shaul & Tauber, 2013). Thus, for the companies that elect to use an ERP, successful implementation of an ERP is critical to their success. Organizations have long struggled with achieving successful implementations of large-scale standardized systems, and family influenced firms are no exception (Ellington, Jones, & Deane, 1996).

In the 1990’s and 2000’s, the subject of ERP success increasingly became a critical topic of research and debate for both the practitioner and academic communities (Soh & Sia, 2004). This is, in part, due to an increased awareness of ERP implementation failures within the business community and the severe effects that implementation failure may have on businesses and their counterparts (Finney & Corbett, 2007). High profile corporate ERP implementation failures such as Hershey, where a 1996 ERP failure caused the loss of $100 million in sales and an 80% decline in stock price, helped to make ERP systems generally well known, but not in a positive sense (Gross, 2013).

While the growing standardization of business processes through ERP adoption may be a net benefit to businesses, it may not be as much of a benefit to companies that vary from standard business practices or work in niche industries
Of particular interest are those companies that are owned and influenced by family ownership. Family influenced businesses are most broadly defined as a business in which there is “some family participation in the business and that the family have control over the businesses’ strategic direction” (J. H. Astrachan & Shanker, 2003, pp. 211–212). Using this broadest definition of family influence, it is clear that the impact of family influenced businesses on the U.S. economy is vast. For example, using the broadest definition, J. H. Astrachan and Shanker (2003) concluded that family influenced businesses represented 89% of business tax returns, 62% of U.S. employment and 64% of gross domestic product (GDP) at $5.9 trillion. Market size alone justifies an exploration into the nature of family influenced businesses in the hope of identifying common traits that might influence the implementation of ERP solutions.

These family influenced companies, to varying degrees, have goals, management structures, and flows of trust and power that do not fully mirror their non-family counterparts (Chrisman, Chua, Pearson, & Barnett, 2012; Verbeke & Kano, 2012). This is caused by the embedded cultural structure of family influence within a firm (Chrisman et al., 2012; Verbeke & Kano, 2012). These differences may exacerbate misalignment with standardized ERP systems and may increase the difficulty of their successful implementation (Jones, Cline, & Ryan, 2006; McLaren, Head, Yuan, & Chan, 2011; Soh, Kien, & Tay-Yap, 2000; Soh & Sia, 2004; Song & van der Aalst, 2008). However, certain aspects of the management of family influenced firms, such as strong organizational control, informality and flexibility may aid in overcoming these difficulties and perhaps ease the adoption process (J. H. Astrachan, 2003; Ellington et al.,
Thus, in order to help increase the likelihood for successful implementation of an ERP system, it is important to better understand the influences these differences may have and what accounts for positive influences.

Therefore, the following research question was explored.

**Research Question:**

*How do the traits of family businesses affect their ability to successfully implement ERP Systems?*

The purpose of this study was to survey managers at firms with various levels of family influence that have implemented ERP systems in order to examine the relationship between the family ownership influence of businesses and the alignment challenges of implementing ERP systems into their organizations, controlling for firm size, and revenue.

This research contributes to the literature in three important ways. First, it provides a bridge between the information systems research community and the family business research community. There is currently a lack of literature on the effects of family influence on the traditional information systems research paradigms of success, fit, and acceptance.

Second, this research helps broaden the concept of organizational fit in the ERP critical success factor research stream. The work of Hong and Kim (2002) in ERP organizational fit and the organizational-enterprise system fit (Org-ES Fit) model developed by Weber (1997) provide both an empirical and theoretical base for this
research stream. However, there is much room left to explore these concepts in various environmental contexts.

Finally, this research provides insight into a possible cause of implementation uncertainty for the practitioner community. Panorama Consulting, in their annual report on ERP trends, found that in 2013 54% of ERP implementations overran budget, 72% overran duration, 66% produced less than half of expected benefits and 16% are judged to be failures (Panorama Consulting Solutions, 2014). The practical implications of understanding the various underlying causes of ERP implementation failure are compelling.

This paper is organized in the following manner. In Chapter 2, a literature review is provided that explores the background of ERP critical success factor research and provides a background into the existing stream of family businesses research. Additionally, the literature review provides a theoretical framing which combines the streams of literature, conceptualizes the hypotheses of this study and introduces the theoretical model of the study. Chapter 3 explores relevant extant constructs that were adopted for this study and discusses the analytical approaches employed. Chapter 4 reports the results of the quantitative analysis conducted. Lastly, Chapter 5 discusses the implications of the findings and explores possibilities for future research.
CHAPTER 2 LITERATURE REVIEW

This chapter provides a review of the existing literature that supports this research agenda. This review is detailed in three main sections. The first section looks at the research into ERP systems implementation success with a focus on cultural fit as a critical success factor. The second section looks at the research into the nature of family firms and how they exhibit common organizational attributes that differ from non-family firms. The third section explores commonalities between fields of ERP research and family business research resulting in a theoretical framework for this research. The third section also introduces the conceptual model and hypotheses of this research.

ERP Research

Enterprise resource planning (ERP) systems were developed in the 1990’s as an evolutionary step from legacy accounting and manufacturing systems (Grabski, Leech, & Schmidt, 2011). ERP systems brought together the entire business cycle of a (e.g. company sales, manufacturing, distribution, operations, purchasing, human resources, cost and financial accounting) under the umbrella of a true enterprise wide information system (Chang, Cheung, Cheng, & Yeung, 2008; Esteves & Pastor, 2001; Nah, Lee-Shang Lau, & Kuang, 2001; Robey, Ross, & Boudreau, 2002; Song & van der Aalst, 2008). The key evolutionary trait that separated ERP systems from earlier information systems was the integrated nature of the modules, often using a unified data store and
enabling cross-functional use of information throughout the enterprise (Nah et al., 2001; Robey et al., 2002).

The advantages of ERP systems include the ability to run the order to cash cycle more efficiently by using an integrated view of the business process. This integrated view allows organizations to implement management innovations, such as just in time manufacturing and procurement, and to manage the finances and overall business cycles of the firm more efficiently (Grabski et al., 2011; Nah et al., 2001; Robey et al., 2002). These advantages are made available to both large and medium sized firms through the work of software companies to standardize, package and scale these products to a variety of industries and firm sizes (Nah et al., 2001; Snider, da Silveira, & Balakrishnan, 2009).

Davenport went so far as to state that “the business world’s embrace of enterprise systems may in fact be the most important development in the corporate use of information technology in the 1990’s” (Davenport, 1998, p. 122).

In contrast with these noted advantages, the disadvantages of the use of ERP systems are substantial. There is a greater need for information systems training among employees (Sein, Bostrom, & Olfman, 1999). There is a greater need for cross-functional and accounting process knowledge among employees (Kang & Santhanam, 2003; Saraf et al., 2013). Implementation of an ERP system creates a level of rigidity to processes and reduces employee flexibility (Park & Kusiak, 2005; Wagner et al., 2010). From a firm prospective, these systems are challenging in their complexity to implement technologically and assimilate from a business process standpoint (Jones et al., 2006).

To examine these various advantages and disadvantages, the academic community has segmented the subject of ERP research into several research streams
illustrated in Figure 1 (Grabski et al., 2011). The concept of critical success factors was refined by Rockart in 1979 as a paradigm to help management focus on the critical contingencies of complex systems (Grabski et al., 2011; Rockart, 1979).

The original concept of critical success factors was imported into the study of ERP systems resulting in the stream of research known as ERP critical success factor research (Grabski et al., 2011). It has been defined as those limited number of aspects of the ERP process where successful outcomes will create competitive advantage for the organization (Akkermans & Van Helden, 2002; Grabski et al., 2011; Song & van der Aalst, 2008; Stratman & Roth, 2002). Within the ERP critical success factor stream, indicated as ERP CSF in Figure 1, are a variety of research topics including, implementation, acceptance,
and adaptation to organizational variations. As the research matured there was a focus on whether an organization’s contexts, such as country, culture and industry, affect ERP implementation success (Grabski et al., 2011). CSFs have been shown to be context sensitive and may vary across domains, such as small to medium enterprise (SME) implementation, allowing for the possibility that family influenced firms may present a previously unexplored context for ERP CSFs (Remus & Wiener, 2010; Snider et al., 2009).

Success in the information systems literature is measured along several dimensions including technical, semantic, and effectiveness metrics (DeLone & McLean, 1992). Success, in terms of enterprise systems, is primarily a function of business outcomes not technological accomplishments (Soh & Markus, 1995). Markus and Tanis (2000) identified a set of three success metrics for enterprise systems. The first being, project metrics consisting of the schedule, budget and functional performance of an implementation project against goals. The second being, early operational metrics which measure the effect of the enterprise systems after implementation but before it is fully assimilated. The third being, longer-term business results, which demonstrate whether the system provides value to the firm over the long term (M. Lynne Markus & Tanis, 2000). From a business perspective, Pereira (1999) explored how a highly successful enterprise system might meet the thresholds of providing strategic competitive advantage. Those thresholds are, value, scarcity, durability, difficulty in replication, and lacking of substitution (Pereira, 1999).

The stream of research that leads to the consideration of organizational fit with an ERP system began in the late 1990’s as ERP system implementations were beginning in
earnest in Asia. The seminal works in the field by Soh, Kien and Tay-Yap (2000) and Davison (2002) dealt with the emerging issue of cultural fit as ERP systems, which were designed in Western Europe and the United States, were implemented into Asian cultures, often with unforeseen complications (Soh et al., 2000). Soh et al. (2000, p. 47) defined misfit as “gaps between the functionality offered by the package and that required by the organization” that require organizations to accept the misfit, adapt processes, or customize the system.

Throughout the 2000’s this idea of cultural misfit was broadened to the concept of fit between organizational culture and the ERP artifact and the effects of misalignment between the two (Jones et al., 2006; Ke & Wei, 2008; McLaren et al., 2011; Wagner et al., 2010). Hong and Kim (2002) identified organizational fit as a critical success factor of ERP implementation and adapting Markus and Robey’s (1983) definition of CSFs they began to empirically examine alignment between the ERP artifact and the structure of the organization that the ERP is being instantiated within (Hong & Kim, 2002). Their research model defined three constructs 1) organizational fit of ERP, 2) contingency variables, and 3) ERP implementation success. They hypothesized a positive relationship between organizational fit and the success of ERP implementation (Hong & Kim, 2002). Their subsequent empirical study developed and validated an instrument that measures the organizational fit of an ERP system. Soh and Sia (2004) expanded their original cultural misfit concept into a broader examination of structural misfits between ERP systems and organizations. Further literature has asserted two important conclusions from this stream of work. First, that the IT artifact within a system cannot be culturally neutral (Koch, Leidner, & Gonzalez, 2013). Second, cultural alignment to the IT artifact
is beneficial to an organization (Ke & Wei, 2008; Rivard, Lapointe, & Kappos, 2011; Strong & Volkoff, 2010).

Strong and Volkoff (2010), drawing on the previous decade of work in organizational fit and the work of Weber (1997), developed a theoretical conceptualization of organizational–enterprise system fit (Org-ES Fit). This work begins by theorizing the enterprise system artifact independent of the generalized IT artifact. It creates a model by which to compare and contrast the structures of an organization and the latent structures within the enterprise system artifact in the numerous domains including usability, roles, and culture (Strong & Volkoff, 2010).

