



# Knowledge Management System Use as a Key Driver of Professional and Organizational Cognitive Engagement

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## Abstract

This study aims to contribute to the literature on knowledge management systems (KMS) through investigating the role of engagement as an important intermediary in the relationship between KMS use and outcomes. Building on prior literature, we propose a theoretical model that conceptualizes KMS use as a valuable resource and distinguish between two types of cognitive engagement: professional cognitive engagement and organizational cognitive engagement. These, in turn, mediate the KMS use-job performance and KMS use-organizational commitment relationships. We tested the model on a sample of 3354 real estate agents using an extensive dataset comprised of primary and secondary data. The findings show that KMS use has an impact on individuals' professional and organizational cognitive engagement, which then impacts their job performance and organizational commitment. However, our findings indicate that professional cognitive engagement only partially mediates the relationship between KMS use and job performance. We conclude the paper with a discussion of theoretical contributions and practical implications.

**Keywords:** KMS Use, Cognitive Engagement, Professional Engagement, Organizational Engagement, Job Performance, Affective Commitment

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## 1 Introduction

This study focuses on exploring the role of cognitive engagement as a mediator of the relationship between knowledge management systems (KMS) use and outcomes. Two concurrent developments in the management and information systems (IS) literatures drive this exploration. In the management literature, there has been increasing interest in employee engagement as a key predictor of employee outcomes (Saks, 2006; Rich et al., 2010). Engagement has been found to be a critical factor in the accomplishment of work and in linking other organizational factors to employee job performance (Gruman & Saks, 2011; Rich et al., 2010). Popular press articles have also highlighted that engaged employees are central to

driving competitive advantage for companies, whereas disengaged employees cost US businesses billions of dollars in lost productivity (Bates, 2004). What organizations can do to foster motivation among employees has therefore become an enduring question in both academic and practitioner literatures. It has been argued that organizational actions that extrinsically motivate employees (through rewards and punishments) are highly flawed (Pink, 2011). Instead, promoting intrinsic motivation among employees through encouraging the three elements of autonomy, mastery, and purpose is more likely to succeed (Pink, 2011).

Over the past two decades, IS literature has increased our understanding of how organizations facilitate knowledge management across the organization

through the development of KMS. These systems support the creation, storage, transfer, and application of knowledge by individuals in the organization (Alavi & Leidner, 2001). KMS function as a primary mechanism for managing organizational memory and providing distributed users within an organization with key access to expertise, thus solving a major problem in organizations of getting users the information they need (Ackerman & Malone, 1990). Although IS research has found that KMS use is an important determinant of an individual's job performance (Kim et al., 2016; Ko & Dennis, 2011; Zhang, 2017; Zhang & Venkatesh, 2017), there has been little attention paid to the intermediaries that transpire between KMS use and individual outcomes. Of the few studies that do focus on intermediaries, we found two streams. The first stream includes studies that do not connect intermediaries to individual outcomes of the individual (Beck et al., 2014; Leonardi & Treem, 2012). The second stream is formed by studies that do make this connection but focus on the learning/knowledge attainment that is brought about by KMS use. For example, sourcing knowledge from a KMS has been found to engender positive learning outcomes (Bera et al., 2011; Griffith & Sawyer, 2006; Lin & Huang, 2008). Furthermore, the narrow focus on knowledge attainment has ignored the broader psychological impacts within the individual. Thus, there is a clear need for further research to unpack the processes at play in the KMS use-performance relationship.

While understanding the role of engagement is important for any type of information system, it may be particularly important in the context of KMS. First, knowledge management systems present an avenue for the individual to facilitate learning (Becerra-Fernandez & Sabherwal 2014). Since successful KMS use involves the synergy of technology and the cognitive processes of the human mind, psychological factors such as engagement of the user are likely to play a dominant role in determining the outcomes of KMS use (Becerra-Fernandez & Sabherwal, 2014, Karlinsky-Shichor & Zviran 2016). Second, unlike traditional information systems (e.g., ERPs) whose use is actively required, KMS use is volitional in that the user decides to either use or not use the system. The extent to which KMS use promotes users' attention, energy, and focus on their work roles (i.e., engagement) may determine not just the individual's success in the work role but also how successful the KMS effort is for the organization. Nevertheless, an examination of the role of engagement is absent in existing KMS literature.

This study aims to further understanding through the theoretical development and empirical examination of the role of engagement as a mediator of the KMS use-outcomes relationship. We focus on engagement as a critical intermediary between KMS use and individual

outcomes because it represents an inclusive view of the individual's agentic self (exercising free will). By doing so, this study seeks to enrich the understanding of the impacts of KMS use and complements existing research, which has tended to focus on narrower aspects of the KMS use-performance relationship. First, building on prior research, we propose a theoretical model that conceptualizes KMS use as a valuable resource. Next, we develop a research model that distinguishes between professional and organizational cognitive engagement and hypothesize that KMS use has a positive impact on both professional and organizational cognitive engagement. Further, these distinct cognitive engagement constructs differentially drive individuals' job performance and their organizational commitment. We empirically tested our research model on a sample of 3,354 real estate agents using a comprehensive dataset comprised of primary and secondary data.

This paper is organized into the following sections. In the theoretical development section, we lay out the arguments supporting the role of engagement as an important intermediary between resource use and outcomes. In the research model and hypotheses section, we distinguish between an individual's professional engagement and organizational engagement. Further, we apply the engagement framework to derive our research model. Next, we describe the research setting, measurement and data collection, and empirical analysis in the research methods section. Finally, we conclude by discussing the implications of our findings and the limitations of the study.

## 2 Theoretical Foundations

### 2.1 What is Engagement?

Over the past two decades, engagement has become a popular concept in management literature since it provides a more comprehensive explanation of individual performance than concepts that reflect on narrower aspects of the individual (Rich et al., 2010). The concept of engagement originates in the work of Kahn (1990), who describes it as the investment of the individual's complete self into a role. In other words, engaged organizational members harness their full selves in their work-role performances by being fully present and attentive and bringing their energy, enthusiasm, and focus to their work. Similarly, Schaufeli et al. (2002, p. 74) define engagement as "a positive, fulfilling state of mind that is characterized by vigor, dedication and absorption." More formally, Kahn (1990, p. 700) defines engagement as "the simultaneous employment and expression of a person's preferred self in task behaviors that promote connections to work and to others, personal presence (physical, emotional and cognitive) and active, full

role, performances.” Some researchers also view engagement as the positive antithesis of *burnout*, wherein engaged employees are characterized by energy, involvement, and efficacy rather than the three burnout dimensions of exhaustion, cynicism, and lack of accomplishment (Schaufeli, 2013).

It is important to address two epistemic questions regarding engagement. First, is engagement a distinct construct in itself or is it merely a different label of other constructs such as job satisfaction? Early research on engagement focused on addressing several ontological and epistemic questions related to the concept such as distinguishing it from related constructs such as job satisfaction and organizational commitment (Gruman & Saks, 2011). Meta-analysis studies have shown that while engagement overlaps with related constructs such as job satisfaction and organizational commitment, it displays a different pattern of correlation with other constructs (Schaufeli, 2013). For example, Rich et al. (2010) show that engagement strongly predicts performance, outweighing job involvement, job satisfaction, and intrinsic motivation. Similarly, meta-analysis has indicated that engagement predicts work performance even after controlling for job satisfaction and organizational commitment. These consistent results demonstrate that engagement is not only distinct from related constructs but may be more powerful in explaining work performance. Thus, there is broad agreement that engagement is a distinct construct (Rich et al., 2010, Gruman & Saks, 2011, Schaufeli, 2013).

