The Effect of Customer Relationship Management Systems on Firm Performance

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Abstract Customer Relationship Management (CRM) systems are a popular tool implemented by managers to improve the relationships between their firms and customers. These CRM systems boast numerous benefits to firms and customers that can improve customer satisfaction (Mithas et al. 2005). However, there is little research regarding the tangible benefits firms actually experience following CRM system implementation (Hendricks et al. 2007). In this study, we examine the operational benefits of CRM system implementations to firm performance. Specifically, we follow the framework established by Dehning and Richardson (2002) and examine the direct and indirect effects of CRM system implementation. Using a sample of firms that implement CRM systems that have audited financial data, we find that CRM system implementation improves performance both directly and indirectly. Specifically, we find that firms perform better and more efficiently following CRM system implementation. Additionally, we find that firms are better at collecting accounts receivables. Finally, we find that for those CRM firms that forecast earnings, the firms that implement CRM systems issue more accurate earnings forecasts. This study contributes to the literature by showing evidence of the tangible benefits of CRM systems.

I. INTRODUCTION

Worldwide spending on enterprise systems (ES) exceeded $250 billion in 2011, with expected growth of approximately 10% each year (Gartner 2011). This news is not surprising given the numerous benefits of Enterprise Resource Planning (ERP) and Supply Chain Management (SCM) systems documented by both practitioners and academics (Hitt et al. 2002; Nicolaou 2004; Dehning et al. 2007; Hendricks et al. 2007; Brazel and Dang 2008; Dorantes et al. 2013). These benefits include improved operational performance and efficiency, as well as the ability to forecast earnings with greater accuracy. Based on the benefits provided by these two ES applications, it is not surprising that firms spend significant amounts to implement them.

However, the extant literature does not thoroughly investigate the benefits of a highly touted third ES application, Customer Relationship Management (CRM) systems. Thus far the research finds that CRM systems do improve customer satisfaction (Mithas et al. 2005), but implementing CRM systems does not improve stock returns or profitability (Hendricks et al. 2007). This raises the question: If there are no measurable benefits achieved while implementing CRM systems, then why do companies to continue to invest heavily in them? The purpose of CRM systems is to improve the relationship between firms and their customers, potentially reducing costs of working with them as well as the ability to better retain current customers and attract additional customers. Therefore, we investigate whether companies that implement CRM systems improve operational performance.

CRM is a strategic approach to marketing that focuses on developing and maintaining appropriate relationships with customers often with the aid of information technology (IT), or CRM systems (Payne and Frow 2005). In their attempts to define what CRM is, Payne and Frow (2005) state that, "CRM provides enhanced opportunities to use data and information to both understand customers and cocreate value with them. This requires a cross-functional integration

of processes, people, operations, and marketing capabilities that is enabled through information, technology, and applications." Simply put, the purpose of CRM and the related systems is to develop and maintain relationships with customers.

Early IT literature documents a Productivity Paradox in which researchers are unable to find a positive relation between IT spending and productivity or profitability measures (Weill 1992; Landauer 1995). These studies brought in to question why firms would invest in IT because the firms would experience no operational benefits. However, more recent papers find that contingent on certain factors there are positive payoffs from investments in IT (Brynjolfsson and Hitt 1995, 1996; Hitt and Brynjolfsson 1996; Dewan and Min 1997; Stratopoulos and Dehning 2000). Thus future research turned to examining when and how IT investments are successful.

Vendors that sell CRM systems boast of the numerous benefits that these systems provide such as improving profitability, customer satisfaction, sales productivity, and sales predictability (Taber 2013). Given these benefits, it is not surprising that companies are forecasted to spend $23.9 billion on CRM systems in 2014 (Gartner 2014). However, it is surprising that the academic literature identifies few tangible benefits of CRM systems given the capabilities of the systems and the amount of money companies spend on them. It is possible that for many companies that companies either overestimated the benefits of CRM systems, underutilized them, had inadequately trained staff, or had CRM systems that simply provided too much information (Taber 2014). Any of these situations could lead to a less than optimal CRM system implementation.

Perhaps in line with the Productivity Paradox, the academic literature identifies few benefits following CRM system implementations. For example, Mithas et al. (2005) find that

customer knowledge increases following CRM system implementation. Similarly, other studies find that following CRM system implementation, customer satisfaction and retention improves (Sutton and Klein 2003; Boulding et al. 2005). Conversely, other studies argue that not all customers value a relationship with firms and therefore improving customer satisfaction does not necessarily lead to better firm performance (Dowling 2002; Danaher et al. 2008). This notion is supported by Hendricks et al. (2007) who find no association between CRM system implementation and stock returns or firm profitability. However, given the numerous features of CRM systems and the benefits for customers, we predict that there must be some measurable benefits for the firms that choose to implement them.

In examining the potential advantages of CRM system implementation we utilize Figure 1, adapted from Dehning and Richardson (2002). Prior literature focuses on path number 1, or the direct effect that IT has on firm performance measures. While we agree that CRM system implementation should improve firm performance, we argue that it is more important to first examine whether CRM systems improve business process measures (path number 2 in Figure 1). We also argue that a focus on direct performance measure improvement may be the reason why prior literature finds mixed results regarding the benefits of CRM system implementations (Hendricks et al. 2007)

Based on the benefits mentioned by Taber (2013), we first examine whether CRM system implementation improves sales, sales efficiency (operating margin and selling, general, and administrative (SGA) expenses), and the ability to collect accounts receivable. Given that a primary objective of CRM system implementation is to gain new customers (Payne and Frow 2005), CRM system implementers should experience an increase in sales. In addition to operational performance, we focus on sales efficiency and examine how CRM system

implementations affect selling, general, and administrative (SGA) expenses. Due to the improvements in customer relationships, firms should be spending less for each sale made. Extant literature does find a positive relationship between CRM system implementation and customer satisfaction (Sutton and Klein 2003; Boulding et al. 2005). We test this from a different perspective by examining the effect of CRM system implementation on accounts receivable. If customers are happier with the firm, and if communication is improved between the firm and customers due to better tracked information regarding outstanding bills, then the firms implementing CRM should be better at collecting accounts receivable. Therefore, we expect that accounts receivable collectability will improve following CRM system implementation.