Hong and Kim (2002) proposed and tested a research model, shown in Figure 2, wherein organizational fit of an ERP system influences implementation success. Organizational fit includes the dimensions of data fit, process fit, and user fit. Hong and Kim (2002) also conceptualized certain institutional influences that might act as potential moderators, referred to as contingency variables, including organizational resistance, the level of adaptation of the ERP system, and the level of adaptation of the organization’s processes.
Figure 2: ERP Implementation Success Model

Their study of 34 Korean firms, including 25 manufacturing firms and 9 of other types with annual revenues ranging from less than $10 million to more than $1 billion dollars, found a meaningful and significant relationship between organizational fit of an ERP and implementation success of an ERP. Interestingly, their post hoc findings support an alternate theory that, while process adaptation level and ERP adaptation do function as moderators, organizational resistance may act as a direct effect on implementation success.

Family Influenced Businesses

The study of family businesses finds its roots as a discrete field of academic study in the early 1980’s (J. H. Astrachan, 2003; Sharma, Chrisman, & Gersick, 2012). During the intervening years the research has broadly coalesced into three streams which find their influence on this work in the following manner. First is the issue of identity: what is
a family business? Second is the issue of objectives: what is important to know about family businesses? The third issue is how to measure the level of family influence. This section examines these three topics.

Family Business Identity

On the surface the question of what is a family business seems simple enough where the answer is that the firm is owned by a family. However, if that is the sole definition of a family business then it is right to question whether or not family businesses are worth studying apart from other businesses (Chrisman, Chua, & Sharma, 2003). The question of whether there is more to a family business, a uniqueness if you will, was well put by Chua, Chrisman and Sharma (1999) as follows: “what makes a family business unique is that the pattern of ownership, governance, management, and succession materially influences the firm’s goals, strategies, structure, and the manner in which each is formulated, designed, and implemented” (Chua et al., 1999, p. 22).

How to theoretically conceptualize this uniqueness has been the subject of further research and is primarily explored using two models: one based on agency theory and another based on the resource based view of the firm. The agency theory based view of the family business is based on the theory of the firm formulated by Jensen and Meckling (1976) and focuses on issues such as differences in agency costs between family firms and non-family firms, and differences in the way altruism and entrenchment are manifested while accounting for non-economic benefits (Chrisman et al., 2003). The resource based view of the family firm is based on the work of Wernerfelt (1984) and focuses on those traits of family businesses that are expressed due to their family nature and which are hard for non-family firms to imitate (Chrisman et al., 2003).
A commonly used working definition developed by Chrisman et al. (2003) conceptualized the family firm using four characteristics. The first characteristic is the intention of the family to maintain control. The second characteristic is the existence of resources and capabilities that are synergistically created by the family’s relations. The third characteristic is the existence of a vision, or set of goals, that is created by the family and which transcends generations. Finally, the fourth characteristic is the active striving towards those goals.

Family Business Objectives

There have been two dominant themes of research into the objectives of family businesses. The first of these is firm performance. A great deal of family business literature seeks to determine whether family businesses have better financial performance outcomes than non-family businesses (Yu, Lumpkin, Sorenson, & Brigham, 2012). Much of this comes from a strategic management perspective by family business researchers (Chrisman et al., 2003; Sharma, Chrisman, & Chua, 1997) and “financial performance is one of the defining outcome variables in strategic management” (Yu et al., 2012, p. 34). The second major theme is generational succession (J. H. Astrachan, 2003). This study breaks rank with these two themes and focuses on the operational and cultural differences that family businesses exhibit for the purpose of aligning the ERP artifact more closely with family businesses.

Family Business Measurement

The measurement of a family’s effect on a business presents three challenges. The first challenge is that there is no consistent definition of a family business (J. H. Astrachan, Klein, & Smyrnios, 2002). The second challenge is that there has been no
consistent measurement scale for the effect of a family’s influence on a firm. For example, Chua, Chrisman and Sharma (1999) called for an operationalized scale that could be used for replicable research. The third challenge is that the scales that were used historically were categorical in nature and restricted the nature of analysis that could be performed (Holt, Rutherford, & Kuratko, 2010).

Throughout a great deal of family business research, family ownership has been operationalized through the use of a dichotomous question asking whether the firm is family owned (Björnberg & Nicholson, 2007). The use of such a simple variable limits the ability of researchers to consider degrees of family influence as a determinate in quantitative research. Björnberg & Nicholson (2007), in the development of the family climate scales, provide an overview of the common instruments used to measure family ownership and influence over the years. Their overview is summarized in Table 1 below.

The table shows a diversity of instruments in terms of fields of study from which they derive their form, focus, and usability. Instruments that are specifically designed for family business use, focusing on both the family and the business, metric in their nature, validated, and accepted by the family business research community are needed for this research.
<table>
<thead>
<tr>
<th>Instrument Name</th>
<th>Source</th>
<th>Primary Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family v. Non-family</td>
<td>(Beckhard &amp; Dyer, 1983; Bernard, 1975)</td>
<td>Has been widely used across many research disciplines. Dichotomous, Categorical</td>
</tr>
<tr>
<td>F-PEC</td>
<td>(J. H. Astrachan et al., 2002)</td>
<td>Family business research. Metric, validated and well-regarded</td>
</tr>
<tr>
<td>Family APGAR</td>
<td>(Smilkstein, 1978)</td>
<td>Family Mental Health</td>
</tr>
<tr>
<td>Aspen Family Business Inventory</td>
<td>(Jaffe &amp; Paul, 2005)</td>
<td>Family Business Consulting</td>
</tr>
<tr>
<td>Personal Authority in Family Systems Questionnaire</td>
<td>(Bray, Williamson, &amp; Malone, 1984)</td>
<td>Clinical Psychology</td>
</tr>
<tr>
<td>Inventory of Family Feelings</td>
<td>(Lowman, 1987)</td>
<td>Family Therapy</td>
</tr>
</tbody>
</table>

Table 1: Overview of Family Measurement Methods

Theoretical Framing

The following section introduces the conceptual model, shown in Figure 3. The conceptual model serves to provide a cohesive visualization of the theoretical framing of this study which will be detailed further. The conceptual model depicts that within family firms, family influence may present a form of institutional influence that affects a firm’s organizational fit to an ERP system and, thus, its overall ERP implementation.
success. The theoretical supports for these influences are outlined in the hypotheses below.

Figure 3: Conceptual Model

In blending the extant theories related to ERP implementation success with the literature of family businesses, one focus becomes the emic causes of non-standard processes. Daily and Dollinger (1993), Riordan and Riordan (1993) and Verbeke and Kano (2012) identify the lack of a principal-agent problem as a source of the variance of family-managed firms’ business practices from best practices. The basic idea is that modern internal control systems exist to protect absentee owners’ interests where there is a hired agent who manages the firm. When that perceived risk is attenuated, the perceived need for rigorous controls decreases.

Gudmundson, Tower, and Hartman (2003), in their study of 89 firms from a Midwestern US state with between 25 and 250 employees, identify and describe a
uniqueness to family businesses. They go on to draw conclusions about how this uniqueness affects innovation within family businesses in ways that vary from non-family owned businesses. They find that family owned businesses vary from non-family owned businesses in material aspects including a lowered acceptance of risk, and a decreased willingness to empower employees to innovate.

Chrisman et al. (2012) developed a model to examine family involvement, family essence, and family-centered non-economic goals. Family involvement is identified by attributes of family ownership, family management, and the number of generations of the family within the business. Family essence involves factors such as trans-generational family goals and family commitment that affect the family management’s behavior. The family-centered, non-economic goals are goals such as family harmony, family social status and family identity linkage that provide value to the ownership, yet are not recognized in standard business metrics.

As a result, these non-standard processes may manifest as a process misalignment with the ERP artifact. Alignment between a firm’s processes and the processes embedded within the ERP system via configuration and customization, at both strategic and tactical levels, has been shown to be a critical component to ERP implantation success (Al-Mudimigh, Zairi, & Al-Mashari, 2001; McLaren et al., 2011; Seddon, Calvert, & Yang, 2010; Song & van der Aalst, 2008). In addition, cultural alignment with an enterprise system is positive (Rivard et al., 2011; Strong & Volkoff, 2010) and the IT artifact of an enterprise system is not culturally neutral (Koch et al., 2013). It stands to reason that there may be challenges for family influenced firms in their efforts to successfully implement ERP systems due to their cultural and process idiosyncrasies.
Given the established literature regarding the relationship between organizational culture and ERP fit, a linkage between family influence and ERP fit can logically be established. Therefore, this study proposes the following hypothesis:

**H1:** *Family ownership influence will have a negative effect upon ERP fit.*

Daily and Dollinger (1993) and Verbeke and Kano (2012) indicate that as a family-managed organization’s size increases, the internal control systems of the organization become more rigorous and standardized. Verbeke and Kano (2012) attribute this to a bifurcation bias, wherein the family management and the non-family management become differentiated due to an asymmetric human resource treatment. As the firm grows and non-family management becomes larger, less committed to family goals and more agent like, stronger internal controls are required (Verbeke & Kano, 2012). This research seems to indicate that any negative effect of family ownership or family management on ERP implementation success will be most observable in the small to medium sized enterprise (SME) environment (Daily & Dollinger, 1993; Verbeke & Kano, 2012). The more standardized controls of these larger firms should provide an easier functional fit between business processes and the ERP artifact (Al-Mudimigh et al., 2001; Seddon et al., 2010; Strong & Volkoff, 2010).

One work of note is Kotey and Folker (2007). Their study of 448 family influenced and 470 non-family influenced small to medium enterprises from Australia compared the effects of firm size and family ownership on employee training. Their results supported the hypothesis that there is a difference in the training habits of medium sized family owned and non-family owned firms. They concluded that medium sized family influenced firms have less structured training practices than similar sized non-
family firms and that larger family influenced firms adopt a more structured training methodology that is more akin to large non-family firms. Their methodology of studying the interaction of firm size and family ownership will serve as a model for this study.

If larger family influenced firms display attributes that are more structured, agent-like and accepting of strong internal controls, then they may exhibit business processes that are more in line with the ERP artifact. As was established in H1: alignment between a firm’s processes and the processes embedded within the ERP system via configuration and customization, at both strategic and tactical levels, has been shown to be a critical component to ERP implantation success (Al-Mudimigh et al., 2001; McLaren et al., 2011; Seddon et al., 2010; Song & van der Aalst, 2008). It stands to reason that larger family influenced firms may have less challenge in achieving process fit with the ERP artifact.

Using the established literature regarding the more standardized practices of larger family influenced firms and the established literature regarding the importance of functional fit between business processes and the ERP artifact, a linkage between firm size and the effect of family influence on ERP fit can logically be established. Therefore, this study proposes the following hypothesis:

**H2:** *As firm size increases, the negative effect of family influence on ERP fit will be reduced.*

Ellington et al. (1996) examined the challenges related to the adoption of standardized management systems within family influenced firms by examining the success of family influenced firms to adopt total quality management (TQM) practices. Their study included 192 family influenced and 159 non-family influenced firms. All of
the firms were manufacturing firms from the US State of Georgia. They found that while family owned firms suffer from a status quo attitude and short term focus they benefit from centralized management, informality, and flexibility that might enhance their ability to adopt wholesale systemic change such as a TQM or ERP system.

