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# Knowledge management and employee productivity

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**KNOWLEDGE MANAGEMENT AND EMPLOYEE PRODUCTIVITY**

**A Thesis**

**Presented to**

**The Faculty of the Department of Psychology**

**San José State University**

**In Partial Fulfillment**

**Of the Requirements for the Degree**

**Master of Science**

**By**

**Christina Michelle Gomez**

**May 2007**

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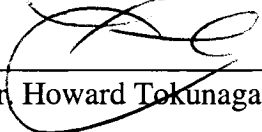
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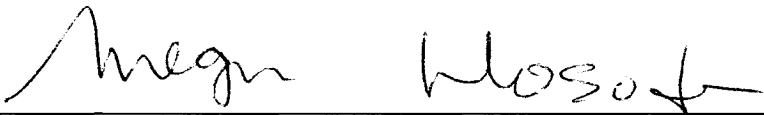
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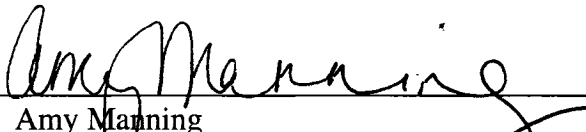
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## ABSTRACT

### KNOWLEDGE MANAGEMENT AND EMPLOYEE PRODUCTIVITY

by Christina Michelle Gomez

Knowledge Management (KM) is the process by which an organization identifies, gathers, and documents the knowledge within the organization in order to share, utilize, and capitalize on the knowledge and efforts of its employees (Santosus & Surmacz, 2001; Lewison, 2001). This study examined the relationship between KM and employee productivity in a call center environment following a KM system implementation. The researcher hypothesized that both case volume and client satisfaction would increase, while initial response time and time to resolve cases would decrease post-KM implementation. Although initial response time and time to resolve did decrease post-KM implementation, case volume and client satisfaction did not increase as expected. Results suggest that KM may have a positive impact on employee productivity in a call center environment, however, limitations and implications are discussed. Future research suggestions include additional exploratory research on the relationship between organizational culture and KM and evaluation of the use of incentives in KM implementation.

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## INTRODUCTION

According to Bender and Fish (2000), the inception of Knowledge Management (KM) can be attributed to Bob Buckman, CEO of Buckman Laboratories, and Karl Wiig, Chairman of Knowledge Research Institute, Inc., in the early 1990's. Knowledge Management has become a widely discussed, yet narrowly researched topic, especially in terms of its impact to an organization's "bottom line" (Rowley, 1999). Although many popular business and organizational publications suggest that successful implementation of KM practices can add exceptional value to the organization (Dyer & McDonough 2001; Hauschild, Licht, & Stein, 2001, Santosus & Surmacz, 2001), few offer empirical evidence to support such claims. Skyrme (2002) notes that the value of KM is difficult to identify in terms of productivity and efficiency. Thus, the present study will explore the relationship between Knowledge Management and employee productivity, and provide empirical research lacking in the present literature to answer the question: Is Knowledge Management correlated with employee productivity?

### *Definition of Knowledge Management*

What is Knowledge Management? Bender and Fish (2000) note "the scope of Knowledge Management is wide and the existing literature gives an endless number of definitions for Knowledge Management. [Therefore] the first barrier that practitioners of Knowledge Management may have to overcome is to define what Knowledge Management is all about and what it means to them and to their business" (p. 128).

Firestone and McElroy (2004) discuss Knowledge Management in terms of its evolution. They make a distinction between first- and second-generation KM initiatives,

which differ largely in their areas of primary focus. According to these researchers, first-generation KM ideas are mostly technology based and focus primarily on “knowledge capture, delivery, and use...or the re-use of existing knowledge (p.183). They assert that second-generation KM has since evolved to address the “...questions of how knowledge is produced, tested, evaluated, and integrated as a precursor to use” and further iterations of KM will expand “...to address strategies for creating high-performance learning organizations” (p. 183).

More recent literature suggests that technology often plays an important role in capturing and disseminating this knowledge, though it is generally not the primary focus in Knowledge Management research (Bender & Fish, 2000; Hildebrand, 1999). Instead, technology is often viewed as a “...good facilitator of data and information transmission” (Bender & Fish, 2000, p. 6), helping organizations meet their primary objective, which is ‘leveraging best practices’ (Hildebrand, 1999). Although the current study will not focus on the KM technology itself, the participating organization has indeed leveraged technology in this manner – that is, to capture and disseminate knowledge, as well as facilitate the transmission of information to its call center employees.

For the purpose of the present study, Knowledge Management refers to the process by which an organization identifies, gathers, and documents the explicit (i.e., policies, procedures, processes) and tacit (i.e., implicit, uncodified, experiential) knowledge within an organization, thereby allowing employees to share, utilize, and capitalize on the knowledge and efforts of others to increase their efficiency and productivity in the workplace (Santosus & Surmacz, 2001; Lewison, 2001). In other

words, “knowledge management is an organization’s strategies and processes of identifying, creating, capturing, and leveraging knowledge so as to enhance organizational performance, customer service, and marketplace competitiveness...” (Lewison, 2001, What is Knowledge Management, ¶ 1).

To demonstrate the actual business impact of Knowledge Management and the value of technology as a “good facilitator” in sharing and disseminating organizational knowledge, the present study will investigate the relationship between implementation of a Knowledge Management system and its impact on employee productivity as well as client satisfaction. Further, the present research will test the hypotheses that a positive relationship exists between KM, employee productivity, and client satisfaction.

#### *Knowledge Management vs. Organizational Learning*

Before reviewing the existing research on KM, it should be noted that KM may be considered similar to Organizational Learning (OL) in certain aspects; therefore, the researcher felt it necessary to discuss the two concepts here to clarify the distinction. Although a consensus has not yet been reached as to whether KM and OL are one and the same, a trend is emerging in the literature to indicate that these concepts do share some commonalities (Easterby-Smith, Crossan, & Nicolini, 2000; Firestone & McElroy, 2004). The present section will address some of the reasons for confusion as well as suggestions for why each concept is different in its own variation, and will therefore remain as separate topics in the present study.

Organizational learning is described as “...an area of knowledge within organizational theory that studies models and theories about the way an organization

learns and adapts” (Wikipedia, 2002; Organizational Learning, ¶ 1). Common themes are presented throughout OL literature, such as the importance of environmental alignment, contextual factors that influence learning, and a distinction between individual and organizational learning (Fiol & Lyles, 1985).

While the themes presented in KM literature similarly cite organizational culture and environmental alignment as key factors to its implementation, and moreover, its success (Bixler, 2002; Dyer & McDonough, 2001; Lewison, 2001), KM literature generally does not reference learning as a key outcome of its efforts. Rather, KM literature focuses instead on the efforts around identification, collection, and dissemination of knowledge (also called knowledge sharing) and the factors influencing the success or failure of an organization’s implementation of these processes, tools, or other methods to adopt these efforts. In other words, Knowledge Management, refers to “...a range of practices and techniques used by organizations to identify, represent and distribute knowledge, know-how, expertise, intellectual capital and other forms of knowledge for leverage, reuse and transfer of knowledge and learning across the organization” (Wikipedia, 2002; Knowledge Management, ¶ 1).

Although the terms used in KM and OL literature can be similar, the concepts are still considerably different in that KM is generally not focused on the act of learning or retaining knowledge, but rather on the variations in how organizations collect and/or disseminate knowledge, if (or how well) people adopt those processes, and whether specific outcomes (e.g., employee productivity or innovation) or business results (e.g., competitive advantage) are achieved as a result of those initiatives. Although there are

commonalities in the language used in both KM and OL literature, there is still considerable distinction between them and no conclusive evidence to suggest that the concepts are one and the same or that they should be treated as such.