We next examine whether CRM system implementation improves firm performance measures, specifically return on assets (ROA) and cash flows from operations. Arguably CRM systems help facilitate forecasting future sales and by extension, the forecasting of earnings. As our final test, we examine whether the accuracy of management earnings forecasts improves following CRM system implementation.

We identify a sample of 95 CRM system implementations using press releases from both the CRM system vendors and the firms implementing the systems. We identify CRM system implementations that occurred between 2001 and 2011. Compared to a control sample, identified using a similar method to Hendricks et al. (2007), we find that firms that implement CRM systems experience significant improvements in all of the areas suggested by Taber (2013).

First, we find that CRM system implementation improves business processes. Compared to the control group, firms that implement CRM systems experience greater improvements in sales. This finding is consistent with the expectation that CRM systems assist in both developing

and maintaining relationships with customers (Payne and Frow 2005). Next, we find that firms that implement CRM systems improve their sales efficency. We specifically find that firms that implement CRM systems improve their operating margins. We also find that these firms reduce SGA expenses as a percentage of both sales and assets. Therefore it appears that firms that implement CRM systems, spend less on each sale that is made, thus improving operating efficiency. Finally, we find that receivables collectability improves following CRM system implementation. We find that following CRM system implementation firms report a reduction in the allowance for doubtful accounts. This may be a less direct measure of customer satisfaction than the measures used in the extant literature (Mithas et al. 2005), but it does provide evidence of another operational component that CRM systems improve. This finding suggests that CRM systems either improve customer satisfaction sufficiently enough that customers are more likely to pay on their accounts or improve the firm's ability to collect receivables. Overall, we find evidence to support path 2 in Figure 1.

We next examine whether CRM system implementations firm performance measures.[1] Similar to our findings related to sales we find that following CRM system implementations firms report better operational performance, measured by ROA and cash flows from operations. Finally, we find evidence that following CRM system implementation, firms issue more accurate earnings forecasts. This result suggests the CRM systems improve sales predictability.

This paper contributes to the ongoing stream of research examining the benefits of ERP systems. For example, the extant literature shows that managers believe that ERP systems aid in decision making, performance, and timeliness of information (Klaus et al. 2000; Shang and Seddon 2002; Spathis 2006). Additionally, Dorantes et al. (2013), find that managers are able to

[1] For the tests of firm performance measures, we do not differentiate if the improvements are a result of path 1 or path 3 in figure 1.

more accurately forecast earnings following ERP system implementation. Complementing that study, Brazel and Dang (2008) find that firms are able to reduce the time between their fiscal year end and their earnings announcement date after they implement ERP systems. Finally, while the prior evidence is mixed, the general consensus is that ERP systems improve operational performance and are viewed positively by the stock market (Hitt et al. 2002; Hendricks et al. 2007). Additionally, some research finds that implementing SCM systems, a specific application of ES, improves the financial performance of the firms implementing them (Dehning et al. 2007). We contribute to this literature by examining the operational benefits that firms receive when they implement CRM systems, another critical application of ES.

Therefore, we also specifically contribute to the literature that investigates the benefits of CRM. Thus far, the extant literature finds that firms that implement CRM systems experience improved customer satisfaction and retention (Sutton and Klein 2003; Boulding et al. 2005). Additionally, Mithas et al. (2005) find that CRM systems can improve customer knowledge. We contribute to this stream of literature, because thus far there is no empirical evidence supporting the notion that CRM systems actually improve operational performance.

This study should be of particular interest to firms interested in implementing CRM systems and the vendors that sell them. As far as we are aware, this study is the first to document empirical evidence of the operational benefits firms enjoy following the implementation of CRM systems. We document the specific areas where firms see improvement following implementation of CRM systems. This study should assist firms in deciding whether a CRM system will be a good fit for their needs. We also provide support for the various features that CRM system vendors tout about their products, suggesting that these claims may be accurate.

We organize the remainder of the paper as follows. First, we develop our hypothesis, which includes a review of relevant literature. Second, we describe our sample and research design. Finally, we discuss the results and provide a conclusion to the study.

II. BACKGROUND AND HYPOTHESIS DEVELOPMENT

Despite the fact that firms spend billions of dollars on IT each year (Gartner 2011), some argue that IT is a commodity that no longer offers a strategic advantage (Carr 2003). These authors argue that most executives view IT as a resource that is necessary to remain competitive, but is not used as a strategy to gain an advantage. Essentially IT is characterized as being "essential to competition but inconsequential to strategy" (Carr 2003). In fact, this author goes on to point out that often there is not a correlation between money spent on IT and positive financial results. As the prior literature suggests, when IT is treated like a commodity and is not used strategically, then IT is not likely to lead to success (Rai et al. 2002; Koch 2007).

Their anecdotal evidence showing that failure to support new IT can be disastrous for a firm. Large companies such as Nike and Hewlett-Packard (HP) lost millions of dollars following failed IT implementations (Koch 2004; Koch 2007). While not every failure is so disastrous, firms often do not experience the returns they expect after implementing new IT (Devaraj and Kohli 2003; Venkatesh and Bala 2008). Given that IT is seen as a commodity and the risk of failure is sufficiently high, one may see it as peculiar that firms continue to invest increasing sums of money each year.

One possible explanation is that despite the potential risks, the extant literature does find benefits for specific IT investments. First, a number of papers document a correlation between IT investments and positive financial performance (Dehning and Richardson 2002; Dehning et al. 2007; Kobelsky et al. 2008). As another example, Masli et al. (2010) show that firms are able

to reduce the likelihood of material weaknesses in internal controls when they implement IT specifically aimed at monitoring the effectiveness of internal controls. There is also a stream of literature that examines the benefits of ERP systems and other components of ES. First, Brazel and Dang (2008) show that ERP systems reduce the financial reporting lag. They specifically find that following ERP system implementation, the time between a firm's fiscal year end and the earnings announcement reduces. In another paper, Dorantes et al. (2013) find that ERP systems improve the internal information environment. Specifically, they find that the quality of management forecasts improves following ERP system implementation. Finally, a number of papers conclude that ERP systems improve financial operating performance (Hitt et al. 2002; Hendricks et al. 2007). However, despite the documented evidence of the benefits of ERP systems, thus far there is no empirical evidence supporting the touted benefits of CRM systems. Therefore, given the risks associated with IT implementations, it is peculiar that firms continue to invest in CRM systems.