Beyond business control process issues, there is a great deal of literature looking at the way family values, culture, and goals affect the performance of firms. Haugh and McKee (2003) define family values as a “shorthand for a range of qualities in the family firm” (p. 145). They go on to note that “it would appear that there is some common ground in the findings relating to the cultural dimensions of the family firm. Themes of loyalty, trust, communication, commitment, independence and survival have emerged” (pp. 145-146).

Strong leadership has been identified repeatedly as a CSF to ERP implementation success (Akkermans & Van Helden, 2002; Ke & Wei, 2008; Wagner et al., 2010). In addition, the ability for an organization to overcome organizational inertia is a factor leading to organizational benefits, thus success, from ERP systems (Seddon et al., 2010).

Hong and Kim (2002) proposed that organizational resistance would negatively moderate the relationship between ERP fit and ERP implementation success. Post hoc analysis showed that organizational resistance was not a moderator but rather had a significant direct effect on ERP implementation success. This finding may also be affected to the extent that strong family influence may override organizational resistance. Furthermore, to the extent that family influence might provide certain social enablers to an organization, the influence might have a positive effect on ERP implementation (Haugh & McKee, 2003; Sarker & Lee, 2003).
Using the established literature regarding family effects on leadership strength and the effect of leadership on ERP success, a linkage between family influence and the effect of organizational resistance on ERP implementation success can logically be established. Therefore, this study proposes the following hypothesis:

**H3:** As family influence increases, the negative effect of organizational resistance on ERP implementation success will be reduced.

This concludes the overview of the theoretical support for the hypotheses that are unique to this study. The other relationships shown in the conceptual model are fully adopted from the prior work by Hong and Kim (2002). The next chapter introduces the methods used for this study.
CHAPTER 3 METHODS

This chapter is divided into six sections, which will provide an overview of the methodological structure of this study. The first section is an overview of the research design. The second section provides an overview of the survey sample and procedures used. The third section details the measurement model used for the study. The fourth section provides an overview of the structural model. The fifth section provides background on the analytic approach of this study. Finally, the sixth section provides an overview of common method variance and outlines the remedies used.

Design

This study was implemented as a cross-sectional quantitative survey. Data was collected using the Qualtrics online survey platform (Qualtrics, 2016). Due to the nature of the conceptual model and the exploratory nature of this research, this study uses Partial Least Squares Structured Equation Modeling (PLS-SEM) for the analysis (C. B. Astrachan, Patel, & Wanzenried, 2014; Hair, Hult, Ringle, & Sarstedt, 2017). Partial Least Squares Structured Equation Modeling is an accepted method within both the information systems discipline and the family business discipline (Ringle, Sarstedt, & Straub, 2012; Sarstedt, Ringle, Smith, Reams, & Hair Jr., 2014; Urbach & Ahlemann, 2010).

The analysis began with an evaluation of the nature of the measurement models to ensure the suitability of the measured constructs and was followed by an evaluation of the
structural model to support the hypotheses of this study (Gefen, Rigdon, & Straub, 2011; Hair et al., 2017; Urbach & Ahlemann, 2010). An analysis of the effect sizes found in Hong & Kim (2002) indicates that the effect sizes could be detected using PLS-SEM with a sample size of 70 usable observations (Cohen, 1992; Hair et al., 2017). In PLS-SEM, the minimum sample size should also be compared to the complexity of the structural model. The minimum sample size should be no less than ten times the number of formative measurement indicators of a single construct or ten times the number of the maximum structural paths to an endogenous construct within the structural model (Hair et al., 2017). Based on these criteria this study sought to acquire a sample size of at least 130 observations.

Survey Sample and Procedures

A survey was conducted targeting managers of family influenced firms that have implemented their first ERP system. There was a goal to sample managers from family firms across varying levels of family influence ranging from no influence to complete control. The respondents were asked to respond specifically considering their first ERP implementation. The companies have implemented various ERP systems -- some generic and some industry specific. These firms were headquartered in the United States and varied in size from $10 million in annual revenue to $1 billion in annual revenue. The lower boundary was chosen based on the findings of Buonanno et al. (2005) supporting the premise that businesses beneath that threshold typically avoid formalized ERP systems. The upper boundary was based on the assertion that the asymmetric treatment
of family members attenuates as a firm becomes larger and has more non-family managers (Daily & Dollinger, 1993; Verbeke & Kano, 2012).

The instrument was reviewed by a panel of family business managers and academics from the IS and family business fields to validate its clarity. The instrument was then used to acquire a pilot sample of 20 responses through a Qualtrics panel. These responses were used to refine the online survey logic.

The final survey was distributed via a Qualtrics panel with the goal of 140 respondents based on the projected 130 usable responses minimally needed. The demographics of the responses are included in Chapter 4. The principal investigator of this study contracted with Qualtrics to recruit respondents, filter the respondents per the study requirements, and deliver the completed results to the principal investigator. After the survey distribution began it was noted that some responses were of lower quality than others. At that point, a selection criterion was applied looking at three indicators to discern responses of lower quality. First, if the reported demographics of the governance board was illogical (e.g. the respondent stated that there were more family and family selected board members than reported seats on the board) the case was removed and replaced. Second, if the reported demographics of the management board was illogical (e.g. the respondent stated that there were more family and family selected board members than reported seats on the board) the case was removed and replaced by Qualtrics. Third, if the free response answer to the question asking which ERP system was used or the free response answer to the question asking for further thoughts was nonsensical, the case was removed and replaced by Qualtrics. In the end, 207 complete
responses were collected from the Qualtrics panel. Of that number, 66 failed the quality criteria and were rejected leaving 141 seemingly usable responses.

Measurement Model

The measurement constructs of this study were adopted from previously established scales. Minor wording changes were made to correct grammar in some questions. The following section details each measurement construct, lists its source, and gives support for the mode of measurement chosen. An analysis of the validity of the measurement model is provided in Chapter 4. The constructs detailed below were supplemented with a collection of demographic questions including ERP type, specific ERP system used, modules implemented, and industry designation. These demographic questions were adopted from the Panorama Consulting ERP Survey (Panorama Consulting Solutions, 2014). A detailed listing of all questions asked in the survey is provided in Appendix A.

Independent Constructs

The primary independent factor of this study is family ownership influence. In 2002, J. H. Astrachan et al. proposed a continuous scale known as the Family Influence on Power, Experience, and Culture (F-PEC) instrument, for the standardized measurement of family influence within a business (J. H. Astrachan et al., 2002). This metric scale has been validated and expanded in several works (Cliff & Jennings, 2005; Holt, Rutherford, & Kuratko, 2007; Klein, Astrachan, & Smyrnios, 2005). The F-PEC scale measures family influence along three dimensions: power, experience, and culture.
During the course of this study, challenges arose with attempts to combine the three dimensions into a single construct. As a result, the three F-PEC dimensions are conceptualized as separate exogenous constructs.

*Family Power (FPower)*. Family power is conceptualized as equity held by the family, governance exercised by the family, and family participation in the management of the firm (Klein et al., 2005). This is operationalized through the power subscale measuring the proportion of shares held, top management positions, and board seats held or controlled by the family (Klein et al., 2005). Based on these indicators being causal, combinational, non-covariate, and non-interchangeable FPower is conceptualized as a formative construct (Chin, 1998; Diamantopoulos & Winklhofer, 2001; Fornell & Bookstein, 1982; Jarvis, MacKenzie, & Podsakoff, 2003; Rossiter, 2002). For the purposes of this study, the three formative proportion indicators are combined into a single indicator for the construct using the method detailed by Jaskiewicz, Gonzalez, Menendez and Schiereck (2005). While the use of single item constructs in PLS-SEM is strongly discouraged for unobservable traits, such as perceptions, it is appropriate for observable metrics (Hair et al., 2017). In this case, the combined indicator assists in the assessment of the responses due to the variation in the structure of the firms responding (e.g., some companies lack governance boards, management boards, or both).

*Family Experience (FExperience)*. Family experience is conceptualized as the amount of time the family has been associated with, and thus influencing, the firm (Klein et al., 2005). Experience is operationalized as a function of which generations of a family are in the ownership, governance, and management of a firm. Based on these indicators being combinational, yet perhaps not entirely causal, possibly covariate, and possibly
interchangeable FExperience is conceptualized as a reflective construct (Chin, 1998; Diamantopoulos & Winklhofer, 2001; Fornell & Bookstein, 1982; Jarvis et al., 2003; Rossiter, 2002).

**Family Culture (FCulture).** Family culture is a function of the overlap of the values of the family and the values of the firm (Klein et al., 2005). Culture is operationalized using the Family Business Commitment Questionnaire developed by Carlock and Ward (2001). Based on these indicators being consequential, covariate, and interchangeable FCulture is conceptualized as a reflective construct (Chin, 1998; Diamantopoulos & Winklhofer, 2001; Fornell & Bookstein, 1982; Jarvis et al., 2003; Rossiter, 2002).

**Organizational Resistance (OrgResist).** The secondary independent construct adopted is organizational resistance. This construct was hypothesized as a moderator in the Hong and Kim (2002) study as shown in Figure 2. However, the original study failed to support the hypothesis that organizational resistance was a moderator. Given the significant direct effect that organizational resistance demonstrated in the Hong and Kim study, this study operationalizes it as an independent construct as shown in Figure 3. Based on these indicators being consequential, covariate, and interchangeable OrgResist is conceptualized as a reflective construct (Chin, 1998; Diamantopoulos & Winklhofer, 2001; Fornell & Bookstein, 1982; Jarvis et al., 2003; Rossiter, 2002).

Dependent Constructs

**Organizational Fit to the ERP (OrgFit).** Organizational fit to the ERP is conceptualized as an organization’s alignment to the standard ERP system prior to
implementation. This is operationalized along three dimensions: data fit, process fit, and user fit. This construct is adopted from Hong & Kim (2002). Based on these indicators being consequential, covariate, and interchangeable OrgFit is conceptualized as a reflective construct (Chin, 1998; Diamantopoulos & Winklhofer, 2001; Fornell & Bookstein, 1982; Jarvis et al., 2003; Rossiter, 2002).

**ERP Implementation Success (PjtSuc).** ERP implementation success is conceptualized as an organization’s ease of implementation and positive outcomes from the ERP implementation. This is operationalized along four dimensions: cost, time, performance, and benefits. This construct is adopted from Hong & Kim (2002). Based on these indicators being consequential, covariate, and interchangeable PjtSuc is conceptualized as a reflective construct (Chin, 1998; Diamantopoulos & Winklhofer, 2001; Fornell & Bookstein, 1982; Jarvis et al., 2003; Rossiter, 2002).

**Moderating Constructs**

This model hypothesizes firm size as a potential moderator of the relationship between family ownership influence and ERP fit. In addition, the moderators from Hong and Kim (2002), namely ERP adaptation level and process adaptation level are adopted along with their associated relationships as shown in Figure 3.