In contrast to Organizational Learning, Knowledge Management does not focus on the transfer of history into “routines” (i.e., learning). Rather, KM research focuses on the process by which both explicit and tacit knowledge is captured and shared between employees. It does not, however, indicate that “learning” must take place for its efforts to be successful. Instead, the literature on KM asserts that organizations will experience increased productivity and competitive advantage by documenting and disseminating the company’s processes and procedures as well as the knowledge of its employees (Bender & Fish, 2000; Dyer & McDonough, 2001; Hauschild, et al., 2001).

In other words, “...while Knowledge Management programs are closely related to Organizational Learning initiatives, KM may be distinguished from OL by its greater focus on the management of specific knowledge assets and development and cultivation of the channels through which knowledge flows” (Wikipedia, 2002; Knowledge Management, ¶ 4). In addition, “...KM objectives are intended to lead to the achievement of specific targeted results such as improved performance, competitive advantage, or higher levels of innovation” (Wikipedia, 2002; Knowledge Management, ¶ 2).

In summary, while Organizational Learning and Knowledge Management may include similar terms, the focus of the present study will not be on “learning” per se, but



rather on the relationship between identified KM programs or initiatives and their proclaimed benefits – specifically, employee productivity and client satisfaction.

### *Perceived Benefits of Knowledge Management*

As previously cited, KM literature is full of claims about the benefits, or return on investment (ROI), of KM practices in organizations. However, empirical research to support these claims is limited. Dyer and McDonough (2001) describe the findings from a survey conducted by Knowledge Management Magazine and International Data Corp. in 2001. Survey participants were from companies that had already implemented their Knowledge Management initiatives or that were interested in pursuing KM in their organization. The survey results indicated four main reasons that companies utilize Knowledge Management: "...to capture and share best practices,...to provide training or corporate learning,...to manage customer relationships,...and to deliver competitive intelligence..." (Drivers and Leadership, ¶ 3). The researchers also listed several benefits for organizations that adopt Knowledge Management strategies, such as retention of key talent, shorter development cycles, increased customer service, productivity, profits and revenue, and competitive intelligence. Dyer and McDonough, however, did not empirically test these arguments.

Likewise, Santosus and Surmacz (2001) outline the benefits of Knowledge Management as increases in productivity, efficiency, response time, and overall business functioning. Although they do not offer empirical results to support their reasoning, the researchers argue that "an effective KM program should help a company do one or more of the following: (a) Foster innovation... (b) Improve customer service by streamlining

response time (c) Boost revenue...(d) enhance employee retention rates...(e) Streamline operations and reduce costs by eliminating redundant or unnecessary processes” (What benefits can companies expect from KM, ¶ 1).

### *Challenges of KM*

While the benefits to Knowledge Management are widely noted in the topic’s literature, as such are the challenges. Previous literature has focused a great deal on the challenges of implementing KM (Dyer and McDonough, 2001; Hauschild, et al., 2001; Santosus & Surmacz, 2001), however, it has offered few “tested” solutions to overcome these challenges. One of the major obstacles to Knowledge Management implementation and success is organizational culture, in particular, one that reflects a more competitive environment where knowledge sharing may be less evident, as opposed to organizational cultures that support knowledge sharing and collaboration (Bixler, 2002; Dyer & McDonough, 2001; Santosus & Surmacz, 2001).

However, Alter (2000) argues that researchers [and practitioners] believe that the ability to clearly identify and measure the value of Knowledge Management, in terms of its effects on the organization’s bottom line (or ROI), are even more challenging to the success of Knowledge Management than creating a knowledge sharing culture or organization. Although not impossible to do, empirical research is limited on how organizations have successfully achieved this evaluation.

Researchers at American Productivity and Quality Center (APQC) assert that measuring knowledge sharing and use is becoming a more integral (and important) part of KM implementation (2003). “What has been missing is the way to tie knowledge

management process measures to organizational outcomes.” (p. 6) The purpose of their study was to specifically address this gap in order “to sustain and justify knowledge management efforts.” (p. 6)

In conducting numerous studies across hundreds of organizations, APQC developed a framework for measuring Knowledge Management, which provided the basis for their benchmarking study. The purpose of the benchmarking study was to outline and validate the key elements of their KM measurement, providing future researchers the structure needed to address the gap in measuring KM and demonstrating ROI to the business.

The first component noted was that measures for KM should be directly aligned to the organization’s KM objectives and strategy. In other words, the strategy of the KM implementation should drive the measures used to determine its success or failure. Second, APQC notes that measures should show a link between the inputs, processes, and desired outcomes. Examples of measures for this included cycle time, customer retention, and reduced costs per transaction.

A third component of this framework was that KM measures should be used to increase the effectiveness of the KM program and demonstrate ROI. Finally, APQC indicated that sharing examples of success would help provide organizations with justification for past and future KM investments.

In using this framework as a basis for their study, APQC identified ten best practices for measuring KM. Included in their list were ROI, success stories, and

alignment of an organization's business measures to KM measures as key indicators of how KM can and should be measured.

#### *Impact on Organizational Performance*

In a study conducted by APQC (2000) on the successful implementation of Knowledge Management, survey responses from forty-nine organizations were compared to determine which elements of Knowledge Management each organization considered critical to its implementation, as well as how these initiatives have impacted their business performance. Of the forty-nine organizations that participated in the benchmarking study, ten were identified by APQC as having strong KM initiatives in place, and were thus used as the comparison group, or "best-practice organizations," for the study. These "early adopters," as they were called, were referred to as "partner companies," whereas the remaining participants were classified as "sponsor companies."

Interestingly, the survey results on impact to business performance were quite different between the two groups. While partners reported their largest benefits in terms of decreased cost (71 percent) and increased productivity (57 percent), this was matched by only 14 percent of sponsors reporting decreased costs, and none reporting increased productivity. Another measure used to gauge KM's impact on business performance was quality and customer satisfaction. Results showed that 14 percent of partners versus 8 percent of sponsors experienced an increase in quality / customer satisfaction as a result of successful implementation of Knowledge Management within their organization.

Researchers concluded that "...over time, organizational performance measures should reflect the value of KM,...however, from an organizational perspective, the true

value of KM is demonstrated not in the activity itself, but in its power to enable business processes and improve business results” (p.95).

*Case Study: 3M Corporation*

Given the limited pool of empirical research on KM, many researchers have used case studies to illustrate the perceived benefits, or ROI, of KM implementation in organizations. For example, in the late 1990's, 3M made more than 10,000 products (Edwards, 2000). Each of their Corporate Customer Contact Center agents handled an average of 52 calls per day, ranging in topic from software to financial information to consumer goods. Realizing that it was becoming increasingly difficult to train their Contact Center agents and that their ability to provide quality, fast, and efficient customer service was decreasing, 3M Corporation developed a system for their Corporate Customer Contact Center that integrated both knowledge management and customer relationship management software. Essentially, Primus eCRM allowed the Contact Center agent to conduct a search in the knowledge base according to the customer's question or problem. Primus eCRM would then provide a list of solutions – weighted by the relevance to the initial question/description. If the agent was not able to solve the problem using the solutions provided, the issue was escalated to a senior support agent. Once a new solution was identified, it automatically became part of the knowledge base for immediate sharing and use. As noted by the author, this system “provided a flexible workflow that supports individual approaches to problem solving...(and) most important...allowed immediate sharing of newly created solutions – eliminating the need for separate, offline knowledge engineering process.” (A Technology Lifeline, ¶ 3)

As a result of 3M's successful Knowledge Management initiative, its call center productivity increased by 13 percent, as agents were able to handle an average of 59 calls per day (up from 52 per day). In addition, 3M's contact center manager cited a 35 percent decrease in training time and costs, an increase in first-call completions rates from 85 to 94 percent, and a 55 percent decrease in escalations from Level 1 to Level 2 agents. Also, 3M's research and development teams were able to dedicate more time to developing new products because the Primus eCRM system allowed them to "...build a repository of knowledge that will help its support operations for years to come" (Launch Time, ¶ 4). Finally, although customer satisfaction ratings were not tracked prior to 3M's Knowledge Management implementation, the company now reports a 95 percent customer satisfaction rate, and attributes their high marks to the increase in consistency of answers received from their call center agents as a result of their Knowledge Management system.