The second question has particular relevance for IS research, how does engagement differ from other constructs used in IS literature such as flow and cognitive absorption? The concept of flow (Csikszentmihalyi, 1997) refers to a short-term state of optimal experience characterized by focused attention, mind and body unison, effortless concentration, control, distortion of time, and enjoyment (Schaufeli et al., 2009). In other words, flow refers to a person’s level of involvement in an activity that is intrinsically rewarding (Csikszentmihalyi, 1997). As such, when one examines the literature, the contrast between flow and cognitive engagement is apparent along two dimensions. First, flow refers to a short-term psychological state, whereas engagement is not limited to the short term. As Schaufeli et al. (2002) explain, “flow ... refers to a rather particular, short-term ‘peak’ experiences instead of a more pervasive and persistent state of mind, as is the case with engagement” (p. 75). Second, flow refers to a person’s autotelic experience in completing a specific *activity*, whereas engagement is role related and the role itself may encompass several activities. Thus, flow and engagement are clearly distinct. Prior IS literature has elaborated the concept of cognitive absorption, defining it as a state

of deep involvement with software that is exhibited through five dimensions of temporal dissociation, focused immersion, heightened enjoyment, control, and curiosity (Agarwal & Karahanna, 2000). This definition of cognitive absorption, with an overt focus on the activity of using software, clearly associates itself with the concept of flow. Thus, the concept of cognitive absorption is more closely related to flow than to an enduring psychological state of mind, i.e., engagement. Indeed, engagement involves cognitive absorption (Schaufeli, 2013). In sum, the concepts of flow and cognitive absorption are more appropriate to examine questions related to short-term outcomes of an individual’s activity. However, since the use and outcomes of KMS span a longer period of time, the concept of engagement is more appropriate. Therefore, we focus on engagement as a key construct in this study.

## 2.2 Engagement in IS Literature

In order to understand how engagement has been conceptualized in prior literature, we conducted a literature review of the four major IS journals (including *Journal of the Association for Information Systems*, *MIS Quarterly*, *Information Systems Research*, and *Journal of Management Information Systems*). An initial search for engagement yielded several articles in which the use of engagement was perfunctory (i.e., not directly related to the concept). In the majority of these studies, engagement is used as a high-level conceptualization of observed behavior, or as a conceptual foundation supporting relationships among other variables of interest. In order to narrow down the results, we concentrated on those articles that used engagement either as a keyword or as a part of the title. The results of the review are tabulated in Appendix B. As can be observed in Appendix B, the concept of engagement has been used in several different contexts, including online communities (Barrett et al., 2016; Ray et al., 2014), social media (Claussen et al., 2013; Xu et al., 2019), and games (Li et al., 2014). The conceptualization of engagement within the various contexts means that these studies label specific types of engagement as pertinent to their context, including, social engagement (Bapna et al., 2018; Kuang et al., 2019), owner/user/stakeholder engagement (Barrett et al. 2016; Arazy & Gellatly, 2012), social media engagement (Xu et al., 2019), community engagement (Ray et al., 2014), citizen engagement (Olphert & Damodaran, 2007), and game engagement (Li et al., 2014).

Perhaps more importantly, three key takeaways emerged from our review. First, cognitive absorption is sometimes used in conjunction with the engagement concept. Cognitive absorption was proposed in IS research by Agarwal and Karahanna (2000) and has been defined as a state of deep involvement in software

(Goel et al., 2011). As discussed in the previous section, engagement and cognitive absorption are closely related, but the main difference is that the conceptualization of engagement is role related and encompasses cognitive absorption, whereas cognitive absorption may be more appropriate for the investigation of task-related outcomes. Surprisingly, we found no studies that examined the role of engagement and its role in impacting performance in a knowledge management system context. Second, most of these studies mirror the conceptual development of engagement in management literature and conceptualize the role of engagement as a key mediating variable. For example, Ray et al. (2014) found that community engagement is a mediator between antecedents such as community identification and knowledge self-efficacy and outcomes such as knowledge contribution. Similarly, Webster and Ahuja (2006) discuss the role of engagement as a mediator in the nomological network of web navigation systems use and performance. Finally, empirical studies on engagement often operationalize engagement as the use of the system (Arazy & Gellatly, 2012; Bapna et al. 2018). Thus, while prior research has made progress in understanding the role of engagement, there is still a dearth of studies, particularly in the KMS context.

### 3 Research Model and Hypotheses

We build upon the foundations of prior literature to develop our research model in order to investigate the impact of KMS use on engagement and performance. Our model is based on the following arguments. First, engagement has consistently been conceptualized as a mediator of the relationship between antecedents (such as performance management, job characteristics, organizational support, etc.), and outcomes (such as job performance, organizational commitment, etc.). For example, Rich et al. (2010) conceptualize job engagement as the mediator for the relationship between perceived organizational support and task performance. Similarly, Saks (2006) conceptualizes

job and organizational engagement as mediators between perceived organizational support and consequences such as job satisfaction and organizational commitment. As discussed previously, IS research has also consistently conceptualized engagement as a key mediator. Support for the mediating role of engagement exists in strategic human resources management research as well. For example, the core tenet of the job demands and resources model (JD-R), represented below in Figure 1, conceptualizes engagement as the mediator between job resources and performance (Bakker & Demerouti 2008; Bakker et al., 2014; Demerouti et al., 2001).

Second, the engagement literature has long recognized that there are three dimensions of engagement: cognitive, emotional, and physical. Indeed, Kahn's (1990) definition of engagement argues that engaged employees express their labors through the three energies of engagement (Rich et al. 2010). Physical engagement refers to the physical effort (how hard they work) that one brings to the pursuit of job-related goals. Emotional engagement refers to energies such as happiness, anxiety, sense of belonging, shared values, etc., that allow employees to meet the emotional demands of their job role. While both physical and emotional engagement are important, in this study, we focus on cognitive engagement—defined as the energies that one invests in in-depth learning, heedfulness, and metacognition geared toward the job role (Rich et al. 2010). The sharing and acquisition of knowledge is a cognitive action, more than a physical or emotional one. Since the focus of this study is the impact of knowledge management system use, the most relevant dimension of engagement that is pertinent to the acquisition of knowledge is the extent to which the knowledge acquired increases the learning and heedfulness of a user. Thus, in the context of KMS use, we argue that cognitive engagement is the most relevant dimension of engagement.