**Firm Size (Size).** Firm size is operationalized by adopting the scales used by Buonanno et al. (2005) measuring revenue and employee count and combining them into a measure of firm size. Based on these indicators being causal, combinational, non-covariate, and non-interchangeable Size is conceptualized as a formative construct (Chin,
ERP Adaptation (ERPAdapt). ERP adaptation is conceptualized as the amount of changes made to the stock ERP system during its instantiation within a firm. It is operationalized by adopting the construct from Hong & Kim (2002). Based on these indicators being consequential, covariate, and interchangeable ErpAdapt is conceptualized as a reflective construct (Chin, 1998; Diamantopoulos & Winklhofer, 2001; Fornell & Bookstein, 1982; Jarvis et al., 2003; Rossiter, 2002).

Process Adaptation (ProcAdapt). Process adaptation is conceptualized as the amount of changes made to business processes of the firm due to the implementation of the ERP system. It is operationalized by adopting the construct from Hong & Kim (2002). Based these indicators being consequential, covariate, and interchangeable ProcAdapt is conceptualized as a reflective construct (Chin, 1998; Diamantopoulos & Winklhofer, 2001; Fornell & Bookstein, 1982; Jarvis et al., 2003; Rossiter, 2002).

Structural Model

The structural model of this study varies somewhat from the conceptual model shown in Figure 3. Due to discriminant validity challenges in bringing family ownership influence together as a second-order construct, the three dimensions of F-PEC were loaded into the structural model independently. This increased the number of paths the testing each hypothesis by a factor of three. The resulting sub-hypotheses are detailed in Table 2 below. The resulting structural path model is shown in Figure 4. An evaluation of the path coefficient strength and significance of each path is detailed in Chapter 4.
Table 2: Resultant Sub-hypotheses

<table>
<thead>
<tr>
<th>H1: Family ownership influence will have a negative effect upon ERP fit.</th>
<th>H1a: Family power will have a negative effect upon ERP fit.</th>
<th>H1b: Family experience will have a negative effect upon ERP fit.</th>
<th>H1c: Family culture will have a negative effect upon ERP fit.</th>
</tr>
</thead>
<tbody>
<tr>
<td>H2: As firm size increases the negative effect of family influence on ERP fit will be reduced.</td>
<td>H2a: As firm size increases the negative effect of family power on ERP fit will be reduced.</td>
<td>H2b: As firm size increases the negative effect of family experience on ERP fit will be reduced.</td>
<td>H2c: As firm size increases the negative effect of family culture on ERP fit will be reduced.</td>
</tr>
<tr>
<td>H3: As family influence increases the negative effect of organizational resistance on ERP implementation success will be reduced.</td>
<td>H3a: As family power increases the negative effect of organizational resistance on ERP implementation success will be reduced.</td>
<td>H3b: As family experience increases the negative effect of organizational resistance on ERP implementation success will be reduced.</td>
<td>H3c: As family culture increases the negative effect of organizational resistance on ERP implementation success will be reduced.</td>
</tr>
</tbody>
</table>

Figure 4: Structural Path Model
Common Method Variance

Common method variance (CMV) is a commonly noted challenge related to survey-based quantitative studies that is the result of the same respondent providing responses to both exogenous and endogenous construct indicators (Burton-Jones, 2009). Excessive CMV can contribute to common method bias (CMB) resulting in unreliable results. Some have suggested that outcome constructs should have their indicators collected from different respondents or at different times than independent constructs (Podsakoff, MacKenzie, & Podsakoff, 2012). This remedy was not possible for this study.

In order to reduce the possibility of CMB, this study used techniques suggested to limit CMB such as varying scale and anchor points between the constructs and separating the ultimate dependent variable from the independent variable by other questions in the survey (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). Furthermore, statistical methods were used to detect the presence of CMB and the results are detailed in Chapter 4 (Babin, Griffin, & Hair Jr., n.d.; Fuller, Simmering, Atinc, Atinc, & Babin, n.d.)
CHAPTER 4 RESULTS

This chapter details the quantitative analysis of this study. Analysis was performed on a sample of 138 cases from the data (reduced from 141 usable responses received). The first section provides an overview of the demographics of the respondents. The following sections follow the workflow for assessing PLS-SEM detailed in Hair et al. (2017). First, the measurement model is assessed. Reflective constructs were assessed for internal consistency and for convergent and discriminant validity. The formative construct was assessed both quantitatively and qualitatively. The measurement model was also assessed for common method bias. After those assessments, the structural model was assessed for effect size and significance. Next, there was an assessment of the explanatory power and predictive relevance of the model. Based on these analyses the results of the hypotheses of the study are reported.

With one exception, the quantitative results of the study were generated using SmartPLS version 3.0 (Ringle, Wende, & Becker, 2015). The Harmon one-factor test used in the common method variance section was performed using SPSS version 23 (IBM SPSS Statistics, 2015). The sample demographics were compiled using Microsoft Excel (Microsoft Excel, 2016).

Sample Demographics

Table 3 below details the breakdown of survey responses and notes the number of dropouts, criteria rejections, and rejections due to low quality responses as detailed in
Chapter 3. Of the sample of 141 usable responses, three responses were still deemed questionable: two of the responses were abnormally straight line and one response indicated an ERP system that is not an ERP system, namely Microsoft Excel. The resulting set of 138 responses was used for all of the final quantitative tests of the model.

<table>
<thead>
<tr>
<th></th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surveys started</td>
<td>354</td>
<td>100.00%</td>
</tr>
<tr>
<td>Dropouts</td>
<td>11</td>
<td>3.11%</td>
</tr>
<tr>
<td>Criteria rejects</td>
<td>136</td>
<td>38.42%</td>
</tr>
<tr>
<td>Completed responses</td>
<td>207</td>
<td>58.47%</td>
</tr>
<tr>
<td>Rejected due to low quality</td>
<td>66</td>
<td>18.64%</td>
</tr>
<tr>
<td>Usable responses</td>
<td>141</td>
<td>39.83%</td>
</tr>
<tr>
<td>Removed due to questionable quality</td>
<td>3</td>
<td>0.85%</td>
</tr>
<tr>
<td>Final analysis sample</td>
<td>138</td>
<td>38.98%</td>
</tr>
</tbody>
</table>

Table 3: Response Rate Details

Table 4 summarizes the demographic questions asked during the survey. All respondents were from firms headquartered in the United States, which are family firms, and have implemented at least one ERP system. Respondents were also filtered based on their familiarity with the ownership family and familiarity with the first ERP implementation. It is of note that there are a large number of respondents from firms below the $10 million annual revenue threshold anticipated during the design of this study. The $10 million lower limit was based on prior research indicating that firms below the $10 million revenue threshold generally did not implement ERP systems (Buonanno et al., 2005). The data indicate that this assertion may not hold in all contexts or that the market has changed since the Buonanno et al. study.
<table>
<thead>
<tr>
<th>Question</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>What is your title within the company?</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CEO / General Manager / CFO</td>
<td>71</td>
<td>51.45%</td>
</tr>
<tr>
<td>CIO / Head of IT</td>
<td>16</td>
<td>11.59%</td>
</tr>
<tr>
<td>Board of Directors</td>
<td>4</td>
<td>2.90%</td>
</tr>
<tr>
<td>Upper Manager</td>
<td>31</td>
<td>22.46%</td>
</tr>
<tr>
<td>Midlevel manager</td>
<td>12</td>
<td>8.70%</td>
</tr>
<tr>
<td>Junior Manager</td>
<td>2</td>
<td>1.45%</td>
</tr>
<tr>
<td>IT Staff</td>
<td>0</td>
<td>0.00%</td>
</tr>
<tr>
<td>General Employee</td>
<td>2</td>
<td>1.45%</td>
</tr>
<tr>
<td><strong>Approximately how many employees does the company have?</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-10</td>
<td>13</td>
<td>9.42%</td>
</tr>
<tr>
<td>11-50</td>
<td>41</td>
<td>29.71%</td>
</tr>
<tr>
<td>51-100</td>
<td>19</td>
<td>13.77%</td>
</tr>
<tr>
<td>101-150</td>
<td>16</td>
<td>11.59%</td>
</tr>
<tr>
<td>151-200</td>
<td>11</td>
<td>7.97%</td>
</tr>
<tr>
<td>201-250</td>
<td>6</td>
<td>4.35%</td>
</tr>
<tr>
<td>251-500</td>
<td>11</td>
<td>7.97%</td>
</tr>
<tr>
<td>501-1,000</td>
<td>14</td>
<td>10.14%</td>
</tr>
<tr>
<td>Over 1,000</td>
<td>7</td>
<td>5.07%</td>
</tr>
<tr>
<td><strong>Approximately how much is the company's annual revenue?</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 7 million</td>
<td>50</td>
<td>36.23%</td>
</tr>
<tr>
<td>Between 7 million and 20 million</td>
<td>29</td>
<td>21.01%</td>
</tr>
<tr>
<td>Between 21 million and 50 million</td>
<td>19</td>
<td>13.77%</td>
</tr>
<tr>
<td>Between 51 million and 100 million</td>
<td>15</td>
<td>10.87%</td>
</tr>
<tr>
<td>Between 101 million and 250 million</td>
<td>11</td>
<td>7.97%</td>
</tr>
<tr>
<td>Between 251 million and 500 million</td>
<td>7</td>
<td>5.07%</td>
</tr>
<tr>
<td>Between 501 million and 1 billion</td>
<td>4</td>
<td>2.90%</td>
</tr>
<tr>
<td>Over 1 billion</td>
<td>3</td>
<td>2.17%</td>
</tr>
<tr>
<td><strong>Are you a Member of the Ownership Family?</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>96</td>
<td>69.57%</td>
</tr>
<tr>
<td>No</td>
<td>42</td>
<td>30.43%</td>
</tr>
<tr>
<td><strong>What is your company's primary industry?</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aerospace and Defense</td>
<td>0</td>
<td>0.00%</td>
</tr>
<tr>
<td>Construction</td>
<td>18</td>
<td>13.04%</td>
</tr>
<tr>
<td>Question</td>
<td>Count</td>
<td>Percentage</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------</td>
<td>-------</td>
<td>------------</td>
</tr>
<tr>
<td>Distribution</td>
<td>5</td>
<td>3.62%</td>
</tr>
<tr>
<td>Education</td>
<td>1</td>
<td>0.72%</td>
</tr>
<tr>
<td>Finance, Insurance and Real Estate Services</td>
<td>10</td>
<td>7.25%</td>
</tr>
<tr>
<td>Healthcare</td>
<td>6</td>
<td>4.35%</td>
</tr>
<tr>
<td>Information Technology</td>
<td>16</td>
<td>11.59%</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>22</td>
<td>15.94%</td>
</tr>
<tr>
<td>Mining</td>
<td>1</td>
<td>0.72%</td>
</tr>
<tr>
<td>NonProfit (Including public sector, government, education)</td>
<td>0</td>
<td>0.00%</td>
</tr>
<tr>
<td>Professional Services</td>
<td>23</td>
<td>16.67%</td>
</tr>
<tr>
<td>Retail Trades</td>
<td>18</td>
<td>13.04%</td>
</tr>
<tr>
<td>Telecommunications</td>
<td>0</td>
<td>0.00%</td>
</tr>
<tr>
<td>Utilities (Gas, Electric, Etc.)</td>
<td>1</td>
<td>0.72%</td>
</tr>
<tr>
<td>Wholesale Trade</td>
<td>7</td>
<td>5.07%</td>
</tr>
<tr>
<td>Other (Please Specify)</td>
<td>10</td>
<td>7.25%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>How many ERP systems has your company implemented?</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>65</td>
<td>47.10%</td>
</tr>
<tr>
<td>2</td>
<td>38</td>
<td>27.54%</td>
</tr>
<tr>
<td>3</td>
<td>24</td>
<td>17.39%</td>
</tr>
<tr>
<td>4</td>
<td>6</td>
<td>4.35%</td>
</tr>
<tr>
<td>5 or more</td>
<td>5</td>
<td>3.62%</td>
</tr>
</tbody>
</table>

Table 4: Sample Demographics

Measurement Model Analysis

Internal Consistency of Reflective Constructs

In evaluating the internal consistency of the reflective constructs, this study reports both Cronbach’s alpha and composite reliability scores for each reflective construct in Table 5 below. Cronbach’s alpha is the traditional measure of internal consistency and should be greater than 0.7 to indicate reliability for each reflective construct (Hair, Jr, Black, Babin, & Anderson, 2010; Streiner, 2003). Composite reliability is a newer measure and preferred for PLS-SEM (Hair et al., 2017). Like
Cronbach’s alpha, the composite reliability of a reflective construct should be greater than 0.7 (Hair et al., 2017).