Although there is little empirical research on Knowledge Management (KM), studies by APQC and 3M Corporation provide evidence to support the notion that Knowledge Management can, and will, offer many benefits to the organization in terms of increased productivity, efficiency, and customer service (satisfaction). Studies to date have a noted positive relationship between KM and productivity as well as client satisfaction, while also maintaining that there are many challenges in measuring the impact of KM on the organization.

Studies such as the case of 3M, have noted a 13 percent increase in employee productivity, as well as high customer satisfaction ratings (95%) following

implementation of their KM system; demonstrating that it is possible to measure the outcome of KM and its impact on the organization. One limitation of this case study, however, is that 3M did not measure their client satisfaction ratings prior to KM implementation. Without the baseline satisfaction ratings, 3M was not able to draw a conclusion about the impact of KM on client satisfaction.

The present study is intended to build upon the 3M case study to further investigate the relationship between KM, employee productivity, and customer (client) satisfaction, providing empirical evidence to support the notion that KM is positively related to both concepts. Specifically, the present study utilized a call center environment to test the hypothesis that a positive relationship exists between KM and employee productivity, and second, that a positive relationship exists between these KM and client satisfaction.

#### *Evaluation of Existing Research*

In evaluating the existing body of literature on Knowledge Management, it is clear that there is a distinct need for more empirical research. In particular, there is a strong need for research on the value and effectiveness of Knowledge Management (Rowley, 1999). Alter (2000) describes the dichotomy between researchers and practitioners in this instance as somewhat of a “catch 22.” That is, researchers assert that KM can not be accurately measured, and organizations will not take KM seriously until the true value of its efforts is realized. Although measuring KM has been a challenge for researchers historically, achieving this goal can provide tangible evidence to support the notion that KM can and will provide organizations with gains in productivity, increased

customer service and competitive advantage (Skyrme, 2002; Alter, 2000; Lewison, 2001).

According to APQC (2003), measuring KM is not impossible, although many organizations simply do not create the appropriate measures to demonstrate the value and ROI of their KM initiatives. To be relevant, measures should be aligned with the organization's KM strategy, inputs, processes, and outcomes, and in turn be used to increase the effectiveness of the program.

### *Purpose and Hypotheses*

So what is wrong with a lack of empirical research? Simply put, without empirical research to measure the impact of KM initiatives, and little or no evidence to support the claims that KM can bring exceptional value and productivity gains to an organization, executives may not realize the true value in its practices, and therefore refuse to fund or support these programs (Alter, 2000; Hauschild, et al., 2001; Skyrme, 2002). For this reason, the present study addressed the scarcity of existing empirical data by measuring the value of knowledge management on an organization's bottom line. Specifically, the present study attempted to demonstrate the relationship between KM initiatives and employee productivity and addressed two questions in relation to the implementation and use of a Knowledge Management system.

First, in alignment with the 3M case study as well as other research presented earlier, the present study addressed the claims that KM offers many benefits to an organization such as employee productivity (Dyer and McDonough 2001; Hauschild, et al., 2001, Santosus & Surmacz, 2001) by testing these assumptions and providing



empirical evidence to support these claims. Building upon the case study of 3M Corporation, the current study will test the following hypothesis:

Hypothesis 1: a positive relationship exists between KM and employee productivity, whereby productivity would increase post-KM implementation..

Second, as referenced in the 3M case study, high client satisfaction results were noted post-KM implementation, and were purported to be related to the KM initiatives in the organization. However, since 3M did not obtain a baseline for these results prior to implementation, a direct conclusion could not be drawn. The current research therefore addressed this relationship in the present study and tested the hypothesis that:

Hypothesis 2: a positive relationship exists between KM and client satisfaction in the call center environment, whereby client satisfaction would increase post-KM implementation.

## METHOD

### *Participants*

The global Human Resources contact center of a leading Fortune 500 internet company in the San Francisco Bay Area (also known as Silicon Valley) was used to gather data for this study. The contact center was established in its initial stages in March 2001, and has expanded over the years in terms of the number of Representatives it employs as well as the content in which it supports. The center operates in a “follow the sun” manner which allows clients to reach Representatives 24 hours per day, 5 days per week (Monday – Friday) via the internet or phone. At the time data were collected, the contact center provided general HR support for all current and former employees, as well as their families, and potential candidates.

This HR contact center was selected for the study during the planning stages of its KM implementation, specifically due to its intent to use KM to drive the evolution and expansion of its services and support to the client community. The HR contact center was slated to grow into a global, virtually centralized shared support organization and KM was to be used as a primary enabler to help increase productivity and client satisfaction.

Since the goal of the present study was to determine whether KM implementation had an impact on employee productivity and/or client satisfaction, data were gathered both prior to and following the contact center’s KM implementation. In order to compare the same Representatives’ data over time, a total of 48 of Representatives were measured for 7 months prior to, and 6 months after the KM implementation. Due to turnover in the

organization, both the sample size and the length of time used to measure pre- and post-productivity were limited.

### *Measures*

As with most call centers, various case metrics and client satisfaction are key indicators of a Representative's productivity, as well as the contact center's overall performance. In the present study, archival data including case volume, initial response time, and time to resolve cases were used to measure daily productivity per Representative. Client satisfaction scores were used as an indicator of the Representative's technical capability in handling the case, and as a function of the accuracy of the solution provided to the client.

*Productivity: Case Volume.* For each inquiry received by the contact center, a case was logged into the Client Relationship Management (CRM) system. Cases varied in topic, but generally included one of the following subjects: compensation, benefits administration, company policy and process, internal web-based tools questions, or resource and referral services to various internal and external resources provided by the company to its employees.

Cases were initiated by clients in one of two ways - via phone or the internet. Web cases were generated automatically upon submission by the client and routed to an available Representative, whereas phone cases were logged directly into the CRM system by the contact center Representative during - or directly following - the phone call from the client. For each case, the CRM system recorded the case type, any internal escalations or research conducted by the Representative and/or subject matter experts

(SMEs) in the contact center, and all responses provided to the client by the contact center Representative. This information was stored within the CRM system for tracking and record keeping purposes as it provided important metrics to the center's management team regarding the productivity of each Representative individually as well as the contact center's overall performance.

In instances where the Representative was able to address the client's inquiry immediately, the solution was provided to the client and the case status was changed to "resolved" by the Representative in the CRM tool. If the inquiry required additional follow up, research, or internal escalation to a SME, the case remained open (active) until a resolution was provided to the client. Once this occurred, the case status was then updated by the Representative to "resolved". In either instance, the case remains in "resolved" status for 5 business days, after which the CRM system moves the case status to "closed."

In the contact center, case volume was defined as the number of cases resolved per day for each Representative. In the present study, the weekly average case volume per month was calculated for each Representative to determine his or her level of productivity overall.