Payne and Frow (2005, p. 168) define CRM as follows:

> "CRM is a strategic approach that is concerned with creating improved shareholder value through the development of appropriate relationships with key customers and customer segments. CRM unites the potential of relationship marketing strategies and IT to create profitable, long-term relationships with customers and other key stakeholders. CRM provides enhanced opportunities to use data and information to both understand customers and cocreate value with them. This requires a cross-functional integration of processes, people, operations, and marketing capabilities that is enabled through information, technology, and applications."

CRM itself is a strategy firms use to develop and improve relationships with customers. This strategy is most often associated with the implementation of a CRM system. Overall, customers and managers appear to be happy with CRM systems, as the extant literature, using information gathered from surveys, documents that CRM systems improve customer knowledge, satisfaction,

and retention (Sutton and Klein 2003; Boulding et al. 2005; Mithas et al. 2005). However, other papers argue that, these improvements may not lead to benefits for a firm because customers do not necessarily desire or value strong relationships (Dowling 2002; Danaher et al. 2008). Therefore, it is not that surprising that the extant literature fails to empirically document any operational benefits of CRM system implementation (Hendricks et al. 2007). However, we predict that there are specific business process areas that are positively impacted by CRM system implementation.

The primary focus of most of the ES literature is on how IT can improve profitability (Dehning and Richardson 2002; Hitt et al. 2002; Hendricks et al. 2007). If CRM systems aid firms in developing and maintaining relationships with customers then these firms should experience increases in profitability. It is unclear, however, if the increase in profitability should be due to an increase in revenue (from making cross sales to current customers or finding new customers), a reduction of expenses, or a combination of both. In behavioral studies, researchers find that CRM systems improve customer happiness, leading to greater customer knowledge, satisfaction, and retention (Sutton and Klein 2003; Boulding et al. 2005; Mithas et al. 2005). We predict that it requires less effort to make sales to a customer who is already happy with your firm. We also predict that happy customers will also be more likely to pay their accounts in a timely manner. In their definition of CRM, Payne and Frow (2005, p. 168) state that "CRM provides enhanced opportunities to use data and information to both understand customers and cocreate value with them." The improvements to information flows regarding customer should also assist in the accounts receivables collections process. Overall, we predict that CRM systems make collecting on accounts receivable easier. We therefore first focus on the potential of CRM systems to directly improve business process measures (path 2 in Figure 1). Therefore, we

predict that CRM system implementation will directly improve sales, sales efficiency, and accounts receivable collectability. Specifically, our first hypothesis is as follows:

> **Hypothesis 1:** Firms that implement CRM systems improve their business process measures to a greater degree than firms that do not implement CRM systems.

We next examine whether CRM system implementations improve operational performance measures, either directly or indirectly. Vendors of CRM systems specifically list increasing profitability as a primary benefit of implementing CRM systems (Taber 2013); however, thus far the extant literature fails to document any empirical evidence supporting this claim (Hendricks et al. 2007). We argue that regardless of which business processes are improved by CRM system implementation (increases in sales or decreases in SGA expenses for example), there should be some improvement in operational performance. Specifically, our second hypothesis is as follows:

> **Hypothesis 2:** Firms that implement CRM systems improve operational performance to a greater degree than firms that do not implement CRM systems.

The final potential benefit that Taber (2013) identifies regarding CRM system implementation is sales predictability. As mentioned earlier, CRM systems provide better information for management regarding their customers. CRM systems allow management to better track sales. Similar to the evidence that enterprise systems provide critical information to assist managers in forecasting earnings (Dorantes et al. 2013), we predict that firms are able to better predict future sales following CRM implementation, as evidenced by their earnings forecasts. Specifically, our third hypothesis is as follows:

> **Hypothesis 3:** Firms that implement CRM systems improve their sales predictability (as evidenced by management earnings forecasts) to a greater degree than firms that do not implement CRM systems.

III. RESEARCH DESIGN

To collect our sample we use Lexis-Nexis to search for press releases announcing the implementation of CRM systems. These announcements are usually either made by the CRM system vendor or the firm implementing the system. To identify the CRM systems implementations, we search for the terms "CRM" or "Customer Relationship Management" and then read through each press release individually to ensure that it does indeed represent a new CRM system implementation. We then identify the firm that is implementing the CRM system. Through this process we are able to identify 138 public firms that adopt a CRM system sometime during the years of 2001-2011. We then eliminate 51 of these observations because they either do not have the necessary data available to compute our financial variables in Compustat, or because we are unable to find an appropriate matching control firm. Therefore, we end with 87 CRM system implementers with the appropriate data available.

We follow Hendricks et al. (2007) in identifying our control sample. For each treatment firm we identify all firms that are within the same industry using the two-digit SIC code. We then identify all potential control firms with ROA within 90-110% the treatment firm in the year of the CRM system implementation announcement.[2] We develop these guidelines following Hendricks et al. (2007) and Barber and Lyon (1996). The authors of these papers document the importance of using a portfolio of firms for the comparison group, and that utilizing this method allows for well-specified and powerful test statistics. Using this method, we have a final sample of 1,256 observations, 87 treatment observations and 1,169 control observations.[3] Panel A of Table 1 provides the distribution of the sample across time. It appears that CRM system

[2] We verify that ROA is not statistically significantly different between our treatment and control firms in year t-1, or the year prior to CRM system implementation for our treatment firms.
[3] Due to data restrictions, our sample is reduced to 342 for our tests of management earnings forecasts.

implementations were more frequent in the early 2000s and then taper off over time.[4] Panel B of Table 1 provides an industry distribution of our sample. It appears that firms in service industries are the most common adopter of CRM systems, but the sample appears to be somewhat evenly distributed among all industries. Table 2 provides definitions for the variables used throughout the paper. Finally, Table 3 provides descriptive statistics for all of the observations in the pre-implementation period.