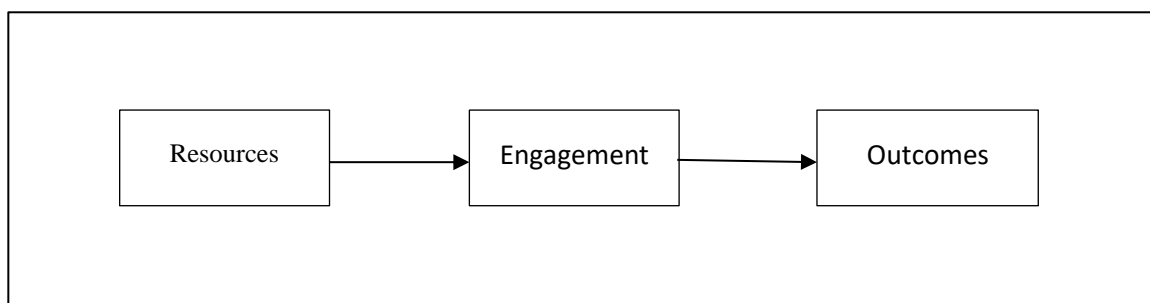


Figure 1. Framework Adapted from Bakker and Demerouti (2007)



Finally, recent engagement literature has identified two types of cognitive engagement: job/professional and organizational cognitive engagement (Saks, 2006; Rothbard, 2001; May et al., 2004). These types follow Kahn's (1990) original conceptualization of engagement as being role related. Individuals have two significant roles within organizations (Rothbard, 2001; May et al., 2004): their *work* role and their role as a member of the *organization* (Saks, 2006). Indeed, as Saks (2006, p. 603) notes, in explaining the nomological model of engagement:

*At the core of the model are two types of employee engagement: job and organization engagements. This follows from the conceptualization of engagement as role related (Kahn, 1990; Rothbard, 2001); that is, it reflects the extent to which an individual is psychologically present in a particular organizational role. The two most dominant roles for most organizational members are their work role and their role as a member of an organization.*

To further exemplify these two roles, let us examine IS academicians. They perform a role as a member of the IS research community and a different role as a member of the organization (i.e., university/college) that they work in. It is important to distinguish between the two types of engagement (professional and organizational engagement) since a resource (such as availability of a research database) may differentially impact each type of engagement. Thus, following calls from prior literature to examine engagement in multiple roles within organizations (Saks, 2006), we distinguish between professional cognitive engagement (defined as cognitive energies directed toward the professional role) and organizational cognitive engagement (cognitive energies directed toward the organization). In line with these arguments, and applying the conceptual framework depicted in Figure 1, we propose the research model presented in Figure 2. The model

highlights that KMS use impacts both professional and organizational engagement of the individual, which in turn differentially impacts job performance and affective commitment, respectively. Drawing on prior research, we conceptualize KMS use as a valuable resource for the individual (DeSanctis & Poole, 1994; Orlikowski, 2000). This is also consistent with prior KMS literature that argues that KMS use is a key resource through which the storage and dissemination of knowledge are provided within organizations (Alavi & Leidner, 2001). KMS use is likely to intrinsically motivate the user by promoting the two elements of mastery and purpose. KMS use can promote users to make progress in their work, which has been found to be the single most motivating aspect for employees (Pink, 2011). Further, KMS use is also likely to encourage purposeful action, driving the user to pursue and achieve focused actions toward specific goals.

Next, the model distinguishes between the cognitive engagement of the individual toward their profession as professional cognitive engagement (henceforth PCE) and cognitive engagement of the individual toward the organization as organizational cognitive engagement (henceforth OCE). Finally, job performance and affective commitment constitute the endogenous variables in the model. We distinguish between the two outcomes because OCE and PCE are distinguished based on the job role, and varying job roles focus on differing outcomes. While job performance relates to how well individuals perform the tasks related their job and is thus the outcome of interest for professional cognitive engagement, affective commitment relates to the extent to which the individual identifies with the organization and is committed to continue with the organization, and is thus the outcome of interest for organizational cognitive engagement. In the following subsections, we lay out the arguments for the hypotheses presented in the model.

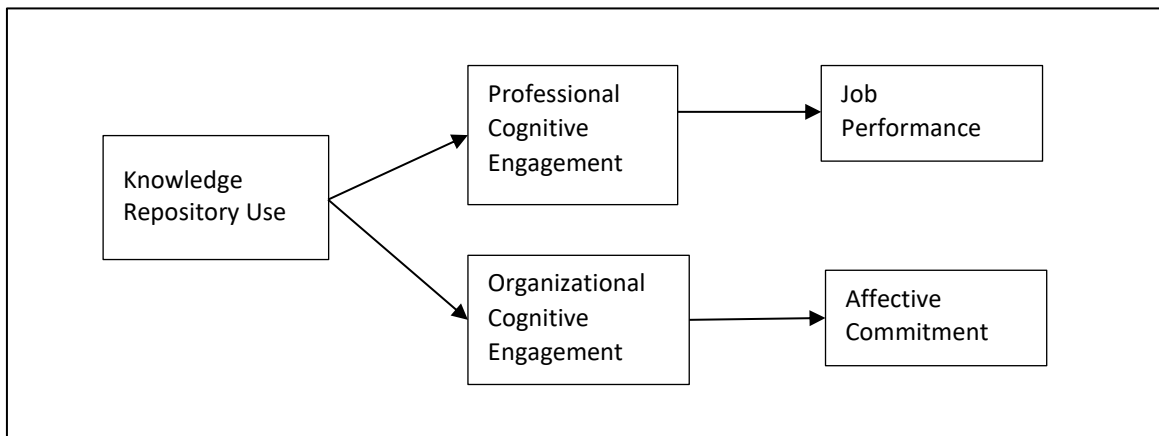


Figure 2. Research Model

### **3.1 KMS Use Impact on Professional and Organizational Cognitive Engagement**

Organizations often provide their employees with access to KMS as a go-to resource (Alavi & Leidner, 2001). Through their use of such systems, individuals gain knowledge that may positively impact their PCE via two mechanisms. First, PCE can be improved through increasing the individual's ability to perform professional tasks (Gruman & Saks, 2011). The knowledge gained is likely to make individuals feel more secure in applying the knowledge to the task at hand, thereby increasing confidence in their own capability to successfully complete job-related tasks. Second, PCE can be improved through increasing the individual's motivation to perform tasks (Luthans et al. 2006). The knowledge gained through KMS use may provide experiences of vocational success and thus reduce the fear of failure. Individuals who have knowledge as a resource that enables them to cope with the demands of their profession are more likely to readily engage with their profession (Kahn, 1990). Often, the knowledge gained from KMS use spurs the individual to think about related opportunities, thereby motivating cognitive engagement with the profession. Thus, we hypothesize that

**H1:** Greater KMS use leads to greater professional cognitive engagement.

KMS use is also likely to impact individuals' OCE. Individuals tend to have expectations, implicit or explicit, that the organizations they work for will provide the necessary resources (Rousseau, 1990; Parzefall & Hakanen, 2010). If these expectations are not met, it is likely that undesirable outcomes will occur, including a reduction in the individual's engagement with the organization (Schaufeli & Salanova, 2011). When individuals receive knowledge through their use of the KMS provided by the organization, they are likely to feel appreciative because the norm of reciprocity for their expectations is being met, and individuals will thus become more engaged with their organization (Saks, 2006). Hence, from a social exchange perspective, individuals who access greater knowledge through the organization-provided KMS are likely to respond with greater OCE. Therefore, we hypothesize that