*Productivity: Initial Response Time.* As another measure of productivity in the contact center, a Representative's initial response time to a case was recorded. As each case was received by the contact center, the first response to the client was recorded within the CRM system. An initial response was defined as the first point of contact with the client upon submission of a case. In some instances (e.g., more complex cases), an

acknowledgement was provided to the client that further research is required before a solution can be provided, whereas in other instances (e.g., less complex cases), the initial response was the same as when the total solution was provided by the Representative.

For cases received via the internet, initial response time was identified as the number of days lapsed before Representative sent the first email response to the client. For cases received by phone, an initial response was considered to be equal to the day and time the case was logged into the CRM system by the Representative. In the present study, the variable initial response time was measured by calculating the weekly mean initial response time per month for each Representative.

*Productivity: Time to Resolve.* Time to resolve was recorded as an indicator of how quickly the Representative was able to resolve a case and provide a final solution or response to the client. Once the solution was provided to the client, the case was placed in resolved status for 5 business days before it was officially closed. Since cases could not be re-opened once they were changed to closed status, the resolved status was utilized as a waiting period during which the client could confirm the solution provided was accurate and to their satisfaction, or request that the case be returned to open (active) status for further review.

For this reason, time to resolve was only recorded after the case has been reclassified from resolved to closed status. This allowed the CRM system to record only the latter date and time for resolution if there was more than one instance where the case had been changed to resolved status.

In the contact center, time to resolve was measured for each case the number of days a case remained open. In the present study, the variable time to resolve was calculated as the weekly mean number of days to resolve a case per month for each Representative.

*Client Satisfaction.* Client satisfaction scores were collected within the contact center for each case and were viewed to be an indicator of the accuracy of the information provided by the Representative, as well as to gauge the client's overall satisfaction with the contact center on an ongoing basis. For each case that was closed in the CRM system, a client satisfaction survey was automatically generated and sent to the client via email.

The survey was comprised of four questions which asked clients to rate the customer service of the HR Representative, whether the information provided was useful, if the issue was addressed in a timely manner, and to rate the overall handling of the request. Clients were asked to provide responses using the Likert type scale (1 = unacceptable, 2 = below average, 3 = met needs, 4 = above average, or 5 = excellent).

For each survey received, an overall satisfaction score was computed using an average of the ratings for each of the four survey questions. In the present study, client satisfaction was measured by calculating the weekly average client satisfaction score for each Representative per month.

*Procedure*

Archival case data, including Representatives' average weekly case volume, initial response time, time to resolve, and client satisfaction scores per case were retrieved by the researcher via the corporation's internal web-based reporting tool. Data were collected from a standard monthly report designed by the contact center's management team which included detailed case metrics for each case logged in the CRM system.

## RESULTS

Descriptive statistics were analyzed pre- and post- KM implementation for each variable to test hypothesized relationships. These variables were analyzed across a 13 month period (7 months pre- and 6 months post- KM implementation) to determine how KM impacted productivity and client satisfaction in the present organization. The organization's Knowledge Management system was launched at the end of month 7; therefore months 1 through 7 represent the pre-KM data set, whereas months 8 through 13 represent the post-KM data set.

### *Tests of Hypotheses*

Hypothesis 1 stated that a positive relationship would exist between KM and employee productivity, whereby employee productivity would increase post-KM implementation. To test this hypothesis, the call center representatives were compared on three variables: case volume (e.g., the number of cases resolved), initial response time (e.g., the number of days before a first response was provided to the client), and time to resolve (e.g., the number of days to resolve a case). Hypothesis 2 stated that a positive relationship exists between KM and client satisfaction in the call center environment. To test this hypothesis, call center representatives were compared on client satisfaction scores received pre- and post-KM implementation.

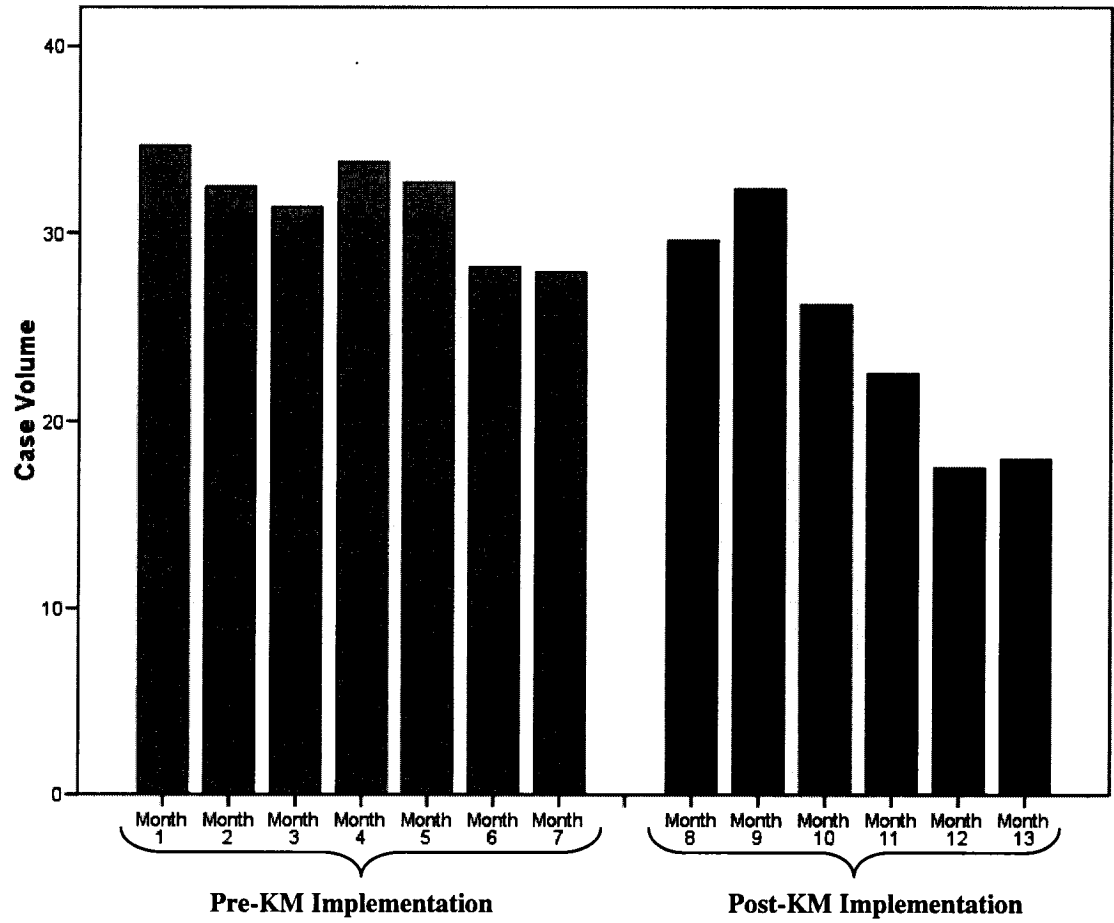
*Case Volume.* The present study hypothesized that case volume would increase following KM implementation because call center representatives would be able to resolve cases more quickly utilizing the KM system. Means and standard deviations for case volume per month are presented in Table 1. Figure 1 represents the overall case



Table 1. Mean Case Volume, Pre- and Post-KM Implementation (N = 48)

Pre-KM Implementation							
<i>Month</i>	1	2	3	4	5	6	7
<i>M</i>	34.68	32.46	31.39	33.80	32.71	28.17	27.89
<i>SD</i>	39.91	28.34	25.18	32.37	28.36	23.66	27.33

Post-KM Implementation						
<i>Month</i>	8	9	10	11	12	13
<i>M</i>	29.62	32.36	26.18	22.50	17.51	17.99
<i>SD</i>	28.98	57.57	29.29	37.87	14.14	15.92



*Figure 1.* Mean Case Volume, Pre- and Post- KM Implementation.

volume per month, both pre- and post- KM implementation and was reviewed across 48 participants.