We use a difference-in-differences approach to examine changes in performance measures over a four year period. We essentially examine the change in our measures from year t-1 (the year before the implementation announcement) to year t+2 (the second year following the implementation announcement. We choose this time frame because prior literature suggests that CRM systems take approximately one year to fully implement (Hendricks et al. 2007). Therefore, year t-1 is the last year before CRM system implementation begins, and year t+2 is the first full year of operations with the CRM system implemented. This allows us to examine actual performance without the effects of any costs directly related to the CRM system implementation. Since our sample includes two years for each firm (the pre and post years), our final sample consists of 2,512 observations, 174 treatment observations and 2,338 control observations.

To examine how CRM systems potentially benefit firms, we investigate whether CRM system implementations affect a selection of performance variables. We therefore use the following OLS regression model to test our Hypotheses 1 and 2 (see Table 2 for variable definitions):

[4] Our number of control firms does not matchup 1 to 1 with our treatment firms, because as discussed we retain all possible control observations that meet the matching criteria.

$$[\text{Performance Measures}]_{i,t} = \lambda_0 + \lambda_1 CRM_{i,t} + \lambda_2 After_{i,t} + \lambda_3 CRM*After_{i,t} + \lambda_4 Size_{i,t} + \lambda_5 MTB_{i,t} + \lambda_6 RD_{i,t-1} + \lambda_7 ADV_{i,t-1} + \lambda_8 ROA_{i,t-1} + \lambda_8 CapInt_{i,t-1} + \varepsilon_{i,t} \quad (1).$$

For all of the models, we include year and industry fixed effects, and estimate robust standard errors clustered by firm following Petersen (2009).

Our variable of interest is the interaction of *CRM* and *After*. This coefficient (λ_3) should measure the effect of CRM system implementations during the post implementation year. We run the model numerous times using different Performance Measures as the dependent variable. For our first hypothesis, we are interested in direct measures of business process improvementy. Therefore, we use *Sales, Sales Scaled, Oper Margin, SGA, SGA Scaled, ARTurn, Doubtful,* and *Doubtful Scaled* as our dependent variables for testing Hypothesis 1. We expect λ_3 to be positive and significant for *Sales, Sales Scaled, Oper Margin,* and *ARTurn*. We expect λ_3 to be positively related to *Oper Margin* because a larger operating margin indicates better operational efficiency. Essentially, the operating margin is a measure of what percentage of each dollar of sales becomes profit. We expect λ_3 to be positively associated with *ARTurn* because we expect firms to be able to more effectively and efficiently collect on their accounts receivables. We expect λ_3 to be negative and significant for *SGA, SGA Scaled, Doubtful,* and *Doubtful Scaled.*[5] We predict that CRM systems reduce the amount the companies will need to spend on SGA expenses to make sales. We expect λ_3 to be negatively associated with both of our allowance for doubtful accounts variables. These results would suggest that CRM systems positively impact our business process measures of sales, sales efficiency, and accounts receivable collectability.

[5] In our tests of *SGA* and *SGA Scaled* we do not include *RD, ADV,* or *CAPINT* in the model due to the mechanical relationship of those variables.

For our second hypothesis, we are interested in measuring the effect of CRM systems on operational performance. We use *ROA, CFO,* and *CFO Scaled* as our dependent variables to test Hypothesis 2. We expect λ_3 to be positively associated with all of these dependent variables, indicating that CRM system implementations positively improve operational performance, either directly or indirectly (paths 1 and 3 in Figure 1).

We include control variables based on prior literature that investigates firm performance (Hendricks et al. 2007; Campbell 2014). We control for size (*Size*) and growth (*MTB*) factors that prior literature finds is associated with performance. Additionally, prior literature finds that prior performance is one of the best determinants of future performance, and therefore we include lagged values of *RD, ADV, ROA,* and *CapInt*. Finally, as suggested by Hendricks et al. (2007), we include a control for industry and time effects by including year and industry fixed effects.

For our third hypothesis, we are interested in the effect that CRM systems have on earnings predictability, and therefore consider management earnings forecasts. We use the following OLS regression model to test Hypothesis 3 (see Table 2 for variable definitions):

$$Abs\_Error_{i,t} = \beta_0 + \beta_1 CRM_{i,t} + \beta_2 After_{i,t} + \beta_3 CRM*After_{i,t} + \beta_4 Size_{i,t} + \beta_5 ROA_{i,t} + \beta_6 Loss_{i,t} + \beta_7 Leverage_{i,t} + \beta_8 EarnVol_{i,t} + \beta_9 CFOVol_{i,t} + \beta_{10} Growth_{i,t} + \beta_{11} IndCon_{i,t} + \beta_{12} Big4_{i,t} + \beta_{13} LnAnalysts_{i,t} + \beta_{14} Std\_AF_{i,t} + \beta_{15} Surprise_{i,t} + \beta_{16} Horizon_{j,i,t} + \beta_{17} Litigation_{i,t} + \beta_{18} High\ Tech_{i,t} + \beta_{19} Weak_{i,t} + \varepsilon_{i,t} \quad (2).$$

For this model we include year fixed effects and estimate robust standard errors clustered by firm. *Abs_Error* is the absolute value of management forecast error, measured as realized earnings less the management forecast, scaled by the closing stock price on the last day of the previous fiscal year. Therefore, a larger number is an indicator of greater error and less accurate

forecasts. Our variable of interest is again the interaction of *CRM* and *After*. We predict that CRM systems make it easier for firms to predict earnings. Following CRM system implementation management earnings forecasts should be more accurate. Therefore, we predict β_3 to be negative, indicating more accurate forecasts.