<table>
<thead>
<tr>
<th>Construct</th>
<th>Cronbach’s Alpha</th>
<th>Composite Reliability</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERPAdapt</td>
<td>0.955</td>
<td>0.964</td>
</tr>
<tr>
<td>FCulture</td>
<td>0.958</td>
<td>0.938</td>
</tr>
<tr>
<td>FExperience</td>
<td>0.967</td>
<td>0.979</td>
</tr>
<tr>
<td>OrgFit</td>
<td>0.957</td>
<td>0.962</td>
</tr>
<tr>
<td>OrgResist</td>
<td>0.941</td>
<td>0.955</td>
</tr>
<tr>
<td>PjtSuc</td>
<td>0.879</td>
<td>0.917</td>
</tr>
<tr>
<td>ProcAdapt</td>
<td>0.965</td>
<td>0.973</td>
</tr>
</tbody>
</table>

Table 5: Composite Reliability

The reflective constructs of this model all score above 0.7 in both tests without removing indicators. Unfortunately, they also score greater than 0.9 which is considered problematic as it is a sign of multicollinearity within the construct (Hair, Jr et al., 2010; Streiner, 2003). However, there is some support in the literature that argues against hard limits on internal reliability tests noting that more general constructs will naturally result in lower scores and more specific constructs will normally score higher and that the fact that these inherent traits exist should not necessarily invalidate a construct from use (Peters, 2014).

Convergent Validity of Reflective Constructs

Convergent validity, the need for the dimensions of a reflective construct to be related, is measured in this study using the average variance extracted (AVE) shown in Table 6 below. In order to support convergent validity, the AVE of each reflective construct should be greater than 0.5 (Hair et al., 2017). All of the reflective constructs of this study pass the AVE test without modification.
Discriminant Validity of Reflective Constructs

Discriminant validity is a measure of whether the reflective constructs of a model are empirically distinct from one another. Previous guidelines for PLS-SEM advocated using the Fornell-Larcker criterion to evaluate discriminant validity (Hair, Jr, Hult, Ringle, & Sarstedt, 2013). However, more recent guidance suggests that the heterotrait-monotrait (HTMT) ratio provides a more robust measurement of discriminant validity for PLS-SEM purposes (Hair et al., 2017; Henseler, Ringle, & Sarstedt, 2014).

The HTMT ratios between each reflective construct are shown in Table 7 below. The rule of thumb is that the HTMT ratio between any two reflective constructs should not exceed 0.85, or not exceed 0.9 in the case of two constructs that are closely related (Hair et al., 2017; Henseler et al., 2014). All of the ratios in Table 7 are less than 0.85 with the exception of the ratio between ProcAdapt and ERPAdapt at 0.865. These two constructs are closely related and the ratio is less than 0.9.
Similar to reflective constructs, formative constructs must also be tested for construct reliability and validity. In addition to these tests, formative constructs must also display content validity. Content validity is derived from theory and validation that the indicators do, in fact, form the construct identified (Bollen & Lennox, 1991; Hair et al., 2017; Petter, Straub, & Rai, 2007; Straub, Boudreau, & Gefen, 2004).

In the case of the formative construct in this study, namely Size, the content validity is provided by the prior work of Buonanno et al. (2005). Tests were performed to evaluate the construct reliability and validity of the Size construct. The results of those tests are shown in Table 8 below.

### Table 7: Heterotrait-Monotrait Ratio (HTMT)

<table>
<thead>
<tr>
<th>ERPAdapt</th>
<th>FCulture</th>
<th>FExperience</th>
<th>FPower</th>
<th>OrgFit</th>
<th>OrgResist</th>
<th>PjtSuc</th>
</tr>
</thead>
<tbody>
<tr>
<td>FCulture</td>
<td>0.210</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FExperience</td>
<td>0.256</td>
<td>0.097</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FPower</td>
<td>0.067</td>
<td>0.063</td>
<td>0.143</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OrgFit</td>
<td>0.206</td>
<td>0.156</td>
<td>0.160</td>
<td>0.127</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OrgResist</td>
<td>0.399</td>
<td>0.219</td>
<td>0.374</td>
<td>0.205</td>
<td>0.279</td>
<td></td>
</tr>
<tr>
<td>PjtSuc</td>
<td>0.497</td>
<td>0.115</td>
<td>0.327</td>
<td>0.175</td>
<td>0.236</td>
<td>0.674</td>
</tr>
<tr>
<td>ProcAdapt</td>
<td>0.865</td>
<td>0.183</td>
<td>0.289</td>
<td>0.128</td>
<td>0.104</td>
<td>0.550</td>
</tr>
</tbody>
</table>

Validity of Formative Construct

The construct reliability test was performed by calculating a variance inflation factor (VIF) for each indicator of the formative construct. The VIF for each indicator

### Table 8: Formative Construct Reliability and Validity

<table>
<thead>
<tr>
<th>Firm Size Indicators</th>
<th>Variance Inflation Factor (VIF)</th>
<th>Outer Loading</th>
<th>Outer Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>FirmSizeEmp</td>
<td>2.269</td>
<td>0.443</td>
<td>-0.568</td>
</tr>
<tr>
<td>FirmSizeRev</td>
<td>2.269</td>
<td>0.926***</td>
<td>1.351**</td>
</tr>
</tbody>
</table>

Notes *p<.10 **p<.05 ***p<.01

The construct reliability test was performed by calculating a variance inflation factor (VIF) for each indicator of the formative construct. The VIF for each indicator
was less than 3.3 indicating construct reliability (Diamantopoulos & Siguaw, 2006; Hair et al., 2017; Petter et al., 2007). Construct validity testing was accomplished by calculating the significance of outer loadings and inner weights of the indicators using PLS bootstrapping (Hair et al., 2017). The results show that one indicator, FirmSizeEmp, was not significant. However, the indicator was retained for this study in order to maintain content validity (Bollen & Lennox, 1991; Hair et al., 2017; Petter et al., 2007).

It is of note that FPower is theoretically a formative construct. The content validity of FPower is provided in the prior work on F-PEC (J. H. Astrachan et al., 2002; Holt et al., 2007; Klein et al., 2005). However, since this study expresses FPower as a single item construct based on the formula used in Jaskiewicz et al. (2005), there is no methodology for examining the construct reliability or validity of FPower.

Common Method Variance

As noted in Chapter 3, common method variance (CMV) is a trait of survey based research that uses the same respondent for both exogenous and endogenous constructs. Common method variance, in high enough levels, can lead to common method bias (CMB) which creates a challenge to the validity of a study. The Harmon’s one-factor test can be used to measure for excessive CMV and is show in Table 8 below (Babin et al., n.d.). If the Harmon’s one-factor test explains more than 50% of the variance of all indicators of the model, then excessive CMV exists and CMB is a problem (Babin et al., n.d.; Fuller et al., n.d.). This study passes the test with 27.769% explanation of variance by one factor. Therefore, CMB does not threaten the validity of the study results.
Structural Model Analysis

With the completion of the measurement model validation the structural model is assessed. The first section begins by assessing the statistical significance of the various paths of the model. Additionally, this section reports the effect size of each path coefficient using the $f^2$ measure (Cohen, 1992; Hair et al., 2017). Following that analysis, the next section examines the $R^2$ coefficient of determination of each endogenous construct for size and significance. Additionally, the second section examines the predictive relevance of the endogenous constructs through the use of the $Q^2$ statistic. Finally, the third section examines the hypotheses of the study and accepts or rejects them based on the structural model analysis.

Path Model Coefficient Significance and Effect Size

The first test of significance for the various paths of the model was accomplished using an analysis of the variance inflation factors of each path shown in Table 10 below. Hair et al. (Hair et al., 2017) suggests that collinearity may challenge the significance of any path with a VIF greater than 5. This analysis suggests that the path between the integration term ERPAdapt X OrgFit and PjtSuc may suffer from this problem. All other paths of the model fell below the VIF threshold of 5.
Further evaluation of significance was performed using the PLS-SEM bootstrapping process. Bootstrapping is required because PLS-SEM is a non-parametric statistical method. Bootstrapping uses subsamples of the data set to determine significance. This study uses a bootstrapping routine with 5000 subsamples following the guidelines from Hair et al. (2017).

This process resulted in the calculation of $t$ values and provides a metric for evaluating significance levels. For the relationships in this study, $t$ values were evaluated on a one-tailed basis due to the directional nature of the hypotheses. Critical values for one-tailed $t$ values are 1.290, 1.660 and 2.330 resulting in significance levels of .10, .05 and .01 based on the sample size (Hair, Jr et al., 2010). Table 11 below shows the various paths of the model and indicates their path coefficient ($\beta$), $t$ value, resulting one-
tailed p value, and the $f^2$ determinate of effect size. The $f^2$ has critical values of .02 for small effect size, .15 for medium effect size, and .35 for large effect size. $F^2$ scores less than .02 indicate no effect (Hair et al., 2017).