While case volume remained relatively consistent in the first five months (ranging between 31.39 and 34.68 in month 3 and 1, respectively) prior to KM implementation, it was followed by a decline in month 6 ( $M = 28.17$ ,  $SD = 23.66$ ) and month 7 ( $M = 27.89$ ,  $SD = 27.33$ ). Following KM implementation, however, there was an initial spike in months 8 ( $M = 29.62$ ,  $SD = 28.98$ ) and 9 ( $M = 32.36$ ,  $SD = 57.57$ ), followed by a steady decline in the remaining months, with the lowest volume in month 12 ( $M = 17.51$ ,  $SD = 14.14$ ). Despite the initial increase in case volume in the two months immediately following the KM implementation (months 8 and 9), months 10 through 13 indicate a smaller number of cases resolved than any other months included in the study. Therefore, the hypothesis that case volume would increase as a result of KM implementation is not supported in the present study.

*Initial Response Time.* Initial response time was expected to decrease post-KM implementation as call center representatives would have immediate access to knowledge about the company's policies and procedures, which would allow them to provide responses and solutions to clients' inquiries more quickly. Monthly means and standard deviations for initial response time are presented in Table 2. Figure 2 represents the average monthly initial response time, both pre- and post- KM implementation, and was reviewed across 48 participants.

As with case volume, initial response time remained relatively consistent in pre-implementation months 2 through 6, however response times were significantly higher in

Table 2. *Mean Initial Response Time, Pre- and Post-KM Implementation (N = 48)*

Pre-KM Implementation							
<i>Month</i>	1	2	3	4	5	6	7
<i>M</i>	2.88	1.06	1.25	.94	.97	1.56	2.92
<i>SD</i>	9.52	1.48	2.11	1.29	.91	2.00	10.47

Post-KM Implementation						
<i>Month</i>	8	9	10	11	12	13
<i>M</i>	1.68	1.28	1.80	1.95	1.02	1.67
<i>SD</i>	1.85	2.47	3.59	6.46	1.92	3.14

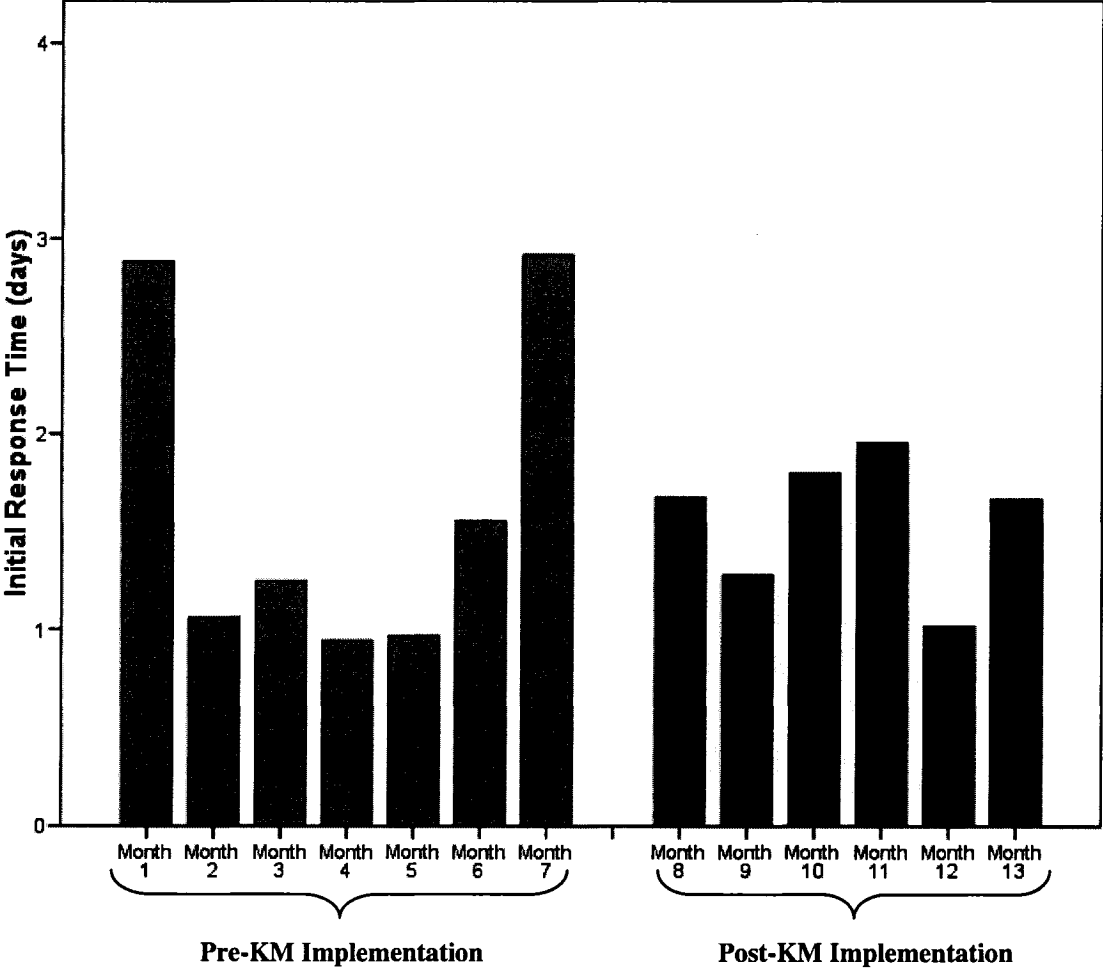


Figure 2. Mean Initial Response Time, Pre- and Post- KM Implementation

months 1 ( $M = 2.88$ ,  $SD = 9.52$ ) and 7 ( $M = 2.92$ ,  $SD = 10.47$ ). There were two instances in month 1 where initial response time was longer than 35 days (38.76 and 55.36 days), and in month 7, there was one instance where the average response time was 72.90 days. These outliers in initial response time could be due to cases being accidentally overlooked in the CRM system by the assigned representative, or may also have been mistakenly assigned to a representative who was not currently in queue to receive cases. In controlling for these outliers, results for pre-implementation initial response time become more consistent with months 2 through 6, with mean response times of 1.04 and 1.46 days for months 1 and 7, respectively.

Post-implementation initial response times ranged from 1.01 days in month 12 to 1.95 days in month 11, but overall remained between 1 and 2 days with less variability than in pre-implementation months. However, even after controlling for outliers in months 1 and 7 in the pre-implementation months, results show a slight increase in response times during the post-implementation months.

One possible explanation for the increase in response times in the months following KM implementation is that Representatives were expected to learn and utilize the new KM system to provide more consistent and accurate responses to clients. While it was expected that the new system would enable Representatives to do this more quickly, there may have been a learning curve initially and it may have taken longer for the Representatives to find the appropriate source data in the new system before using it to provide a response to the client. The hypothesis that initial response time would decrease following KM implementation is therefore not supported in the present study.

*Time to Resolve.* As with initial response time, it was expected that KM implementation would assist the call center representatives to more quickly find solutions and therefore more quickly resolve cases. As shown in Table 3, monthly means for time to resolve are lower post-KM implementation than in the months prior to KM implementation. Figure 3 represents the average monthly time to resolve a case for the months prior to and following KM implementation, and was reviewed across 48 participants.