We include additional independent variables to control for other factors that can possibly affect management forecast quality based on prior literatures. Because larger firms tend to have more experienced and knowledgeable staff, we expect firm size (*Size)* to be positively associated with management forecast accuracy (Kasznik and Lev 1995). Prior literature also finds that more profitable firms tend to make more accurate forecasts and therefore we include *ROA* (Baik et al. 2011). Based on Hayn's (1995) findings that earnings of loss firms are less informative than profitable firms, other papers find a negative relationship between *Loss* and the accuracy of earnings forecasts. Feng et al. (2009), similarly find financially challenged firm issue less accurate forecasts, which is why we include both *Loss* and *Leverage*. We include *EarnVol* and *CFOVol* because other papers find that firms with highly volatile earnings face greater difficulty in issuing accurate forecasts (Feng et al. 2009; Dorantes et al. 2013). Feng et al. (2009) also find that firms with greater sales *Growth* tend to issue less accurate forecasts. Bamber and Cheon (1998), find that industry competitive pressures can influence disclosures, and we thus include *IndCon.* The extant literature shows that clients of *Big4* auditors tend to issue more accurate earnings forecasts (Lang and Lundholm 1993; Ajinkya et al. 2005; Feng et al. 2009). The prior literature also finds relationships between analyst behavior and management forecast accuracy. Specifically, this research finds that greater analyst following creates pressure for higher quality disclosure, while more analyst dispersion signifies greater forecasting difficulty, and therefore we include both *LnAnalysts* and *Std_AF* (Ajinkya and Gift 1984; Swaminathan 1991; Lang and

Lundholm 1996; Ajinkya et al. 2005). The management forecast literature shows that it is more difficult to forecasts earnings further from the period end, which we control for using *Horizon* (Baginski and Hassell 1997; Ajinkya et al. 2005). We include *Litigation* and *High Tech*, to control for the fact that firms that operate in more litigious and high tech industries face different disclosure pressures (Francis et al. 1994). Finally, recent literature finds that firms with poor internal controls release earnings forecasts that are less accurate, which we control for by including *Weak* (Feng et al. 2009; Li et al. 2012).

IV. RESULTS

Table 4 presents univariate results of comparisons between CRM implementation firms and our control firms. We compare CRM firms to control firms both before and after the CRM implementation. In addition, we compare CRM to themselves from before the implementation to after the CRM system implementation. It is not surprising that due to our matching criteria, in the before implementation period, the treatment and control firms are quite similar to each other. The only significant differences are in *Sales* (unscaled), *CFO* (unscaled), *Doubtful*, *Abs_Error*, and *Size*. We next compare CRM implementation firms to themselves from before implementation to after. With the exception of *ROA* and *Abs_Error*, none of these differences are statistically different. However, most of the variables change in the direction that we expect. For example, in the after implementation period, our treatment firms appear to report higher *ROA, Sales,* and *Cash Flows* from operations. They also report lower *SGA* expense, greater *ARTURN,* and a lower balance in the allowance for doubtful accounts. While most of these differences are not statistically significant it does suggest that when we control for market changes utilizing our difference in differences multivariate approach we may see significant results. Finally, we compare our treatment and control firms in the period after implementation.

The only significant differences are the same as the pre-implementation period, but the difference is in the opposite direction for *Abs_Error* suggesting CRM system implementers improve their management earnings forecast accuracy.

Tables 5, 6, and 7 present the regression results for our tests of Hypothesis 1, regarding the direct effects of CRM system implementations on business process measures. In Table 5, we specifically examine the effect of CRM systems implementations on sales. The coefficient on the interaction of *CRM* and *After* represents how the CRM implementers improved their performance over the four-year period from one year before CRM implementation to two years after implementation compared to control observations over the same four-year period. The positive and significant coefficient in both Columns 1 and 2 suggests that CRM systems allow companies to improve their sales as raw sales and total sales scaled by total assets increased at a greater rate than for control firms. This suggests the firms that implement CRM systems are able to improve their sales business process allowing them to attract new customers, and make more sales to existing customers. Overall, the evidence supports our first hypothesis suggesting that CRM systems do positively affect business processes.

Table 6 presents the regression results for our tests of sales efficiency. For all three columns, our coefficient of interest is in the predicted direction and is significant ($p<0.10$). The positive and significant coefficient in Column 1 suggests that CRM systems improve the operating margin for firms that choose to implement them. This suggests that firms are making more profit off of each dollar of sales following CRM system implementation. The negative and significant coefficients in both Columns 2 and 3 suggest that these firms are spending less than control firms on SGA expenses as scaled by both sales and total assets. Essentially, firms are spending less than control firms on SGA expenses following CRM implementation without

sacrificing sales. These results further support our first hypothesis, because they show that CRM systems improve business processes that affect sales efficiency. This is important for firms because it allows them to do more with less money.

Table 7 presents the regression results for our tests of effect of CRM systems implementations on firms' ability to collect accounts receivable. Our coefficient of interest is in the predicted direction for all three columns, but it is only statistically significant ($p<0.10$) in Columns 2 and 3. The positive coefficient in Column 1 suggests improvements to the accounts receivable turnover ratio; however, the result is not statistically significant so we do not draw any conclusions from this result. The negative and significant coefficients in Columns 2 and 3 show that firms that implement CRM systems reduce their allowance for doubtful accounts to a greater degree than control firms. This suggests that firms are more confident in their ability to collect accounts receivable following CRM system implementation, further supporting our first hypothesis.

Table 8 presents the results of testing our second hypothesis regarding CRM systems and operation performance. We predict that firms that implement CRM systems should experience improved operational performance, either directly through the CRM implementation or indirectly due to the business process improvements examined in Hypothesis 1. In Column 1, we find that our coefficient of interest is approaching significance ($p=0.111$). This indicates that while it appears that CRM systems may positively impact *ROA*, signifying an increase in profitability, the results are not quite statistically different from zero. However, the coefficient is positive and significant in both of the remaining columns ($p<0.10$). The positive and significant coefficient in both Columns 2 and 3 show that CRM system firms experienced a greater increase in operational

cash flows than control firms. Overall, we find marginal evidence supporting our second hypothesis.