<table>
<thead>
<tr>
<th>Inner Model Path</th>
<th>$\beta$</th>
<th>T Value</th>
<th>P Value</th>
<th>$f^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERPAdapt -&gt; PjtSuc</td>
<td>-0.285</td>
<td>2.540</td>
<td>0.006***</td>
<td>0.048+</td>
</tr>
<tr>
<td>ERPAdapt X OrgFit -&gt; PjtSuc</td>
<td>0.126</td>
<td>1.257</td>
<td>0.104</td>
<td>0.010</td>
</tr>
<tr>
<td>FCulture -&gt; OrgFit</td>
<td>0.252</td>
<td>1.437</td>
<td>0.075*</td>
<td>0.077+</td>
</tr>
<tr>
<td>FCulture -&gt; PjtSuc</td>
<td>-0.182</td>
<td>1.921</td>
<td>0.027**</td>
<td>0.061+</td>
</tr>
<tr>
<td>FCulture X Size -&gt; OrgFit</td>
<td>-0.126</td>
<td>1.111</td>
<td>0.133</td>
<td>0.018</td>
</tr>
<tr>
<td>FExperience -&gt; OrgFit</td>
<td>-0.132</td>
<td>1.426</td>
<td>0.077*</td>
<td>0.022+</td>
</tr>
<tr>
<td>FExperience -&gt; PjtSuc</td>
<td>-0.085</td>
<td>0.729</td>
<td>0.233</td>
<td>0.012</td>
</tr>
<tr>
<td>FExperience X Size -&gt; OrgFit</td>
<td>0.150</td>
<td>1.230</td>
<td>0.109</td>
<td>0.022+</td>
</tr>
<tr>
<td>FPower -&gt; OrgFit</td>
<td>0.094</td>
<td>1.163</td>
<td>0.122</td>
<td>0.011</td>
</tr>
<tr>
<td>FPower -&gt; PjtSuc</td>
<td>0.051</td>
<td>0.726</td>
<td>0.234</td>
<td>0.005</td>
</tr>
<tr>
<td>FPower X Size -&gt; OrgFit</td>
<td>-0.203</td>
<td>1.233</td>
<td>0.109</td>
<td>0.052+</td>
</tr>
<tr>
<td>OrgFit -&gt; PjtSuc</td>
<td>0.285</td>
<td>2.920</td>
<td>0.002***</td>
<td>0.098+</td>
</tr>
<tr>
<td>OrgResist -&gt; PjtSuc</td>
<td>-0.391</td>
<td>3.152</td>
<td>0.001***</td>
<td>0.161++</td>
</tr>
<tr>
<td>OrgResist X FCulture -&gt; PjtSuc</td>
<td>-0.075</td>
<td>0.777</td>
<td>0.218</td>
<td>0.011</td>
</tr>
<tr>
<td>OrgResist X FExperience -&gt; PjtSuc</td>
<td>0.042</td>
<td>0.427</td>
<td>0.335</td>
<td>0.004</td>
</tr>
<tr>
<td>OrgResist X FPower -&gt; PjtSuc</td>
<td>-0.154</td>
<td>1.923</td>
<td>0.027**</td>
<td>0.043+</td>
</tr>
<tr>
<td>ProcAdapt -&gt; PjtSuc</td>
<td>-0.169</td>
<td>1.281</td>
<td>0.100*</td>
<td>0.014</td>
</tr>
<tr>
<td>ProcAdapt X OrgFit -&gt; PjtSuc</td>
<td>0.032</td>
<td>0.281</td>
<td>0.389</td>
<td>0.001</td>
</tr>
<tr>
<td>Size -&gt; OrgFit</td>
<td>0.219</td>
<td>1.951</td>
<td>0.026**</td>
<td>0.060+</td>
</tr>
</tbody>
</table>

Notes *p<.10 **p<.05 ***p<.01  $f^2$ effect size + Small ++ Medium +++ Large

Table 11: Path Model Coefficients

Explanatory Power and Predictive Relevance

This study considered two endogenous constructs: OrgFit and PjtSuc. This section examines the quality of the structural model in terms of predicting these two constructs. These results are detailed in Table 12 below. The results shown below are
the result of the PLS-SEM analysis, PLS bootstrapping to determine significance, and
PLS blindfolding to determine predictive relevance (Hair et al., 2017).

<table>
<thead>
<tr>
<th>Endogenous Constructs</th>
<th>R²</th>
<th>Adjusted R²</th>
<th>Q²</th>
</tr>
</thead>
<tbody>
<tr>
<td>OrgFit</td>
<td>.230***</td>
<td>.188***</td>
<td>0.145</td>
</tr>
<tr>
<td>PjtSuc</td>
<td>.540***</td>
<td>.496***</td>
<td>0.365</td>
</tr>
</tbody>
</table>

Notes *p<.10 **p<.05 ***p<.01

Table 12: Explanatory Power and Predictive Relevance

The structural model provides a weak coefficient of determination of OrgFit. The R² of .230 is significant however. In addition, the Q² value of .145 indicates a medium level of predictive relevance. The structural model provides a substantial coefficient of determination of PjtSuc. The R² of .540 is significant and the Q² value of .365 indicates a large level of predictive relevance (Hair et al., 2017).

Hypothesized Relationships

This section examines the outcomes of the various hypotheses of the study. The hypotheses, their associated structural path, path coefficient, significance, and result are shown in Table 13 below. The table does not include results of the hypotheses related to Hong and Kim’s (Hong & Kim, 2002) model nor does it report results from paths not related to hypotheses. These paths will be discussed in Chapter 5.
<table>
<thead>
<tr>
<th>Label</th>
<th>Predictor</th>
<th>β</th>
<th>t Value</th>
<th>p Value</th>
<th>$f^2$</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1a</td>
<td>FPower -&gt; OrgFit</td>
<td>0.094</td>
<td>1.163</td>
<td>0.122</td>
<td>0.022+</td>
<td>Rejected</td>
</tr>
<tr>
<td>H1b</td>
<td>FExperience -&gt; OrgFit</td>
<td>-0.132</td>
<td>1.426</td>
<td>0.077*</td>
<td>0.022+</td>
<td>Accepted</td>
</tr>
<tr>
<td>H1c</td>
<td>FCulture -&gt; OrgFit</td>
<td>0.252</td>
<td>1.437</td>
<td>0.075*</td>
<td>0.077+</td>
<td>Rejected</td>
</tr>
<tr>
<td>H2a</td>
<td>FPower X Size -&gt; OrgFit</td>
<td>-0.203</td>
<td>1.233</td>
<td>0.109</td>
<td>0.052+</td>
<td>Rejected</td>
</tr>
<tr>
<td>H2b</td>
<td>FExperience X Size -&gt; OrgFit</td>
<td>0.150</td>
<td>1.230</td>
<td>0.109</td>
<td>0.022+</td>
<td>Rejected</td>
</tr>
<tr>
<td>H2c</td>
<td>FCulture X Size -&gt; OrgFit</td>
<td>-0.126</td>
<td>1.111</td>
<td>0.133</td>
<td>0.133+</td>
<td>Rejected</td>
</tr>
<tr>
<td>H3a</td>
<td>OrgResist X FPower -&gt; PjtSuc</td>
<td>-0.154</td>
<td>1.923</td>
<td>0.027**</td>
<td>0.043+</td>
<td>Rejected</td>
</tr>
<tr>
<td>H3b</td>
<td>OrgResist X FExperience -&gt; PjtSuc</td>
<td>0.042</td>
<td>0.427</td>
<td>0.335</td>
<td>0.004</td>
<td>Rejected</td>
</tr>
<tr>
<td>H3c</td>
<td>OrgResist X FCulture -&gt; PjtSuc</td>
<td>-0.075</td>
<td>0.777</td>
<td>0.218</td>
<td>0.011</td>
<td>Rejected</td>
</tr>
</tbody>
</table>

Notes: *p<.10 **p<.05 ***p<.01  $f^2$ effect size + Small ++ Medium +++ Large

Table 13: Hypotheses Results

The majority of the hypotheses, namely H1a, H2a, H2b, H2C, H3b, and H3c, are rejected due to lack of significance. H1c: “Family culture will have a negative effect upon ERP fit” is rejected because, while it is significant, the path coefficient indicates that FCulture has a positive effect on OrgFit contrary to the hypothesis. H3a: “As family power increases the negative effect of organizational resistance on ERP implementation success will be reduced” is rejected because, while it is significant, the path coefficient indicated that FPower increases the negative effect of OrgResist on PjtSuc contrary to the hypothesis. Hypothesis H1b: “Family experience will have a negative effect upon ERP fit.” is accepted.
CHAPTER 5 DISCUSSION

Chapter 5 addresses the implications of the findings from Chapter 4 in light of the literature reviewed. The first section discusses the implications of the hypothesized results and examines some of the structural model results not related to the hypotheses and discusses their post hoc implications. The second section discusses the managerial implications of this study. Finally, the third section details limitations and future research opportunities.

Discussion of Results

Hypothesized Results

As noted in Chapter 4, the hypothesized results were largely rejected due to lack of significance. Of note is the one accepted hypothesis H1b: “Family experience will have a negative effect upon ERP fit.” ($\beta=-0.132, p<.1, f^2>0.02$). While this result may support the proposition of the study that higher family influence, FExperience being a dimension, has a negative effect on organizational fit, it may also support the idea that older firms have a problem with OrgFit. It has been noted that FExperience could be considered a proxy for firm age (Merino, Monreal-Pérez, & Sánchez-Marín, 2012).

Considering the multidimensional nature of the F-PEC construct (FPower, FExperience, and FCulture) may provide insight as to the reason for the failure to support the various sub-hypotheses. The extant literature examined in Chapter 2 primarily considers misalignment between organizational culture and the cultural traits embodied in the ERP artifact. An examination of the direct effect of FCulture on PjtSuc in the next
section may lead us to conclude that the sub-hypotheses failed because the primary driver of the phenomenon is cultural.

Post Hoc Analysis

On post hoc consideration, there are several interesting outcomes from this study. The first outcome involves the simple effect of FCulture on PjtSuc. The second outcome involves the relationship between OrgFit and PjtSuc. The third outcome involves the simple effect of Size on OrgFit.

During the analysis of H3c on the moderating effect of FCulture on the relationship between OrgResist and PjtSuc, the study observed a simple direct effect between FCulture and PjtSuc that was both negative (β=-0.182), significant (p<.05) and sizable ($f^2=0.061$). This leaves open the possibility that one of the key theoretical underpinnings of this study, that cultural alignment with an enterprise system is positive (Rivard et al., 2011; Strong & Volkoff, 2010), the IT artifact of an enterprise system is not culturally neutral (Koch et al., 2013), and that the culture of family firms may not align to the artifact may be supportable. The phenomenon may exist even though OrgFit was the wrong path to examine it through.

Examination of the relationships studied in the previous work by Hong and Kim (2002) provides some interesting outcomes. The relationship between OrgFit and PjtSuc in this study is positive (β=0.285), significant (p<.01), and sizable ($f^2=0.098$). In addition, the relationship between OrgResist and ProjSuc is also reaffirmed as negative (β=-0.391), significant (p<.01) and sizable ($f^2=0.161$). These findings, combined with the predictive value of PjtSuc ($R^2=.540$) (p<.01), largely validate the earlier study. However,
the prior findings of ERPAdapt and ProcAdapt being moderators of the relationship between OrgFit and PjtSuc were not supported in this study. ERPAdapt was found to have a negative direct effect on PjtSuc ($\beta=-0.285$) that is significant ($p<.001$) and sizable ($f^2=0.048$). This study is notable in that it boundary spans the earlier work from the Korean business environment to the United States. This study also looks at more firms (138) than the Hong and Kim (2002) study (34).

A further item of interest is the examination of the simple direct effect of Size on OrgFit being positive ($\beta=0.219$), significant ($p<.05$), and sizable ($f^2=0.060$). The earlier study did not examine firm size, either because it was not measured or because they did not have enough variation among the limited number of companies they surveyed (with an N=106, but from only 34 firms). This finding may lead to a deeper examination of why smaller firms have challenges with organizational fit to enterprise systems.