Overall, time to resolve was higher in month 4 ( $M = 50.35$ ,  $SD = 76.81$ ) than in any other months included in the study. This was followed closely by months 1 ( $M = 45.51$ ,  $SD = 65.71$ ), 2 ( $M = 45.90$ ,  $SD = 60.43$ ), and 7 ( $M = 44.91$ ,  $SD = 75.64$ ) in the pre-implementation months. Although there was a decrease in resolve times in months 3 ( $M = 35.27$ ,  $SD = 52.91$ ) and 5 ( $M = 32.43$ ,  $SD = 40.35$ ), the pre-implementation resolve times remained relatively high. In comparison, post-implementation months, showed a general declining trend for time to resolve, however this included some variance up and down on a month-to-month basis, ranging from 22.93 days in month 13 to 33.14 days in month 11. Given that overall resolve times were lower in the post-implementation months than pre-KM, the hypothesis that time to resolve would decrease post-implementation is supported in the study.

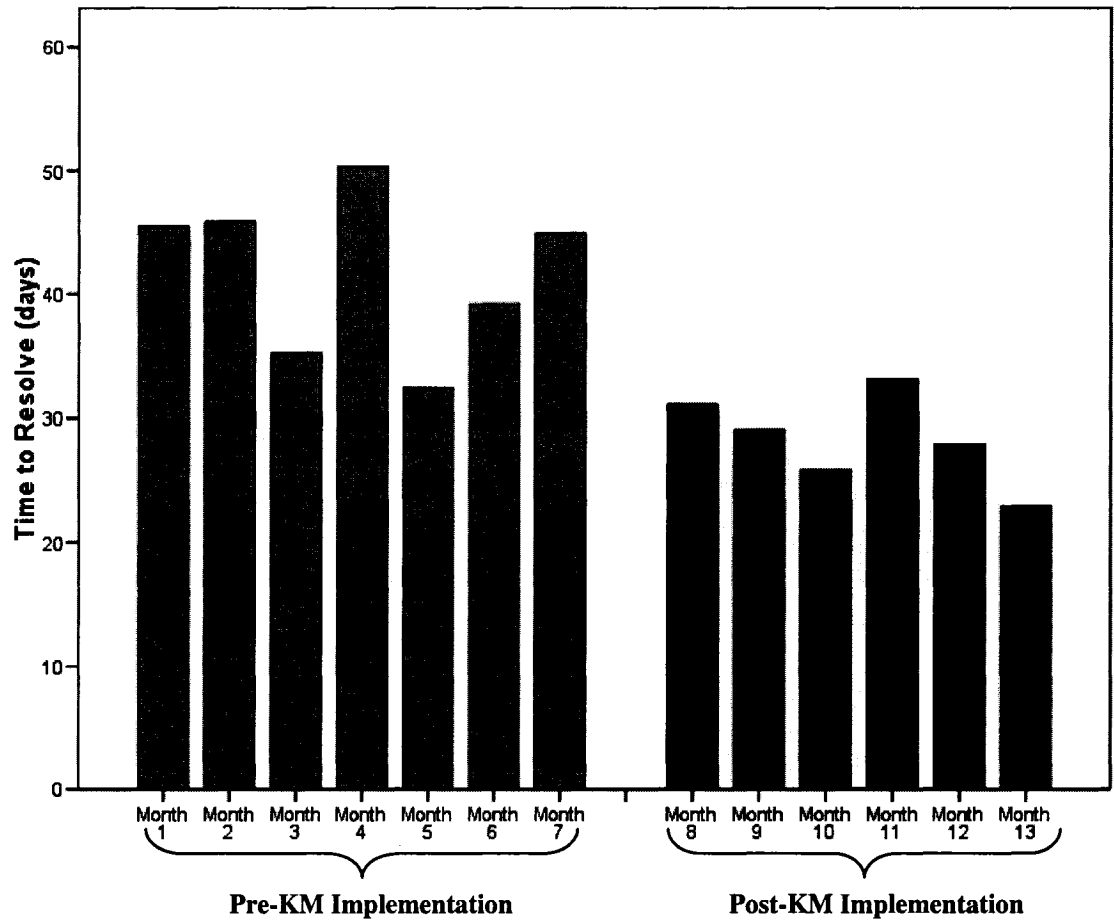
*Client Satisfaction.* Hypothesis 2 predicted that client satisfaction would increase post-KM implementation as a result of decreased initial response time and time to resolve a case. In other words, the researcher expected call center representatives would respond to and resolve cases more quickly, as well as provide more consistent and accurate

Table 3. Mean Time to Resolve, Pre- and Post-KM Implementation (N = 48)

Pre-KM Implementation							
<i>Month</i>	1	2	3	4	5	6	7
<i>M</i>	45.51	45.90	35.27	50.35	32.43	39.18	44.91
<i>SD</i>	65.71	60.43	52.91	76.81	40.34	62.28	75.64

Post-KM Implementation						
<i>Month</i>	8	9	10	11	12	13
<i>M</i>	31.11	29.08	25.85	33.14	27.89	22.93
<i>SD</i>	55.07	52.40	46.44	47.83	43.65	31.31





*Figure 3.* Mean Time to Resolve, Pre- and Post- KM Implementation.

information to their clients as a result of utilizing the KM system for solutions. Clients' satisfaction would therefore increase as they would be receiving accurate solutions in a timelier manner.

Means and standard deviations for client satisfaction scores are presented in Table 4. Average monthly client satisfaction scores for 11 participants, both prior to and following KM implementation are represented in Figure 4. However, due to the low response rate of the client satisfaction survey, results are limited for this variable and are based on a total of 11 Representatives' scores rather than 48 Representatives for the other variables.

Overall, client satisfaction scores did not vary much from month to month, and did not show much variance in scores pre- and post-KM implementation. Pre-implementation scores ranged from 4.26 in month 1 to 4.53 in month 6. Post-implementation scores ranged from 4.21 in month 10 to 4.67 in month 11. Given that scores did not increase post-implementation as expected, the present study did not find support for Hypothesis 2.

#### *Summary of Hypotheses*

In summary, not all results were as expected and therefore hypotheses were only partially supported in the present study. The researcher hypothesized that KM implementation would impact the variables in the following ways: case volume would increase, and both initial response time and time to resolve would decrease (Hypothesis 1). Further it was asserted that client satisfaction would increase post-KM implementation (Hypothesis 2).

Table 4. *Mean Client Satisfaction Scores, Pre- and Post-KM Implementation (N = 11)*

Pre-KM Implementation							
<i>Month</i>	1	2	3	4	5	6	7
<i>M</i>	4.26	4.43	4.47	4.44	4.48	4.53	4.41
<i>SD</i>	.53	.31	.31	.36	.36	.32	.51

Post-KM Implementation						
<i>Month</i>	8	9	10	11	12	13
<i>M</i>	4.40	4.51	4.21	4.68	4.50	4.50
<i>SD</i>	.51	.24	1.10	.32	.27	.21