Finally, Table 9 presents the results of the test of our third hypothesis regarding CRM systems and earnings predictability. In this test we examine whether the implementation of CRM systems affect management earnings forecasts. Our coefficient of interest is negative and significant (p=0.012), indicating a lower forecast error and more accurate management earnings forecasts. As we predicted, firms that implement CRM systems are able to forecast future earnings more accurately than control firms following the implementation of the system. This supports our fourth hypothesis because this suggests that CRM systems are associated with earnings predictability.

V. CONCLUSION

The extant literature documents numerous benefits firms received from implementing new IT, especially ERP systems. However, despite vendor claims of how CRM systems can improve numerous facets of companies that adopt them, thus far the extant literature fails to empirically document any operational benefits of CRM systems. Using a sample of firms that implement CRM systems, we examine a collection of possible benefits for firms that choose to adopt these systems.

Our analysis provides evidence of numerous operational benefits these systems provide for firms. Specifically, we find that following CRM system implementation firms show improvements in operational performance, operational efficiency, accounts receivable collectability, and earnings predictability. These results are evidenced through increases in sales and operational cash flows, a reduction to the operating margin, a reduction of the allowance for

doubtful accounts, more accurate management earnings forecasts, and improvements to other similar performance measures.

We extend the literature that examines the benefits of ES, by examining a specific type of system that has thus far not been fully investigated. Our study should be of interest to vendors of CRM systems and firms interested in implementing them as we show numerous benefits these firms can receive if they choose to do so. Overall, we find support for the positive implications of CRM system implementation.

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Figure 1
Framework for the Benefits of IT Investments (adapted from Dehning and Richardson 2002)

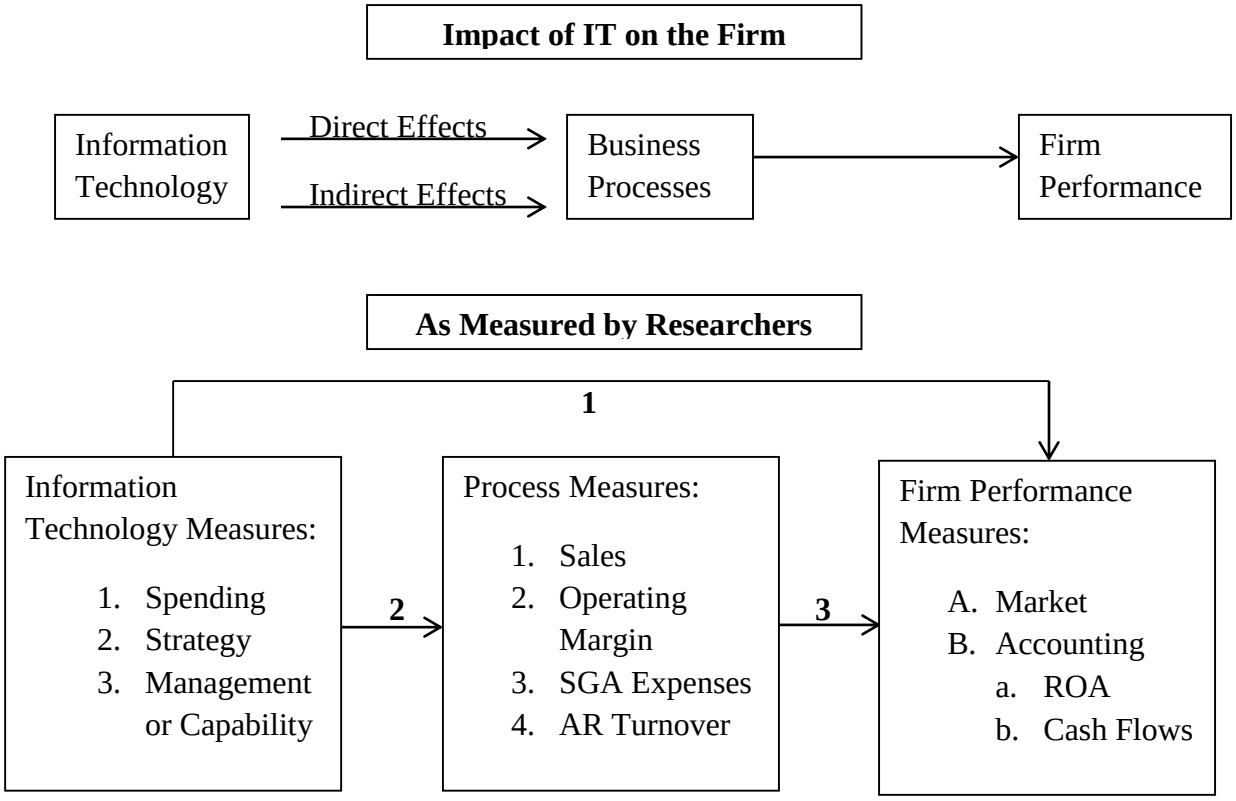

Table 1
Sample Statistics

Panel A: Year Distributions

Year	CRM Implementations	Control Firms	All Firms
2001	13	108	121
2002	22	304	326
2003	11	152	163
2004	13	288	301
2005	10	174	184
2006	11	89	100
2007	3	12	15
2008	1	13	14
2009	2	15	17
2010	0	0	0
2011	1	14	15
Total	87	1,169	1,256

Panel B: Industry Distributions

Industry	2-Digit SIC Code	CRM Implementations	Control Firms	All Firms
Chemicals	28-29	6	101	107
Electrical	36, 38	13	178	191
Equipment	35	5	39	44
Retail Sales	50-59	9	37	46
Services	70-79	16	375	391
All Others	All Others	38	439	477
Total		87	1,169	1,256

Table 2. Variable Definitions	
Panel A: Dependent Variable Definitions	
Variable	**Definition**
ROA	the return on assets calculated as net income before extraordinary items divided by total assets in year t.
Sales	the raw amount of sales in year t.
Sales Scaled	sales scaled by total assets in year t.
CFO	total cash flows from operations in year t.
CFO Scaled	total cash flows from operations scaled by total assets in year t.
Oper Margin	the operating margin calculated as total operating income divided by sales in year t.
SGA	total selling, general, and administrative expenses scaled by total sales in year t.
SGA Scaled	total selling, general, and administrative expenses scaled by total assets in year t.
ARTurn	accounts receivable turnover calculated as net sales divided by average accounts receivable in year t.
Doubful	the allowance for doubtful accounts in year t.
Doubtful Scaled	the allowance for doubtful accounts scaled by sales in year t.
Abs_Error	the absolute value of the management forecast error (realized earnings less the management forecast) / lagged stock price.