Managerial Implications

This study provides insight to businesses undertaking the arduous task of implementing an ERP system for the first time. This study reaffirms earlier research that organizational fit between a firm’s data, processes and users to the standards of the ERP system provide a real increase in terms of implementation success, as measured in cost, time performance, and system benefits. This should be especially noted by smaller firms and those with a strong family ownership effect on their culture. Firm’s should also work to educate and incentivize their workforces to support the implementation of ERP systems as to reduce organizational resistance.
Family firms should be aware that the special characteristics of their organizational cultures, that many firms cherish and view as a source of both value and competitive advantage, may not be an advantage when implementing ERP systems. Family firms should be aware that their implementations may cost more, take longer, and require more change than implementations at similar sized non family firms. During the selection process, family firms should also consider the experience level with family firms of their ERP consultants and vendors.

Family firms should also be aware that their experience implementing ERP systems will vary depending on their size. Smaller family firms should approach ERP implementation with the understanding that the flexibility and nimbleness that provide them advantages in other contexts are a challenge when implementing ERP systems. These firms should take care when choosing ERP products and consultants to ensure that they are properly aligned to the needs of smaller firms.

Limitations and Future Research

There were some challenges with the quantitative analysis presented in this study. First is the problem of high collinearity within the reflective constructs as evidenced by the very high Cronbach’s alpha and composite reliability scores (greater than 0.9) reported for most reflective constructs. This raises the possibility that larger constructs, such as FExperience, may be overstated in their effect. Second is the low effect sizes reported for many of the structural paths in Table 11. Small effect size being defined as an $f^2$ of .02 or above (Hair et al., 2017). While these relationships may have a small
effect size the effect is meaningful, $f^2$ less than .02 are deemed to not have an effect (Hair et al., 2017).

A second limitation is presented in the issue of corroboration of respondent information from employees of the same firm. Due to the terms of Institutional Review Board and the contract with Qualtrics, this study was not able to ask the name of the firm that the respondent works for. A preliminary examination of the demographic traits asked about the respondents’ firms (e.g. revenue, number of employees, ERP used, ownership and board percentages, and modules implemented) demonstrated almost no overlap, suggesting that none of the 138 respondents work for the same firm. However, this study cannot support that assertion conclusively.

This study provides an incremental advancement in the literature of both information systems and family business studies. Based on the analysis of this study there are several areas for future research. Of interest are the cultural implications of information systems, further examination of F-PEC as it conceptualizes family ownership influence, deeper examination of the antecedents of OrgFit, the broader interaction of firm size on the family firm traits, and considerations of firm size as it relates to enterprise systems implementation.

First, there is room to further examine the effect of cultural fit on enterprise systems success. This study makes an empirical attempt to understand the phenomenon and quantify it. However, further empirical studies are needed to complement theoretical work such as the Strong and Volkoff (2010) development of the organization-enterprise system fit model expanding the conceptualization of the cultural aspects of the enterprise system artifact.
Second, there is room to further examine the F-PEC construct. There is need to continue to refine, expand, and further conceptualize family ownership influence for quantitative research. However, the diverging outcomes of the various dimensions of F-PEC in this study call into question whether family ownership influence can be conceptualized as a unified metric.

Third, there is room to further examine the antecedents of organizational fit to the ERP (OrgFit). While the model has a significant and predictively relevant set of antecedents to OrgFit, the adjusted coefficient of determination is low (Adjusted \( R^2 = 0.188 \)). Since OrgFit has a significant and sizable effect of PjtSuc it is worth further examination of the causes and nature of organizational fit to the ERP.

Fourth, there is room to further examine the interaction effects between firm size (Size) and the various other constructs measured. Specifically, the possible interaction effects between Size and FPower, Size and OrgResist, and the interaction between FPower and OrgResist. Further examination of family firms of varying sizes provides an opportunity to more deeply explore family firms and their experience with information systems.

Finally, there is room to further examine the interaction of firm size and organizational fit to the ERP. As was noted in Chapter 4, more smaller firms are implementing ERP systems than previously determined by Buonanno et al. (2005). The indication that smaller firms have less fit to the ERP demonstrates the need to further understand the nature and needs of smaller firms as they evolve into enterprise information systems. Also of interest for future study are the changes that have allowed for smaller firms to more readily enter the ERP space. It is possible that the advent of
cloud computing, with its reduced capital investment costs and smaller infrastructure footprint, allows for smaller firms to more easily adopt ERP and other enterprise systems (Al-Johani & Youssef, 2013; Budriene & Zalieckaite, 2012; Miranda, 2013).

Overall, this study provides support for future work examining the effects of cultural alignment of organizations, including family firms, to the cultural artifacts embedded within information systems. It is hoped that future work on this concept and the concepts relating to firm size and ERP success will help researchers, developers and IS practitioners help develop systems and processes to help companies achieve greater success with their ERP experience.
REFERENCES


APPENDIX: FAMILY ERP INSTRUMENT
Family ERP Instrument

Q1 ONLINE SURVEY CONSENT FORM Title of Research

Study: Implementing Enterprise Resource Planning Systems in Family Firms

Researcher's Contact Information: James N. Smith, 478-227-4360, jnsmith@bluereefgroup.com

Introduction You are being invited to take part in a research study conducted by James N. Smith of Kennesaw State University. Before you decide to participate in this study, you should read this form and ask questions about anything that you do not understand.

Description of Project The purpose of the project is to test hypotheses concerning the effects of family ownership influence within organizations and its impact on their success implementing enterprise resource planning systems.

Explanation of Procedures Each participant is being asked to complete a series of questions designed to promote understanding of the experiences of family influenced firms related to enterprise resource planning system implementation. Certain participants who are recruited as part of the survey pretest will be contacted for phone interviews related to the ease of understanding of the survey and inquiring about the participant’s thoughts on technology use in family firms.

Time Required The survey is estimated to take 20 – 30 minutes to complete.

Risks or Discomforts Survey participants are not subject to risks due to the anonymity of this survey (internet protocol addresses will not be captured and there is no personally identifiable information included in the survey instrument). Each response will be assigned a non-identifying code for analysis purposes.

Benefits There is limited direct benefit to participation in the survey.

Confidentiality The results of this survey participation will be confidential. Again, internet protocol addresses will not be
captured and there is no personally identifiable information included in the survey instrument. Inclusion Criteria for Participation You must be 18 years of age or older to participate in this study. Use of Online Survey Internet protocol addresses will not be captured. Research at Kennesaw State University that involves human participants is carried out under the oversight of an Institutional Review Board. Questions or problems regarding these activities should be addressed to the Institutional Review Board, Kennesaw State University, 585 Cobb Avenue, KH3403, Kennesaw, GA 30144-5591, (470) 578-2268. PLEASE PRINT A COPY OF THIS CONSENT DOCUMENT FOR YOUR RECORDS, OR IF YOU DO NOT HAVE PRINT CAPABILITIES, YOU MAY CONTACT THE RESEARCHER TO OBTAIN A COPY

☑️ I agree and give my consent to participate in this research project. I understand that participation is voluntary and that I may withdraw my consent at any time without penalty. (1)

☑️ I do not agree to participate and will be excluded from the remainder of the questions. (2)

If I do not agree to participa... Is Selected, Then Skip To End of Block

Q28 Introduction Title of Research Study: Implementing Enterprise Resource Planning Systems in Family Firms Description of Project We will be asking questions about the relationship of the family or families that own your company have with the company and how the company is effected by that relationship. We will also be asking questions about the experience the company had implementing Enterprise Resource Planning (ERP) systems. The definition of an ERP system is provided below. This survey hopes to study the first implementation of an ERP system within a company. If your company has implemented multiple ERP systems, please answer the
questions thinking about your experience with the first implementation. Definition of an ERP System  Enterprise resource planning (ERP) is a category of business-management software—typically a suite of integrated applications—that an organization can use to collect, store, manage and interpret data from many business activities, including: - product planning- cost accounting- manufacturing or service delivery-marketing and sales- inventory management- shipping and payment ERP Systems can be broadly categorized into three categories 1. Large enterprise / implementation ERP (e.g. SAP, Oracle, Peoplesoft, Sage 500) 2. Small to medium enterprise / implementation ERP (e.g. SAP Business One, Sage 100 & 300, Microsoft Dynamics) 3. Industry Specific ERP (e.g. Sage 300 CRE, Epricor Automotive, MIetrak/MIEPro)

Q3 Definitions • Family Business is defined as a business where the family of the founder can effectively control the direction of the business and where the family benefits from the business in terms of wealth, income or identity. • Family is defined as a group of persons including those who are either offspring of the company founder and their in-laws as well as their legally adopted children.

Q23 Is your company a family business?

☐ Yes (1)
☒ No (2)

If No Is Selected, Then Skip To End of Block
Q45 What is your title within the company?

- CEO / General Manager / CFO (1)
- CIO / Head of IT (2)
- Board of Directors (3)
- Upper Manager (4)
- Midlevel manager (5)
- Junior Manager (6)
- IT Staff (7)
- General Employee (8)

Q46 Are you familiar with the company's first ERP implementation?

- Yes (1)
- No (2)

If No Is Selected, Then Skip To End of Block

Q47 Are you familiar with the family that owns the company?

- Yes (1)
- No (2)

If No Is Selected, Then Skip To End of Block

Q48 Are you a member of the family that owns the company?

- Yes (1)
- No (2)

Q24 Approximately how many employees does the company have?

- 1-10 (1)
- 11-50 (2)
- 51-100 (3)
- 101-150 (4)
- 151-200 (5)
- 201-250 (6)
- 251-500 (7)
- 501-1,000 (8)
- over 1,000 (9)
Q25 Approximately how much is the company's annual revenue?

☐ Less than 7 million (1)
☐ Between 7 million and 20 million (2)
☐ Between 21 million and 50 million (3)
☐ Between 51 million and 100 million (4)
☐ Between 101 million and 250 million (5)
☐ Between 251 million and 500 million (6)
☐ Between 501 million and 1 billion (7)
☐ Over 1 billion (8)

Q26 Is the company's stock publicly traded?

☐ Yes (1)
☐ No (2)

Q27 Has the company ever implemented an Enterprise Resource Planning (ERP) System?

☐ Yes (1)
☐ No (2)
If No Is Selected, Then Skip To End of Block

Q34 Where is your company headquartered?

☐ United States of America (1)
☐ Canada or Mexico (2)
☐ Latin America (3)
☐ Western Europe (4)
☐ Eastern Europe (5)
☐ Asia (6)
☐ India (7)
☐ Other (8)
If United States of America Is Not Selected, Then Skip To End of Block
Q42 What is your company's primary industry?

- Aerospace and Defense (1)
- Construction (2)
- Distribution (3)
- Education (4)
- Finance, Insurance and Real Estate Services (5)
- Healthcare (6)
- Information Technology (7)
- Manufacturing (8)
- Mining (9)
- NonProfit (10)
- (Including public sector, government, education) (11)
- Professional Services (12)
- Retail Trades (13)
- Telecommunications (14)
- Utilities (Gas, Electric, Etc.) (15)
- Wholesale Trade (16)
- Other (Please Specify) (17) ________________

Q30 How many ERP systems has your company implemented?

- 1 (1)
- 2 (2)
- 3 (3)
- 4 (4)
- 5 or more (5)

Q31 What category of ERP system did your company use for its first implementation?