**H2:** Greater KMS use leads to greater organizational cognitive engagement.

### **3.2 Professional and Organizational Cognitive Engagement Impact on Outcomes**

Prior literature has consistently argued for a positive relationship between an individual's PCE and job performance (Gruman & Saks, 2011). PCE has a profound influence on performance because it increases individuals' work quality and capacity to focus on their tasks (Leiter & Bakker, 2010). These arguments have received support in empirical studies that have investigated the relationship between engagement and performance (Xanthopoulou et al., 2009). Further, a meta-analysis has found that engagement positively impacts job performance (Halbesleben, 2010). Consistent with these studies, we argue here that PCE has a positive relationship with an individual's job performance. In general, Individuals with PCE are able to broaden their thought-action repertoires to become more productive (Bakker & Demerouti, 2008). Further, those with greater PCE are cognitively more vigilant to their job endeavors (Rich et al., 2010). In other words, individuals with greater PCE are more attentive and focused on the demands of their work, which is termed "heedfulness" (Weick & Roberts, 1993). As a result of this heedfulness, they are likely to explore their environments, be more open to learn new solutions, and be more creative in discovering novel lines of thought or action, thus resulting in better job performance (Bakker et al., 2014). In line with these arguments, we therefore hypothesize that

**H3:** Greater professional cognitive engagement leads to greater job performance.

Affective commitment (AC) captures the investment and attachment to the organization and has been a key outcome variable for engagement researchers (Parzefall & Hakanen, 2010). Consistent with prior literature, we argue here that there is a positive relationship between an individual's OCE and AC. Individuals with greater OCE are likely to perceive their relationship with the organization as a high-quality reciprocal relationship and are therefore likely to seek continuation of the relationship (Saks, 2006). In a similar vein, researchers have often found that greater engagement levels have a negative effect on turnover intentions (Schaufeli & Bakker, 2004). Through KMS use, individuals will be inclined to feel more engaged toward the organization, and further, the increase in engagement is likely to motivate individuals to remain committed to the relationship. In line with these results, we hypothesize that

**H4:** Greater organizational cognitive engagement leads to greater affective commitment.

### 3.3 Professional and Organizational Cognitive Engagement as Mediators Between KMS use and Outcomes

Prior literature on engagement has consistently argued for a mediation relationship between the antecedents of engagement and outcomes such as job performance and AC. For example, the JD-R model places engagement as the mediator between job resources and performance outcomes (Bakker & Demerouti, 2008). Similarly, engagement literature argues for the mediating role of engagement in determining outcomes such as task performance and organizational citizenship behavior (Rich et al., 2010; Saks, 2006). As discussed in the theoretical development section, IS literature has conceptualized engagement as a mediating variable (Ray et al., 2014, Webster & Ahuja, 2006). Consistent with these arguments, we argue here that PCE and OCE mediate the relationship between KMS use and relevant outcomes.

First, individuals will likely improve their job performance through KMS use only when it is accompanied by heedfulness—i.e., when the thought efforts to learn new solutions and be more creative in discovering novel lines of thought and/or action result in better job performance. Individuals with greater PCE bring greater levels of absorption and vigor regarding the knowledge gained through the use of KMS and become engrossed in their professional roles. Indeed, if this heedfulness in terms of PCE is absent, then individuals are likely to only “go through the motions” of using the KMS but will lack the ability to discover how the knowledge can be put to optimal use. Therefore, those lacking PCE are unlikely to derive the performance benefits of KMS use. Thus, we expect PCE to mediate the relationship between KMS use and job performance, hypothesizing that

**H5:** Professional cognitive engagement mediates the relationship between KMS use and job performance.

Similarly, we expect OCE to mediate the relationship between KMS use and AC. Through greater KMS use, individuals perceive their relationship with the organization to be a reciprocal relationship and are therefore more likely to bring more energy to their organizational roles and feel more committed to the organization. With greater KMS use, individuals may feel a greater sense of gratitude and indebtedness, leading them to display greater dedication to the organization and increase their commitment to stay with the organization. However, individuals with low OCE who lack a high sense of gratitude toward the organization despite KMS use are likely to be less committed to the relationship. Therefore, we hypothesize that

**H6:** Organizational cognitive engagement mediates the relationship between KMS use and affective commitment.

## 4 Methods

### 4.1 Contextual Setting

For our research, we selected RE/MAX, a leading real estate franchise firm, as a suitable research setting. We gained access to fine-grained data about the firm's efforts to establish a KMS to support its associates. RE/MAX—an acronym for “real estate maximum”—was founded in 1973 and has a loose-coupling structure enabling independent brokerages and new franchise owners to tap into a client base by positioning themselves in the local market more quickly than would be possible independently. RE/MAX's business goal is to sell franchises and recruit and retain real estate agents. To accomplish this, the firm provides its network of franchisees with a strong brand name, proven business practices, and operational support (including training and education, information systems support, and timely market knowledge). Its founder, Dave Liniger, understood that information technology was the foundation of doing business in the digital economy, particularly in information-sensitive industries like real estate. Since the late 1980s, RE/MAX has invested in information technology initiatives to support its associates. In particular, RE/MAX developed MainStreet, which started as a basic agent-centric intranet supporting associates' job performance and evolved into a multifunction, multi-interface, and multi-stakeholder communication KMS to make them “the best real estate agents they could be.” A detailed description of the system and its functionality is available in Appendix C.

### 4.2 Measurement of Variables

Job performance was measured as the log of annual commissions for the agent. AC toward the organization was measured using the eight-item instrument developed by Allen & Meyer (1990). Job performance and AC reflect the practical bottom-line concerns of the two parties involved—the individual agent, and RE/MAX. Given that a key goal of the individual agent is to earn a living, how much the agent earns in commissions (i.e., earnings as a real estate agent) is a natural variable of interest. For RE/MAX, on the other hand, retaining agents is critical. If agents have high levels of affective commitment toward RE/MAX, they are unlikely to leave, making affective commitment important from RE/MAX's perspective. In order to measure PCE and OCE, we modified the six-item instrument developed by Rich et al. (2010) to suit our context. KMS use was measured as the number of distinct visits the agent made to the system in the calendar year.

In addition, we controlled for the influence of several variables that may exert an influence. First, we controlled for the job performance of the agent, measured as the log of commissions for the prior year. In addition, we controlled for the age, gender, experience, and tenure of the agent within the organization. We also controlled for the number of documents that the agent downloaded from the knowledge repository. Since the economic downturn may have had a differential influence, we included the estimated foreclosure rate for the county in which the agent operated. Finally, we controlled for the market conditions the agent operated in by including the county's per capita income, median home value, and population.

### 4.3 Data Collection

After initial developing the instrument to measure PCE, OCE, and AC, we solicited feedback from the company as well as three academics. Following this, we conducted two pilot studies to test the efficacy of the instruments. Some wording changes were made after the first pilot, and the second pilot confirmed the

face validity of the survey items. An online survey targeting 60,000+ agents was sent out via email in the last week of July; the survey was closed after three weeks. In all, 6660 agents responded to the survey indicating about a 10% response rate. There were two sources for the secondary data used in this study, i.e., KMS use, job performance, and the control variables. First, we collected all the secondary data pertaining to the agents from a centrally managed repository from RE/MAX. This database yielded the demographic information (age, gender, experience, tenure, etc.) as well as the commissions made by the individual for the calendar year. In addition, the repository also contained information on how the agent accessed the KMS between March and December, 2011. Second, using the zip code information from the agent repository, we collected data on the per capita income, median home value, and county population from the US census database. We deleted cases that were missing data (typically job performance), ending up with a final sample of 3354 agents. The means, standard deviations, and correlations for the variables are presented in Table A1 (see Appendix).