Table 2. Variable Definitions	
Panel B: Independent Variable Definitions	
Variable	**Definition**
CRM	an indicator variable coded as one if the firm is a CRM implementer and zero otherwise.
After	an indicator variable coded as one for observations that occur after the CRM implementation or the control year match and zero otherwise.
Size	the natural log of total assets in year t.
MTB	the market to book ratio calculated as the market value of equity divided by the book value in year t.
RD	total research and development expenses scaled by sales in year t.
ADV	total advertising expenses scaled by sales in year t.
CapInt	capital intensity calculated as total assets divided by total sales in year t.
Loss	an indicator variable coded one if the firm reports a net loss in year t, and zero otherwise.
Leverage	total liabilities divided by total assets in year t.
EarnVol	the standard deviation of ROA over the prior 10 years.
CFOVol	the standard deviation of operating cash flows over the prior 10 years.
Growth	percentage of sales growth from year t-1 to year t.
IndCon	the Herfindahl index in year t, measured as the sum of the squares of the market shares of all firms within the same three-digit SIC industry.
Big4	an indicator variable coded one if the firm engages a Big 4 auditor in year t, and zero otherwise.
LnAnalysts	the natural log of the number of analysts following the firm at the end of year t.
Std_AF	the standard deviation of the individual analyst forecasts for year t, immediately prior to the management forecast for year t.
News	the management forecast value less the pre-existing median analyst forecast scaled by lagged stock price.
Horizon	the number of days between the date of issuance for the management forecast and the fiscal year end date.
Litigation	an indicator variable coded one if the firm operates in an industry that is associated with increased litigation (SIC codes 2833-2836, 3570-3577, 7370-7374, and 3600-3674 following Francis et al. 1994) and zero otherwise.
High Tech	an indicator variable coded one if the firm operates in a high tech industry (as identified by Francis and Schipper 1999), and zero otherwise.
Weak	an indicator variable coded one if the firm reports any material weaknesses in internal controls in year t, and zero otherwise.

Table 3
Descriptive Statistics

Variable	Mean	Standard Deviation	25th Percentile	Median	75th Percentile
ROA	-0.090	0.491	-0.025	0.012	0.056
Sales	2396.339	9105.019	36.813	118.381	785.727
CFO	463.985	2014.793	-0.351	12.713	110.919
Oper Margin	-0.538	8.368	0.039	0.166	0.325
SGA	0.510	1.666	0.193	0.298	0.450
ARTurn	13.575	41.193	4.631	6.052	8.272
Doubtful	28.904	134.079	0.284	1.339	6.986
Abs_Error	0.010	0.010	0.003	0.007	0.016
CRM	0.070	0.255	0.000	0.000	0.000
Size	6.056	2.378	4.453	6.090	7.492
MTB	1.986	44.105	1.353	2.009	3.489
RD	0.455	6.373	0.000	0.000	0.110
ADV	0.017	0.081	0.000	0.000	0.125
CapInt	8.743	73.545	0.919	1.681	12.006

Table 4

Univariate Analysis

	CRM-Before	Control-Before	CRM & Control Before		CRM-After	CRM Before and After		Control-After	CRM & Control After	
	N=87	N=1169	Difference	P-Value	N=87	Difference	P-Value	N=1169	Difference	P-Value
Abs_Error	0.021	0.009	-0.012	<0.001***	0.006	-0.015	<0.001***	0.014	0.008	0.002***
ADV	0.016	0.017	0.000	0.995	0.015	-0.001	0.765	0.013	-0.002	0.502
ARTurn	11.428	13.791	2.363	0.623	15.995	4.567	0.386	11.195	-4.799	0.196
CapInt	2.781	9.191	6.411	0.439	4.628	1.848	0.472	6.224	1.596	0.294
CFO	1565.625	358.033	-1207.592	<0.001***	1985.184	419.559	0.503	469.150	-1516.034	<0.001***
Doubtful	129.121	19.013	-110.107	<0.001***	83.18	-45.941	0.255	25.833	-57.347	0.002***
MTB	3.393	1.880	-1.512	0.761	1.910	-1.483	0.292	1.072	-0.838	0.776
Oper Margin	-0.084	-0.572	-0.488	0.604	-1.224	-1.140	0.431	-0.380	0.844	0.309
RD	0.221	0.473	0.252	0.753	1.198	0.977	0.412	0.248	-0.950	0.017**
ROA	-0.310	-0.940	-0.630	0.254	0.020	0.331	0.075*	-0.057	-0.077	0.135
Sales	10492.81	1787.851	-8704.959	<0.001***	12494.68	2001.87	0.610	2433.191	-10061.489	<0.001***
SGA	0.319	0.524	0.205	0.275	0.294	-0.025	0.595	0.757	0.463	0.531
Size	7.693	5.933	-1.760	<0.001***	7.896	0.203	0.567	6.226	-1.67	0.002***

All p-values are two-tailed. *, **, and *** represent significance levels of 0.10, 0.05, and 0.01 respectively.

Table 5
Business Process Improvements -- Sales

Variables	Column 1 Sales	Column 2 Sales Scaled
Intercept	-9,471.530**	0.867***
	(0.037)	(0.000)
CRM	2,808.67	0.138**
	(0.128)	(0.041)
After	-992.544**	0.100***
	(0.019)	(0.005)
*CRM*After*	2,103.457***	0.062*
	(0.008)	(0.078)
Size	2,335.784***	-0.070***
	(0.000)	(0.000)
MTB	-6.688***	0.000
	(0.003)	(0.126)
RD	-25.273**	-0.001
	(0.015)	(0.774)
ADV	2,716.150***	-0.243**
	(0.005)	(0.017)
ROA	-227.034**	0.013***
	(0.018)	(0.001)
CapInt	-1.122	-0.002**
	(0.678)	(0.034)
Year and Industry Indicators	Included	Included
Number of observations	2,512	2,512
Adjusted R2	0.338	0.357
F-Statistic	24.130***	140.590***

The dependent variables are business process measures as defined in the text. *** p<0.01, ** p<0.05, * p<0.10. The p-values are listed in parentheses under the coefficient. The models are estimated using ordinary least squares regressions with robust standard errors clustered by firm.