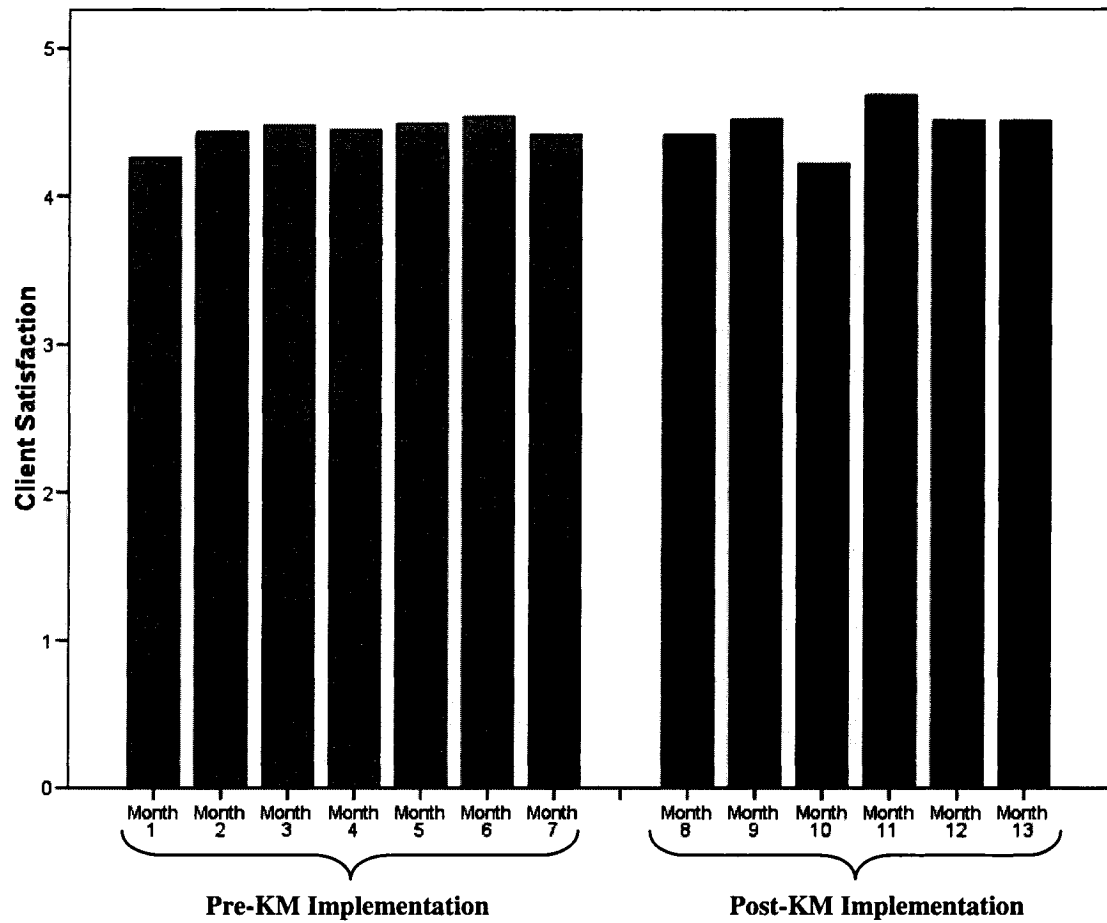


Figure 4. Mean Client Satisfaction Scores, Pre- and Post- KM Implementation.

Results for Hypothesis 1 were mixed in that monthly means for time to resolve did decrease as expected post-KM implementation, however case volume did not increase as expected post-KM implementation. Results for initial response time were also not as expected in that mean response times increased, rather than decreased post-KM implementation. Therefore, Hypothesis 1 was partially supported, whereas Hypothesis 2 was not supported in the present study as results did not show a positive relationship between KM implementation and client satisfaction.

## DISCUSSION

The purpose of the present study was to demonstrate the relationship between KM implementation and employee productivity. Specifically, this research was designed to address the claims that KM offers many benefits to an organization, such as employee productivity and client satisfaction, by testing these assumptions and providing empirical evidence to support these claims. Specifically, it was hypothesized that KM would have a positive impact on both employee productivity as well as client satisfaction in a call center environment.

### *Summary of Findings*

Results suggest that KM implementation may have an impact on the amount of time it takes a call center Representative to resolve a case (time to resolve). In essence, time to resolve decreased in the months following the company's implementation of a KM system in their Human Resources call center. This variable showed a decrease in the first month immediately after KM implementation. This trend continued in the remaining post-implementation months with the exception of a slight increase in month 11. Therefore, one conclusion that can be drawn from this is that there is a positive relationship between KM implementation and call center productivity, as it relates to resolution time for each representative.

Conversely, although KM implementation was expected to have a similar impact on initial response time, this hypothesis was not supported in the present study. In fact, initial response times increased slightly in post-implementation months, with four of the six months showing response times greater than 1.5 days. This is in comparison to only

two of the pre-implementation months. This increase in initial response time post-implementation could potentially be related to a learning curve as representatives are trained and get acquainted with the new system. It would be expected, however, that beyond the initial learning curve, initial response times would decrease as a result of their utilization of the KM system.

Likewise, the hypothesis that case volume, or the number of cases resolved per day, would increase as a result of KM-implementation was not supported in the present study. Overall case volume for the call center remained relatively consistent and stable for the months preceding KM implementation, with a decrease in case volume in the two months immediately following the KM implementation. However, the post-implementation months then showed a significant decrease in the number of cases resolved per month. One possible explanation that was not explored was the total population of Representatives employed in the call center during this period of time. In the event that the total call center volume was rising and more call center Representatives were hired to respond to cases, the overall volume would essentially be distributed across more people, and could therefore result in a decreased case volume per person – despite a stable (or increased) number of cases resolved each day for the call center overall.

Further, it was expected that KM implementation would have positive impact on client satisfaction as the Representatives would be in a position to provide faster, more accurate responses to clients' inquiries. Instead, results showed that client satisfaction was not impacted either positively or negatively by KM implementation and remained

relatively constant over time. This could be related to the low response rate of the client satisfaction survey and that generally only very satisfied clients respond to the survey.

In reviewing pre-implementation trends across all three variables, results showed that a higher number of cases were being resolved, with longer average times to resolve each case. Then, in the two months immediately preceding and following KM implementation, case volume decreased pre-implementation and increased post-implementation, whereas response and resolve times increases pre-implementation and decreased post-implementation. One explanation for this pattern is that after the new KM system was implemented, it took Representatives less time to provide responses to clients and resolve cases, and in turn resolved more cases per day.

Finally, in the remaining post-implementation months case volume began to decline overall, and initial response time and time to resolve varied month to month. One conclusion that could be drawn is that overall call center productivity increased as a result of KM implementation given that resolution times were shorter. However, another possible explanation, is that case volume was declining, which potentially allowed call center representatives more time to research their initial responses and provide complete responses more quickly, thereby reducing resolve time accordingly.

### *Implications*

*Theoretical Implications.* While the benefits to Knowledge Management are widely noted in the topic's literature, as such are the challenges. And although previous literature has focused a great deal on the challenges of implementing KM (Dyer and McDonough, 2001; Hauschild, et al., 2001; Santosus & Surmacz, 2001), it has offered



few “tested” solutions to overcome these challenges. In particular, there is a continued need for research on the value and effectiveness of Knowledge Management (Rowley, 1999), and for KM to be accurately measured so that organizations will take KM seriously and realize the true value of its efforts.

According to APQC (2003), measuring KM is not impossible, although many organizations simply do not create the appropriate measures to demonstrate the value and ROI of their KM initiatives. Measures should be aligned with the organization’s KM strategy, inputs, processes, and outcomes, and in turn be used to increase the effectiveness of the program.

The present study provides a framework for measurement in a call center environment by utilizing measures that are aligned with the organization’s values on productivity and client satisfaction. Although the study’s hypotheses were only partially supported, there is evidence to suggest that KM can and does contribute to an organization’s bottom line and should continue to be explored in future research.

*Practical Implications.* This study suggests that KM can in fact be accurately measured, and further suggests that KM may have an impact on an organization’s bottom line, specifically in terms of call center productivity. Day and Wendler (1998) also present several case studies to demonstrate how organizations were able to leverage their Knowledge Management practices and systems to gain competitive advantage in each of their markets. Companies such as McDonald’s attributed gains in competitive advantage to the strong network of information made available to the company’s employees which allowed them to leverage best practices and fostered innovation within the organization.