**Table 1. Loadings and Cross-Loadings**

<b>Professional Cognitive Engagement (Alpha= 0.93; C.R. = 0.80 ; AVE= 0.78)</b>					
At work, my mind is focused on my job	0.89	-0.05	0.01		
At work, I pay a lot of attention to my job	0.90	-0.02	0.00		
At work, I focus a great deal of attention on my job	0.74	0.07	-0.05		
At work, I am absorbed by my job	0.91	-0.03	0.02		
At work, I concentrate on my job	0.92	-0.01	-0.01		
At work, I devote a lot of attention to my job	0.92	-0.02	0.00		
<b>Franchise Cognitive Engagement (Alpha= 0.97; C.R. = 0.89 ; AVE= 0.89)</b>					
My mind is focused on RE/MAX	0.01	0.88	0.04		
I pay a lot of attention to RE/MAX	-0.02	0.97	-0.02		
I focus a great deal of attention on RE/MAX	0.00	0.93	-0.03		
I am absorbed by RE/MAX	-0.02	0.94	0.02		
I concentrate on RE/MAX	-0.01	0.97	-0.01		
I devote a lot of attention to RE/MAX	-0.02	0.97	-0.01		
<b>Affective Commitment (Alpha= 0.90; C.R. = 0.71 ; AVE= 0.57)</b>					
I would be very happy to spend the rest of my career with RE/MAX	0.09	0.01	0.76		
I enjoy discussing RE/MAX with outside people	0.12	0.09	0.69		
I think that I could easily become as attached to another realtor network as I am to RE/MAX	-0.05	-0.08	0.82		
I do not feel like 'part of the family' at RE/MAX	-0.03	-0.02	0.87		
I do not feel 'emotionally attached' to RE/MAX	-0.03	0.00	0.89		
I do not feel a strong sense of belonging to RE/MAX	-0.02	-0.04	0.87		



### 4.4 Measurement Model Analysis

Three variables in our model were measured using survey instruments, i.e., PCE, OCE, and AC. Before testing our structural model, we investigated the reliability and validity of the measures. We began by conducting a principal components analysis of all the items measuring the three constructs. Based on the Kaiser criterion (eigenvalues >1), three factors were extracted. While each of the items loaded onto their own construct, two of the eight items measuring AC had loadings below the recommended threshold of 0.7. Therefore, we dropped these two items from the analysis. We then ran a confirmatory factor analysis with three factors. Table 1 summarizes the Cronbach’s alpha, composite reliability, and average variance extracted (AVE) for each of the three constructs. Alpha values ranged from 0.90 to 0.97, higher than the recommended threshold of 0.707 (Nunnally & Bernstein, 1994). Similarly, contingent reliabilities also exceeded the recommended value of 0.7 (Straub, 1989). The AVE values also support discriminant validity of the measurement model. The square root of the AVE also exceeded the recommended threshold of 0.5 (Fornell & Larcker, 1981; Hair et al., 1995). In addition, we conducted a Chi-square test of difference between the theorized measurement model with three factors (OCE, PCE, and AC) with two other models; a one-factor model where all items loaded onto a single factor, and a two-factor model where the items measuring OCE and PCE loaded onto one factor. The theorized three-factor measurement model is significant, indicating the superiority of the theorized model, as compared to the other two models. Together, these results provide evidence of the validity and reliability of the items in the study.

### 4.5 Structural Model Analysis

We employed covariance-based structural equation modeling in the analysis of the structural model, using the statistical package Stata Release 12. (<https://www.stata.com/stata12/>). The relatively large sample size, lack of second-order formative constructs, and the need for modeling the measurement error of the mediating variables measured using multiple items, all drove our choice for SEM. Table A2 (see Appendix) and Figure 3 present the statistical results of the structural model. Table 2 presents the results of the hypotheses tested in this study. H1, predicting a positive relationship between KMS use and PCE is strongly supported by our results (coefficient = 0.013,  $p$ -value < 0.001). H2 predicts a positive relationship between KMS use and OCE and is also strongly supported (coefficient = 0.03,  $p$ -value < 0.001). H3 predicts a positive relationship between PCE and job performance and is also strongly supported (coefficient = 0.18,  $p$ -value < 0.001). OCE was hypothesized to positively impact AC. The path coefficient is highly significant (coefficient = 0.28,  $p$ -value < 0.001), providing support for H4. In addition to the statistical significance, our results, particularly those related to job performance, are also significant for practice.

The coefficients from our model suggest that a one standard deviation increase in PCE increases job performance by almost 18%, on average. This presents quite an appreciable increase in the earnings of the individual agent. On the other hand, the direct impact of KMS use is significant but is much smaller at around 1%. Further, a unit standard deviation attenuates job performance by 4%, on average. These results underscore the importance of KMS use and show that its impact on PCE can have important impacts on the earnings of individuals using the system.

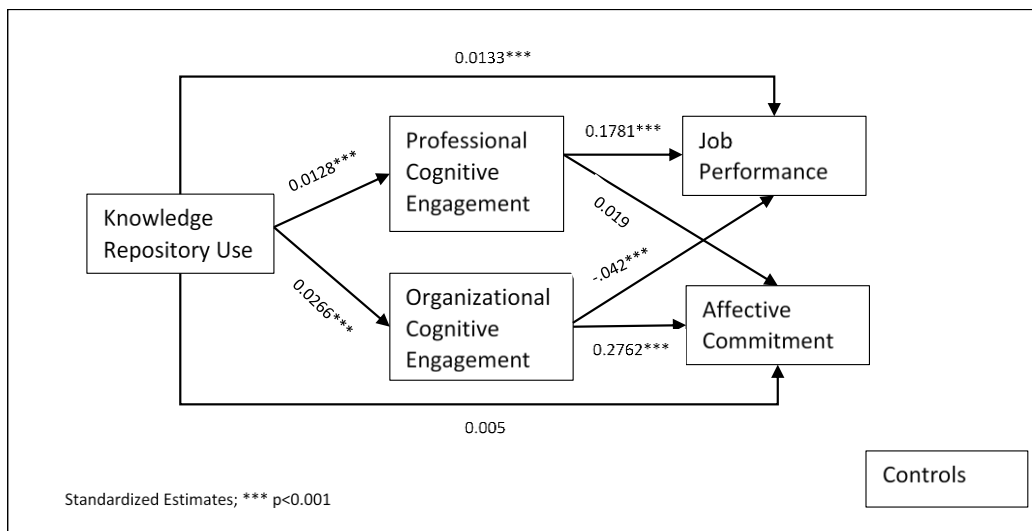


Figure 3. Results

**Table 2. Hypotheses and Results**

Hypothesis	Result
H1: Greater KMS use leads to greater professional cognitive engagement	Supported
H2: Greater KMS use leads to greater organizational cognitive engagement	Supported
H3: Greater professional cognitive engagement leads to greater job performance	Supported
H4: Greater organizational cognitive engagement leads to greater affective commitment	Supported
H5: Professional cognitive engagement mediates the relationship between KMS use and job performance	Partially Supported
H6: Organizational cognitive engagement mediates the relationship between KMS use and affective commitment	Supported