Table 6
Business Process Improvements – Sales Efficiency

Variables	Column 1 Oper Margin	Column 2 SGA	Column 3 SGA Scaled
Intercept	-2.602***	2.723**	0.336***
	(0.007)	(0.023)	(0.000)
CRM	-0.378**	0.199	0.108***
	(0.039)	(0.140)	(0.000)
After	0.209	0.012	0.063***
	(0.414)	(0.879)	(0.001)
*CRM*After*	0.443**	-0.273*	-0.025*
	(0.049)	(0.069)	(0.090)
Size	0.232***	-0.197**	-0.070***
	(0.000)	(0.027)	(0.000)
MTB	0.009	-0.008	-0.000
	(0.337)	(0.387)	(0.133)
RD	-0.411***		
	(0.000)		
ADV	-1.458		
	(0.231)		
ROA	0.294***	-0.366***	-0.066***
	(0.000)	(0.000)	(0.000)
CapInt	-0.107***		
	(0.000)		
Year and Industry Indicators	Included	Included	Included
Number of observations	2,512	2,512	2,512
Adjusted R2	0.647	0.040	0.419
F-Statistic	25.360***	20.460***	80.550***

The dependent variables are business process measures as defined in the text. *** p<0.01, ** p<0.05, * p<0.10. The p-values are listed in parentheses under the coefficient. The models are estimated using ordinary least squares regressions with robust standard errors clustered by firm.

Table 7
Business Process Improvements -- Receivables Collectability

Variables	Column 1 ARTurn	Column 2 Doubtful	Column 3 Doubtful Scaled
Intercept	20.110***	-121.082**	0.003
	(0.003)	(0.041)	(0.655)
CRM	-2.176	66.951***	0.010*
	(0.372)	(0.000)	(0.067)
After	-4.718*	0.357	0.006**
	(0.098)	(0.969)	(0.035)
*CRM*After*	0.971	-50.857***	-0.010**
	(0.279)	(0.010)	(0.041)
Size	-1.217***	19.636***	-0.003***
	(0.003)	(0.000)	(0.002)
MTB	0.005	-0.052	-0.000
	(0.654)	(0.469)	(0.266)
RD	1.544***	0.057	-0.003***
	(0.000)	(0.917)	(0.004)
ADV	16.364	35.218	0.056
	(0.220)	(0.352)	(0.322)
ROA	0.502***	-1.651	-0.000
	(0.000)	(0.215)	(0.274)
CapInt	0.019	-0.047	0.001***
	(0.788)	(0.719)	(0.004)
Year and Industry Indicators	Included	Included	Included
Number of observations	1,558	1,558	1,558
Adjusted R2	0.121	0.202	0.176
F-Statistic	3.690***	15.070***	5.560***

The dependent variables are business process measures as defined in the text. *** p<0.01, ** p<0.05, * p<0.10. The p-values are listed in parentheses under the coefficient. The models are estimated using ordinary least squares regressions with robust standard errors clustered by firm.

Table 8
Operational Performance

Variables	Column 1 ROA	Column 2 CFO	Column 3 CFO Scaled
Intercept	-0.102*	2,682.82	-0.128**
	(0.102)	(0.138)	(0.016)
CRM	-0.064**	297.755	-0.023
	(0.026)	(0.385)	(0.198)
After	-0.032*	-227.699*	-0.031**
	(0.075)	(0.061)	(0.011)
*CRM*After*	0.037	320.988**	0.035**
	(0.111)	(0.019)	(0.018)
Size	0.053***	450.203***	0.036***
	(0.000)	(0.000)	(0.000)
MTB	0.000	-1.173**	0.001
	(0.282)	(0.032)	(0.127)
RD	-0.003	-3.261	-0.003*
	(0.151)	(0.199)	(0.104)
ADV	-0.159	599.311***	-0.056
	(0.223)	(0.005)	(0.544)
ROA	0.097***	-37.324**	0.038***
	(0.000)	(0.044)	(0.000)
CapInt	0.000	-0.634	0.000
	(0.924)	(0.319)	(0.547)
Year and Industry Indicators	Included	Included	Included
Number of observations	2,512	2,512	2,512
Adjusted R2	0.301	0.169	0.293
F-Statistic	8.510***	42.020***	14.430***

The dependent variables are operational performance measures as defined in the text. *** p<0.01, ** p<0.05, * p<0.10. The p-values are listed in parentheses under the coefficient. The models are estimated using ordinary least squares regressions with robust standard errors clustered by firm.

Table 9
Management Earnings Forecast Error

Variables	Column 1 Absolute Forecast Error
Intercept	0.030***
	(0.000)
CRM	0.005
	(0.243)
After	-0.004
	(0.136)
*CRM*After*	-0.008**
	(0.012)
Size	-0.000
	(0.865)
ROA	-0.136***
	(0.000)
Loss	0.034***
	(0.000)
Leverage	-0.002
	(0.678)
EarnVol	-0.098
	(0.103)
CFOVol	0.052
	(0.150)
Growth	-0.011
	(0.111)
Big4	0.002
	(0.575)
LnAnalysts	-0.003
	(0.191)
Std_AF	0.014
	(0.250)
News	0.296**
	(0.027)
Horizon	0.000***
	(0.000)
Weak	-0.004
	(0.176)
Year Indicators	Included
Industry Controls	Included
Number of observations	342
Adjusted R2	0.560
F-Statistic	14.330***

The dependent variable is forecast error measured as the absolute value of management forecast error, (realized earnings less the management forecast amount)/lagged stock price. *** p<0.01, ** p<0.05, * p<0.10. The p-values are listed in parentheses under the coefficient. The models are estimated using ordinary least squares regressions with robust standard errors clustered by firm.