- Large enterprise / implementation ERP (i.e. SAP, Oracle, Peoplesoft, Sage 500) (1)
- Small to medium enterprise / implementation ERP (i.e. SAP Business One, Sage 100 & 300, Microsoft Dynamics) (2)
- Industry Specific ERP (i.e. Sage 300 CRE, Epricor Automotive, MIEtrak/MIEPro) (3)
Q32 Which ERP system did your company use for its first implementation? (i.e. SAP, Oracle, Peoplesoft, Sage 500, SAP Business One, Sage 100 & 300, Microsoft Dynamics, Sage 300 CRE, Epipcor Automotive, MIEtrak/MIEPro)

Q43 Which ERP modules did your company implement during its first implementation?

(Check all that apply)

- Master Data Management (1)
- Enterprise Performance Management (2)
- Customer Relationship Management (CRM) (3)
- Customer SelfService (4)
- Business Process Outsourcing (5)
- Governance, Risk and Compliance (6)
- Project Portfolio Management (7)
- Human Capital Management, HR/Payroll (8)
- Commerce Solution (9)
- Transportation Management (10)
- Customer Experience (11)
- Supply Chain Management (12)
- Sales and Distribution / Order Processing (13)
- CRM (14)
- Financial Management (i.e. Procurement, Budgeting, Project Accounting, etc.) (15)
- Product Lifecycle Management (PLM) (16)
- Advance Planning / Supply Chain (17)
- Materials Management (18)
- Product Configurator (19)
- Business Intelligence (20)
- Retail (21)
- Warehouse Management (22)
- Manufacturing / MRP (23)
- Transportation / Logistics (24)
- Other (please specify) (25) ____________________
Q33 Approximately what percentage of the company’s employees are/were users of the first ERP system your company implemented?

______ Percentage of Total Employees (1)

Q44 Definitions• Family Business is defined as a business where the family of the founder can effectively control the direction of the business and where the family benefits from the business in terms of wealth, income or identity. • Family is defined as a group of persons including those who are either offspring of the company founder and their in-laws as well as their legally adopted children. • Ownership means ownership of stock or company capital (equity or shareholder equity). When the addressing the ownership questions below, if the percentage of voting rights differs from percentage of ownership, please indicate voting rights. • Governance Board refers to the board that represents the ownership and governs the company (e.g. Board of Directors). • Management Board refers to the company board that manages or runs a company (e.g. top management team).

Q4 Please indicate the proportion of share ownership held by family and nonfamily members.

______ (a) Family % (1)

______ (b) Nonfamily % (2)
Q5 Are shares held in a holding company or trust?

- Yes (1)
- No (2)

Answer

If Are shares held in a holding company or similar entity (e.g., trust)? Yes Is Selected

Q6 If YES, please indicate the proportion of ownership:

(a) Main company owned by:

- (i) Direct Family Ownership % (1)
- (ii) Direct Nonfamily Ownership % (2)
- (iii) Holding Company % (3)
- (iv) Trust % (4)

(b) Holding company owned by:

- (i) Family Ownership % (1)
- (ii) Nonfamily Ownership % (2)

(c) Percentage of the trust for the benefit of:

- (i) The ownership family benefit % (1)
- (ii) Non-family benefit % (2)
Q9 Does the business have a Governance Board?

☐ Yes (1)
☐ No (2)

Answer If Does the business have a Governance Board? Yes Is Selected

Q10 If YES:

______ (a) How many Board members does the Governance Board comprise? (1)

______ (b) How many Board members are family? (2)

______ (c) How many nonfamily (external) members nominated by the family are on the Governance Board? (3)

______ (d) How many times a year does the Governance Board meet? (4)

Q11 Does the business have a Management Board?

☐ Yes (1)
☐ No (2)
Q12 If YES:

(1) How many persons does Management Board comprise?

(2) How many Management Board members are family?

(3) How many nonfamily Management Board members are chosen through them?

(4) How many times a year does the Management Board meet?

Q14 Definitions • The founding generation is viewed as the 1st generation. • Active family members involve those family members who contribute substantially to the business. These individuals might hold official positions in the business as shareholders, board members or employees.

Q15

(1) Which Generation (highest) owns the company?

(2) Which Generation (highest) manages the company?

(3) Which Generation (highest) is active on the Governance Board?
Q16

_____ How many family members participate actively in the business? (1)
_____ How many family members are working in the business? (2)
_____ How many family members are managers in the business? (3)
_____ How many family members are owners (including trust beneficiaries) of the business? (4)
_____ How many family members do not participate actively in the business but are interested? (5)
_____ How many family members are not (yet) interested at all? (6)
_____ How many family members are likely to be interested in being involved in the business in the future? (7)

Q22 Please rate the extent to which:

<table>
<thead>
<tr>
<th></th>
<th>Not at all (1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>To a large extent (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>The family has an influence on the business. (1)</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>The family members share similar values. (2)</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>The family and business share similar values. (3)</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>
Q23 Please rate the extent to which:

<table>
<thead>
<tr>
<th></th>
<th>Strongly Agree (1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>Strongly Disagree (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family members support the family business in discussions with friends, employees, and other family members. (1)</td>
<td>○</td>
<td>○</td>
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<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Family members feel loyalty to the family business. (2)</td>
<td>○</td>
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</tr>
<tr>
<td>Family members are proud to tell others that we are part of the family business. (3)</td>
<td>○</td>
<td>○</td>
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<tr>
<td>There is so much to be gained by participating with the family business on a long-term basis. (4)</td>
<td>○</td>
<td>○</td>
<td>○</td>
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<tr>
<td>Family members agree with the family business goals. (5)</td>
<td>○</td>
<td>○</td>
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<tr>
<td>Family members</td>
<td>○</td>
<td>○</td>
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<tr>
<td>Agree with the family business plans. (6)</td>
<td>Family members agree with the family business policies. (7)</td>
<td>Deciding to be involved with the family business has a positive influence on my life. (8)</td>
<td>I understand my family’s decisions regarding the future of the family business. (9)</td>
<td>I support my family’s decisions regarding the future of the family business. (10)</td>
<td>Family members are willing to put in a great deal of effort beyond that normally expected to help the family business be successful. (11)</td>
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</tbody>
</table>
Family members care about the fate of the family business. (12)

Q19 Thinking of the company's first ERP implementation project.

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree (1)</th>
<th>Disagree (2)</th>
<th>Somewhat Disagree (3)</th>
<th>Neither Agree nor Disagree (4)</th>
<th>Somewhat Agree (5)</th>
<th>Agree (6)</th>
<th>Strongly Agree (7)</th>
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<tbody>
<tr>
<td>The processes built into the ERP meet all the needs required to match organizational processes. (1)</td>
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<td>The processes flow built into the ERP correspond to the flow of organizational processes. (2)</td>
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<td>The processes built into the ERP accommodate the changes required to match organizational processes. (3)</td>
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</tbody>
</table>
The processes built into the ERP correspond to the business practices of our company. (4)
The name and meaning of the ERP data items correspond to those of the documents used in our company (i.e. an sales order sheet, sales report). (5)
The form and format of data items in the ERP correspond to those of the documents used in our company. (6)
The output data items of the ERP correspond to those of the documents used in our company. (7)
The input data items of
the ERP correspond to those of the documents used in our company. (8)

The user interface structures of the ERP are well designed to match the work structure required for conducting business in our company. (9)

The user interface of the ERP is well designed to meet the user capabilities of our company. (10)

The user interface of the ERP is well designed to meet the business needs of our company. (11)
Q18 Thinking of the company's first ERP implementation project.

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree (1)</th>
<th>Disagree (2)</th>
<th>Somewhat Disagree (3)</th>
<th>Neither Agree nor Disagree (4)</th>
<th>Somewhat Agree (5)</th>
<th>Agree (6)</th>
<th>Strongly Agree (7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>The cost of ERP project was significantly higher than budgeted. (1)</td>
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<td>The ERP project took significantly longer than expected. (2)</td>
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<td>The system performance of ERP is significantly below the expected level. (3)</td>
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<td>The anticipated benefits of ERP have not materialized. (4)</td>
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<td>The ERP implementation project was harmful to the company. (5)</td>
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<td>The ERP was abandoned after implementation as a result of its performance. (6)</td>
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</table>
The ERP project was a failure. (7)

Q17 Thinking of the company's first ERP implementation project.

<table>
<thead>
<tr>
<th>Strongly Disagree (1)</th>
<th>Disagree (2)</th>
<th>Somewhat Disagree (3)</th>
<th>Neither Agree nor Disagree (4)</th>
<th>Somewhat Agree (5)</th>
<th>Agree (6)</th>
<th>Strongly Agree (7)</th>
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<tr>
<td>Significant time and effort have been required to alter ERP data items to align with our organizational process needs. (1)</td>
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<tr>
<td>Significant time and effort have been required to append new ERP data items to align with our organizational process needs. (2)</td>
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<td></td>
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<tr>
<td>Significant time and effort have been required to alter ERP processes to align with our</td>
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<tr>
<td>1. <strong>organizationa l process needs. (3)</strong></td>
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<tr>
<td>2. <strong>Significant time and effort have been required to append new ERP processes to align with our organizationa l process needs. (4)</strong></td>
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<tr>
<td>3. <strong>Significant time and effort have been required to alter ERP input/output screens to align with our organizationa l process needs. (5)</strong></td>
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<td>4. <strong>Significant time and effort have been required to alter ERP reports to align with our organizationa l process needs. (6)</strong></td>
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<tr>
<td>5. <strong>This is an attention filter. Please select</strong></td>
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<tr>
<td>'Strongly Disagree' for this statement. (7)</td>
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<td>-------------------------------------------</td>
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</tbody>
</table>

If This is an attention filter... Is Not Selected, Then Skip To End of Block
Q20 Thinking of the company's first ERP implementation project.

<table>
<thead>
<tr>
<th>Strongly Disagree (1)</th>
<th>Disagree (2)</th>
<th>Somewhat Disagree (3)</th>
<th>Neither Agree nor Disagree (4)</th>
<th>Somewhat Agree (5)</th>
<th>Agree (6)</th>
<th>Strongly Agree (7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>There have been many users resisting the ERP implementation. (1)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>There have been many people blaming the occurrence of business problems on the ERP. (2)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>There have been many cases in which users persist traditional business practice even though the ERP changed the way of conducting business. (3)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>There have been many cases in which user departments did not reply to business requests from the ERP project team. (4)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>There have been many people pretending the ERP as a tool to cover up their mistakes. (5)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>There have been many people trying to sabotage the ERP project. (6)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>There have been many users complaining about the ERP's performance. (7)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>
been many people wishing for the ERP to fail. (5)

Q21 Thinking of the company's first ERP implementation project.

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree (1)</th>
<th>Disagree (2)</th>
<th>Somewhat Disagree (3)</th>
<th>Neither Agree nor Disagree (4)</th>
<th>Somewhat Agree (5)</th>
<th>Agree (6)</th>
<th>Strongly Agree (7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Significant time and effort have been required to alter elementary processes to align with the ERP. (1)</td>
<td></td>
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</tr>
<tr>
<td>Significant time and effort have been required to alter our process flows to align with the ERP. (2)</td>
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<tr>
<td>Significant time and effort have been required to standardize our organizational processes to align with the ERP. (3)</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
Significant time and effort have been required to integrate our redundant organizational processes to align with the ERP. (4)

Significant time and effort have been required to alter our document and data elements to align with the ERP. (5)

Q35 Do you have any thoughts, insights or anecdotes from your experience with family firms implementing and using ERP systems?

Q13 Thank you for your participation.