**Table 3. Robustness Checks**

	PCE				OCE			
	Coeff.	Std. Error	z	p-value	Coeff.	Std. Error	z	p-value
<b>March-July KMS use</b>	0.00	0.00	1.96	0.05	0.00	0.00	2.53	0.01
<b>Age</b>	-0.01	0.00	-3.49	0.00	-0.01	0.00	-3.07	0.00
<b>Experience</b>	0.00	0.00	-1.78	0.08	0.00	0.00	-0.69	0.49
<b>Gender</b>	0.00	0.03	0.08	0.94	0.11	0.05	2.34	0.02
<b>Tenure</b>	-0.01	0.00	-2.36	0.02	0.00	0.01	0.40	0.69
<b>Prior performance</b>	0.16	0.01	12.23	0.00	-0.08	0.02	-3.70	0.00
<b>Foreclosure rate</b>	0.17	0.74	0.22	0.82	1.64	1.20	1.37	0.17
<b>Per capita income</b>	0.00	0.00	0.93	0.35	0.00	0.00	-1.72	0.09
<b>Median home value</b>	0.00	0.00	-1.22	0.22	0.00	0.00	-0.84	0.40
<b>Total population</b>	0.00	0.00	1.66	0.10	0.00	0.00	-1.08	0.28
<b>Constant</b>	4.66	0.19	24.79	0.00	5.57	0.30	18.38	0.00

H5 predicts that PCE mediates the relationship between KMS use and job performance. As can be seen from the results table, however, the direct path from KMS use to job performance is significant (coefficient = 0.013,  $p$ -value < 0.001). We then compared the fit of the baseline model (with a direct path from KMS use to job performance) to the model without the direct path in order to compare the model fit. While the fit indices are similar across the two models, a chi-square difference test between the two models (difference in  $\chi^2 = 14.8$ ; d.f. = 1;  $p$ -value < 0.0001) indicates that a partial mediation model (i.e., the model including the direct path between KMS use and job performance) is a better fit than the fully mediated model. Thus, H5 is only partially supported. We followed a similar process to test H6, which predicts that OCE will completely mediate the relationship between KMS use and AC, although the direct path from KMS use to AC is not significant (coefficient = 0.0047,  $p$ -value = 0.17). A chi-square difference test between the two models (difference in  $\chi^2 = 1.9$ ; d.f. = 1;  $p$ -value > 0.1) indicates that the

differences between the two models (with and without the direct path from KMS use to AC) are insignificant. We followed the advice of Shrout and Bolger (2002) to calculate the effect size ratio, which was found to be greater than 1, offering support for H6.

#### 4.6 Robustness Checks for Hypotheses 1 and 2

While H1 and H2 are supported, the results may be criticized for the threat of endogeneity. Further, the KMS use variable contained data for the months of March-December, whereas the engagement constructs were measured in August, opening up the possibility of reverse causality. We therefore conducted robustness checks to examine whether the results reported from SEM stood up to these critiques. First, we constructed the KMS use variable as total use during the months of March-July only, which preceded the survey. Next, we conducted a two-stage least squares instrumental variable regression, where each monthly usage amount (for March-July) served as the instrumental variables, with KMS use (March-July) as

the independent variable and PCE and OCE as dependent variables. In both analyses, the under-identification test (Anderson canonical correlation statistic) and the weak identification test (Cragg-Donald  $F$  statistic) were strongly rejected, indicating that the instruments used were valid instruments. In addition, the Sargan test for over-identification was not rejected, indicating that there was no over-identification. These results indicate some evidence of the appropriateness of the instruments employed. Finally, the results for both analyses, tabulated in Table 3, indicate that KMS use (March-July) significantly predicted PCE ( $p$ -value = 0.05) and OCE ( $p$ -value = 0.012). The tests indicate that the results from testing H1 and H2 are fairly robust against the threat of endogeneity.

## 5 Discussion

### 5.1 Contributions and Implications

The aim of this study is to explore the role of engagement as an intermediary of the KMS use-outcomes relationship. We began by theorizing about the role that engagement plays as the mediator between resources and outcomes. We then applied the framework to derive our research model, which conceptualizes KMS use as a valuable resource that impacts both PCE and OCE. These, in turn, drive the individual's job performance and organizational commitment, respectively. The findings, based on a large sample of primary and secondary data from 3,354 real estate agents, render support for the argument that cognitive engagement may be a key intermediary of KMS use.

This study offers three main contributions to the IS literature. First, it enhances the understanding of the role that cognitive engagement plays in the KMS use-outcomes relationship. Our results indicate that KMS use has a positive impact on the individual's cognitive engagement with both the profession and organization. Further, professional cognitive engagement drives job performance and organizational cognitive engagement drives organizational commitment. These results broadly support arguments that KMS use has an important role to play in enabling favorable outcomes (Alavi & Leidner, 2001). Further, beyond the narrow focus on individuals' job performance, our results also indicate that KMS use can play a positive role in enhancing the individuals' commitment to the organization. In doing so, this study adds to the increasing literature on knowledge management systems and increases our understanding of the impacts of KMS use, beyond the narrower arguments concerning the KMS use-performance relationship.

Second, the empirical results of the model serve to affirm the importance of engagement as an important

intermediary. Prior studies have often focused either on the intermediaries themselves or on the outcomes, resulting in a splintered tradition that has stymied our understanding. Perhaps more importantly, the inclusion of intermediaries takes a process perspective on the impact of KMS use, rather than an outcome-based perspective. In other words, while the KMS use-performance relationship is important, the overt focus on this relationship has often meant a failure to explain the process through which the influence of KMS use works. This study seeks to bridge this research gap by integrating the outcome-based view and process-based view to derive a holistic model that incorporates KMS use as much more than an organizational tool with a narrow purpose. The results demonstrate that the understanding of the direct effects of KMS use on performance is much more nuanced when the intermediaries are taken into account, satisfying not only the imperative to predict the outcomes of KMS use from a utilitarian perspective but also explaining the intrinsic motivations at play. In other words, the model clarifies the value of KMS use for the individual and the organization and reveals how this value can be expected.

Finally, this study proposes a framework that offers the potential to integrate the efficiency/productivity paradigm of IT use along with the psychological/motivational constructs at play in agent behavior. Although our empirical examination is presented within a specific context of a knowledge repository used in one organization, the framework has the potential to inform models of IT use and outcomes in varied contexts. As can be observed from the rise of gamification research (Koivisto & Hamari, 2019), there has been an increasing focus on improving the enjoyment aspect of using technology, even in utilitarian (versus hedonic) information systems. While traditional research involving utilitarian systems has employed models springing from rational, extrinsically motivated, utility-seeking perspectives, more recent developments in processing capacity and the changing psychological needs of users have directed attention toward the psychological outcomes (particularly those pertaining to intrinsic motivations of the user). Thus, there is a need to integrate constructs such as engagement into the more traditional theories of adoption and acceptance. The framework proposed in this study provides a way to integrate engagement with use and integrate it with a variety of outcomes, including those that pertain to the agentic self (like individual job performance) and those that may be important for the organization.