In the case of McDonald's, best practices include their Hamburger University, where managers receive up to 3,000 hours of regional training, and the use of peer groups to share knowledge and transmit sales on an hourly basis. Day and Wendler cite that these knowledge sharing practices render "...the location of group members [as] immaterial...At the same time, the system enables corporate headquarters to keep a tight grip on the valuable knowledge that links its outlets" (p. 21).

According to Lewison (2000), many organizations today are shifting their ideas about competitive advantage from a focus on physical capital to intellectual capital. By tapping into its intellectual capital, many organizations believe they will be able to sustain the greatest competitive advantage "in an increasingly global marketplace" (Overview, ¶ 1). In light of this shift, an increasing focus on Knowledge Management, the need for accurate measurement, and demonstrated value-add is evident.

The present study provides support for the notion that accurate measurement is possible and provides empirical evidence to suggest that KM may have an impact on the organization's productivity. In a call center environment, this impact can and does have significant impact on the organization's bottom line.

### *Strengths*

This study contributes to the body of literature related to Knowledge Management and provides further indication that although difficult to measure, there is a critical need to continue to address the question of if, and how KM contributes to an organization's bottom line. Given the scarcity of empirical research on KM in the literature today, the present study offers an additional source to support the notion that KM can have a

positive impact on organizations. As cited earlier, many popular business journals indicate the value that KM can and does bring to an organization, as well as the benefits to implementing such programs, systems, or initiatives, however, few offer evidence to support these claims in a practical manner.

The present study lays the groundwork for future studies to build upon in terms of measurement and evaluation of KM programs in a real business environment.

Organizations should continue to test the claims of researchers and practitioners alike on the proposed value and benefits offered for KM implementation. Further, they should evaluate these benefits by defining the critical components of their KM strategy and measuring their ROI against those components.

#### *Limitations*

Although the present study provides support for the notion that KM can be accurately measured and does offer value to an organization by increasing productivity in a call center environment, the study is not without limitations.

First, the relationship between KM and customer satisfaction was not supported in the present study, and the researcher asserts that this could be due to considerably low response rates to the client satisfaction survey used by the call center. In addition, the data showed that if responses were provided at all, they were typically only in instances where the client was extremely satisfied with the service provided. Therefore, satisfaction scores were skewed very high and did not provide an accurate depiction of the overall satisfaction of all possible clients of the call center. One possible solution would be to distribute a broad-based client satisfaction survey to employees within the

company who have utilized the call center to gain a better understanding of overall client satisfaction.

Another possible limitation of this study was that the call center was in the process of outsourcing portions of their client support to an external company, which could potentially have an impact on call center performance in terms of day-to-day operations and the quality of support provided to its clients. Although the impacts of employment status (i.e., temporary versus regular workers) on the present study were not explored, one explanation is that employment status may have an impact on the quality of the Representatives' work, as temporary workers may have a shorter duration of employment or service with the company and are less familiar with internal operations at the company. As a result, temporary workers could have a greater learning curve than someone who was employed with the parent organization for a longer period of time. Duration of employment was also not explored, but it is possible that length of time in the job prior to KM implementation may have impacts on the outcome of the study in the same regard. One suggestion would be to control for this factor in future studies or to compare differences across different employment statuses.

Third, the total headcount in the call center was not analyzed to understand the case distribution across all Representatives. It is possible that the decrease in average monthly case volume towards the latter end of the present study was due to an increase in total Representatives employed in the call center. In the present study, although case volume is shown to decrease this could be due, in part, to an increased number of Representatives handling cases during the months following KM implementation.

### *Future Research*

In the future, researchers should continue to explore the relationship between KM and the value it brings to an organization. Current literature highlights several key components and critical success factors of Knowledge Management, which include: organizational structure (horizontal vs. vertical), organizational culture, trust, communication, time for learning, accuracy and accessibility of information, and incentives (Skyrme, 2002; Dyer & McDonough, 2001). Bixler (2002) discerns that an organization's Knowledge Management initiatives and practices, in combination with its technology and culture, become key determinants in the success or failure of the program.

While organizational culture may have an impact on the success or failure of KM programs, the empirical research to support this claim is scarce. In particular, little research has been conducted on the use of incentives in KM implementation. This might be a critical point in the adoption of KM usage in an organization, particularly in environments that tend to support competition versus cooperation. Therefore, future research should continue to focus on these success factors and test them empirically in a business environment.

Other researchers indicate that successful KM implementation is directly tied to increases in an organization's competitive advantage (Day & Wendler, 1998; Bender & Fish, 2000; Dyer & McDonough, 2001; Lewison, 2001; Santosus & Surmacz, 2001). However, the present researcher recommends that focus be placed on the development of accurate measures for KM and its ROI to an organization. This will help researchers and

practitioners build a solid case to demonstrate the true value KM can bring to an organization.

Finally, it would be interesting to explore whether duration of employment and/or employment status (temporary versus regular, full-time employment) impacts the use of a KM system, and whether duration of employment has any impact on the commitment and use of KM tools. One might argue that employees who are newer to an organization and have less organizational knowledge prior to KM implementation might be more likely to utilize the KM system and/or be dependent on it to fulfill one's job responsibilities. Conversely, employees who have been in their position for a longer period of time may be more resistant to change and/or to utilize the KM system as they may perceive themselves as already having most of the knowledge they would need to perform their jobs. Future researchers should build upon the current study and explore these relationships in a call center environment.

### *Conclusion*

In conclusion, this study provides practical implications for organizations who seek to implement KM solutions in their daily work environment. In particular, results indicate that call centers can potentially benefit from the use of KM to decrease time to resolve cases. Although overall case volume, initial response time, and customer satisfaction were not shown to be impacted by KM in the current study, the researcher has offered suggestions for future research based on the limitations identified in the present study.

As the empirical research on KM is scarce, it may be difficult to convince an organization's top executives of the value KM can bring to their organization. However, with continued focus on measurement of these benefits and exploratory research on the critical success factors for KM implementation, the empirical evidence to support these claims will grow and continue to demonstrate the true value KM can bring to an organization's bottom line.

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## APPENDIX A

## Human Subjects Institutional Review Board Approval Letter



**San José State**  
UNIVERSITY

**Office of the Academic  
Vice President  
Academic Vice President  
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From: Pam Stacks,   
Interim AVP, Graduate Studies & Research

Date: July 15, 2004

The Human Subjects-Institutional Review Board has approved your request to use human subjects in the study entitled:

“Knowledge Management and Productivity.”

This approval is contingent upon the subjects participating in your research project being appropriately protected from risk. This includes the protection of the anonymity of the subjects' identity when they participate in your research project, and with regard to all data that may be collected from the subjects. The approval includes continued monitoring of your research by the Board to assure that the subjects are being adequately and properly protected from such risks. If at any time a subject becomes injured or complains of injury, you must notify Pam Stacks, Ph.D. immediately. Injury includes but is not limited to bodily harm, psychological trauma, and release of potentially damaging personal information. This approval for the human subjects portion of your project is in effect for one year, and data collection beyond July 15, 2005 requires an extension request.

Please also be advised that all subjects need to be fully informed and aware that their participation in your research project is voluntary, and that he or she may withdraw from the project at any time. Further, a subject's participation, refusal to participate, or withdrawal will not affect any services that the subject is receiving or will receive at the institution in which the research is being conducted.

If you have any questions, please contact me at (408) 924-2480.

cc: Dr. Nancy Da Silva

The California State University:  
Chancellor's Office  
Bakersfield, Channel Islands, Chico,  
Dominguez Hills, Fresno, Fullerton,  
Hayward, Humboldt, Long Beach,  
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