A surprising result produced by the model is the negative impact of OCE on job performance. We did not expect a crossover relationship between OCE and job performance or between PCE and AC. Implicitly, we expected that the impact of KMS use on OCE and

PCE would lead to distinct pathways toward distinct outcomes. While the relationship between PCE and commitment is not significant, the relationship between OCE and job performance is negative and significant. This result suggests that the multiple foci of engagement may end up competing against each other, resulting in the suppression effect revealed by our study. Future theoretical developments may shed more light on the ways in which engagement on various foci may compete with and co-opt each other.

For practitioners, this study also offers important insights. Given today's dramatic and rapidly changing business environment, organizations are investing in providing KMS to support the creation, storage, transfer, and application of knowledge by their associates toward decision-making, problem solving, and optimal use of organizational assets. Therefore, the importance of KMS use will only increase. However, simply deploying such digital tools aimed at achieving short-term results without understanding the interactions involved between the use of these tools, individuals, and their context, is irresponsible and wasteful. Executives need to decide not just whether to join others in deploying KMS but, more importantly, how such systems can be used to engage their associates. Our study reveals the importance of directing attention toward long-term engagement and strategic vision. Specifically, it validates the insights that organizations can use KMS to increase the individual's ability to perform professional tasks and increase the individual's commitment to the organization.

## 5.2 Limitations and Future Research

As is true of most research, the results of the study should be considered in light of its limitations. The first limitation concerns the contextual franchise setting of real estate agents as the subjects of the study. The real estate industry is a knowledge-intensive setting and is thus appropriate for studying individual knowledge-seeking behavior and its consequences. Furthermore, this contextual setting also afforded objective data on performance. As such, the agent's performance and commitment to continue with the franchise are both outcomes of interest for the franchise network. In other contextual situations, the relative importance of outcomes may differ. For example, in using a decision support system in a hospital setting, the performance of the individual may be much more important as an outcome rather than a measure of organizational commitment. Indeed, in some outlying contexts, distinguishing between organizational and professional engagement may not be relevant (e.g., the army). However, regardless of the relative importance of OCE and PCE in various contexts, we believe that recognizing and investigating the foci of engagement as an outcome of technology use is important. For

example, in the gaming context, do gaming features increase engagement with the game itself or also the gaming platform? Future studies that examine the role of engagement as a mediator in other contexts may improve the generalizability of the framework and the model presented in this study.

Second, while our data were collected from both primary and secondary sources, thus avoiding most issues related to mono-method bias, several limitations are thereby introduced. For example, concerning common-method bias, OCE and AC were measured using the same instrument. To examine the extent of mono-method bias, we conducted the one-factor Harman test (Podsakoff et al., 2003) using all the reflective items of the constructs. Our unrotated results indicate that none of the factors accounted for a majority of the variance. More importantly, we tested for mono-method bias by including a latent method factor in the model. All indicator variables were loaded onto this factor along with their respective constructs. We then compared the coefficients of this model to the original model presented. The results show no significant differences between the coefficients with and without the latent method factor. In addition, we conducted an instrumental variable technique, which provides the most straightforward solution to the common-method bias problem (Podsakoff et al., 2012; Antonakis et al., 2010). We used KMS use as an instrumental variable to conduct a two-stage least squares model, instrumenting for OCE. The results indicate that a significant relationship between OCE and AC. Therefore, these robustness checks support our contention that common-method bias is not a serious concern for our study.

Another concern is that we did not have data on how the agent performed on specific transactions throughout the year. Having specific transactions may have helped connect the knowledge gained directly to the achievement of specific tasks. Future studies that focus on task performance (rather than overall job performance) would contribute to our further understanding of KMS use. Further, our KMS use data were missing data from the first two months of the year. We conducted correlation analysis on the KMS-use monthly data. The use variables for each month were fairly well correlated with each other, indicating that the missing data for the first two months likely did not introduce systematic bias because individuals were likely to retain their pattern of KMS use. In addition, the winter months of January and February are generally characterized by the lowest amount of real estate activity in the calendar year. While we believe that the missing data for these two months did not significantly bias our results, future studies without this limitation could potentially explain more variance.

Finally, the cross-sectional nature of the dataset impedes us from making general causal claims with



authority. While the risk of endogeneity and reverse causality are somewhat mitigated for the engagement-outcomes relationships because of the consistent theoretical and empirical evidence from management literature, the same cannot be said about the KMS use-engagement relationship. In order to investigate this risk, we conducted a two-stage least squares analysis using KMS use data from the four months preceding the survey as our instrumental variables. While the results are weaker, the pattern of results still hold, providing some evidence countering endogeneity arguments. Further, KMS use and engagement may positively reinforce each other. Future longitudinal studies could contribute by providing insights into the temporal aspects of the technology use-engagement relationship.

## **6 Conclusion**

This study contributes to IS literature through the theoretical development and empirical investigation of the role of engagement in the relationship between knowledge management use and outcomes. We

developed a theoretical model that conceptualizes KMS use as a valuable resource and distinguished between two types of cognitive engagement: professional cognitive engagement and organizational cognitive engagement. These types of cognitive engagement, in turn, mediate the KMS use-job performance and KMS use-organizational commitment relationships. Our model was tested on a sample of 3,354 real estate agents using an extensive dataset comprised of primary and secondary data. Results indicate that KMS use has an impact on individuals' professional and organizational cognitive engagement, which then impacts their job performance and organizational commitment. As firms invest even more resources in managing their knowledge resources, they will need to recognize the job-related and psychological impacts of these initiatives. We hope that the findings of this study encourage more attention to research that goes beyond the instrumental value of technology, in general, and KMS, in particular, focusing instead on holistic examinations that can help organizations to meet the challenges of rapidly changing business environments.

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## Appendix A

**Table A1. Means Standard Deviations and Correlations**

	<b>Variable</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>	<b>13</b>	<b>14</b>
<b>1</b>	Job performance	10.92	1.05	1.00													
<b>2</b>	Prior Performance	10.95	1.11	0.68	1.00												
<b>3</b>	Affective commitment	0.26	0.72	0.00	0.02	1.00											
<b>4</b>	PCE	6.01	0.89	0.25	0.18	0.14	1.00										
<b>5</b>	OCE	4.03	1.38	-0.06	-0.07	0.48	0.23	1.00									
<b>6</b>	KMS Use	3.09	4.16	0.08	0.02	0.06	0.08	0.10	1.00								
<b>7</b>	Age	53.10	10.68	-0.11	-0.02	0.03	-0.12	-0.07	-0.07	1.00							
<b>8</b>	Experience	16.48	10.25	0.12	0.20	0.01	-0.08	-0.06	-0.04	0.51	1.00						
<b>9</b>	Gender	0.61	0.49	-0.02	-0.01	0.08	-0.01	0.04	-0.04	0.08	0.02	1.00					
<b>10</b>	Tenure	8.86	6.65	0.16	0.26	0.07	-0.06	-0.06	-0.06	0.36	0.68	-0.03	1.00				
<b>11</b>	Foreclosure rate	0.04	0.02	-0.01	-0.03	0.01	0.01	0.05	0.01	0.00	-0.01	0.03	-0.06	1.00			
<b>12</b>	Per capita income	30208.85	6955.38	0.05	0.08	-0.04	0.01	-0.07	0.02	0.03	0.09	-0.02	0.12	-0.40	1.00		
<b>13</b>	Median home value	207414.20	95895.40	0.04	0.08	-0.05	0.00	-0.07	0.00	0.02	0.06	-0.03	0.08	-0.43	0.68	1.00	
<b>14</b>	Total population	968124.50	1509514.00	0.01	0.01	-0.04	0.03	-0.02	-0.02	-0.02	0.02	-0.04	0.04	0.21	-0.05	0.12	1.00
<b>15</b>	Total documents downloaded	13.59	24.03	0.02	-0.02	0.02	0.04	0.07	0.63	-0.08	-0.04	-0.04	-0.05	0.00	0.01	-0.01	0.04

Table A2. Results of Structural Model

	PCE				OCE				Job performance				Affective commitment			
	Coeff.	Std. Error	z	p-value	Coeff.	Std. Error	z	p-value	Coeff.	Std. Error	z	p-value	Coeff.	Std. Error	z	p-value
<b>KMS use</b>	0.01	0.00	3.17	0.00	0.03	0.01	4.54	0.00	0.01	0.00	3.85	0.00	0.00	0.00	1.38	0.17
<b>Age</b>	0.00	0.00	-3.18	0.00	-0.01	0.00	-2.90	0.00	-0.01	0.00	-8.20	0.00	0.00	0.00	2.47	0.01
<b>Experience</b>	0.00	0.00	-1.76	0.08	0.00	0.00	-0.59	0.56	0.01	0.00	3.64	0.00	0.00	0.00	-2.56	0.01
<b>Gender</b>	0.01	0.02	0.28	0.78	0.11	0.04	2.58	0.01	-0.01	0.02	-0.35	0.73	0.08	0.02	3.41	0.00
<b>Tenure</b>	-0.01	0.00	-2.44	0.02	0.00	0.00	0.38	0.71	0.00	0.00	-0.14	0.89	0.01	0.00	5.02	0.00
<b>Prior performance</b>	0.13	0.01	11.31	0.00	-0.07	0.02	-3.61	0.00	0.56	0.01	47.73	0.00	0.02	0.01	1.67	0.09
<b>Foreclosure rate</b>	-0.15	0.62	-0.24	0.81	1.10	1.08	1.02	0.31	0.39	0.61	0.64	0.52	-0.59	0.61	-0.97	0.33
<b>Total documents downloaded</b>	0.00	0.00	-0.58	0.56	0.00	0.00	-0.05	0.96	0.00	0.00	-0.84	0.40	0.00	0.00	-0.92	0.36
<b>Per capita income</b>	0.00	0.00	0.94	0.35	0.00	0.00	-1.81	0.07	0.00	0.00	0.18	0.85	0.00	0.00	-0.90	0.37
<b>Median home value</b>	0.00	0.00	-1.30	0.20	0.00	0.00	-0.72	0.47	0.00	0.00	-0.82	0.41	0.00	0.00	-0.73	0.46
<b>Total population</b>	0.00	0.00	1.86	0.06	0.00	0.00	-1.01	0.31	0.00	0.00	-0.52	0.61	0.00	0.00	-1.28	0.20
<b>PCE</b>									0.18	0.02	9.56	0.00	0.03	0.02	1.89	0.06
<b>OCE</b>									-0.04	0.01	-4.14	0.00	0.28	0.01	23.03	0.00
<b>Constant</b>									5.15	0.16	32.05	0.00				

Note: Model fit statistics: d.f = 322; Chi-square = 4003.42; RMSEA = 0.058; AIC = 518587; BIC = 519175; CFI = 0.943; TLI = 933; SRMR = 0.066

## Appendix B

Table B1. Review of IS Literature on Engagement

Year	Author	Journal	Topic	Findings	Treatment of engagement
2000	Agarwal & Karahanna, 2000	MISQ	Present cognitive absorption, defined as a state of deep involvement in a software	Find that cognitive absorption has an impact on perceived usefulness and perceived ease of use	Discuss how engagement is related to cognitive absorption. This work predates more recent conceptual development of engagement as a construct.
2012	Arazy & Gellatly, 2012	JMIS	Examined user engagement with wikis and how owners' engagement affected it	Wikis can promote and impede engagement	Owner engagement measured as self-reported items regarding how much time they spent reading and contributing to wikis. User engagement measured as usage logs
2018	Bapna et al., 2018	MISQ	Examined whether the decision to become premium subscribers caused users to be more socially engaged	Found that premium subscribers become more socially engaged	Operationalized social engagement along two dimensions; content (how many songs listened to, number of playlists)) and community (forum posts, adding friends).
2016	Barrett et al., 2016	ISR	Examined value creation in online communities over time	Several kinds of value were produced as people engaged with the system over time	User/stakeholder engagement used as an indicator of how involved they were with the system
2013	Claussen et al., 2013	ISR	Examined Facebook apps rule change, wherein more engaging apps were rewarded with further opportunities to engage users	Social media can use rewards and incentive systems to encourage specific behavior	Engagement used as a euphemism to indicate the extent to which users are hooked on apps
2011	Goel et al., 2011	MISQ	Examined user intentions to return to virtual worlds	Found that a state of deep involvement (defined as cognitive absorption) determines the intention to return to virtual worlds	Used cognitive absorption as the central concept defined as deep involvement where user interests are engaged
2005	Hess et al., 2005	JMIS	Examined how multimedia vividness and computer-based social cues impacted involvement and decision-making outcomes	Similarity and playfulness increase involvement	Involvement is defined as the extent of engagement with a decision aid
2019	Kuang et al., 2019	JMIS	Examined the impact of financial incentives to encourage desirable behaviors on knowledge exchange platforms	Financial incentives work and also have positive spillover effects	Social engagement used as a euphemism for how many users are followed by and how many they follow. User engagement used akin to knowledge seeking and sharing activities

2014	Li et al., 2014	JMIS	Examined how two cognitive elements of games—complexity and familiarity—impacted user game-engagement	Found main and joint effects of both elements	Used neurophysiology-based EEG, theta oscillations on the left side as the measure of engagement.
2017	Liu et al., 2017	MISQ	Comment on gamification and its impact on meaningful engagement	Not applicable	Meaningful engagement used to describe the two goals of gamified systems, experiential outcomes, and instrumental outcomes
2012	Milton et al., 2012	JAIS	Examined how the ontological clarity and cognitive engagement impacted the evaluation of cognitive models	Cognitive engagement seems to have an important effect on the quality of conceptual model evaluation	Two characteristics of quality evaluation method promote cognitive engagement, structure, and challenge
2011	Nah et al., 2011	MISQ	Examined the effect of 2D and 3D virtual world environments on enjoyment, telepresence, brand equity, and behavioral intention	Found a positive effect of 3D on telepresence and enjoyment and a negative effect because of distraction	Engagement used to describe the process of flow and enjoyment while using a virtual environment
2007	Olphert & Damodaran, 2007	JAIS	Discuss how to engage citizens in e-government efforts	Consolidated evidence supports the notion that engagement plays a big role	Citizen engagement used analogously to citizen participation
2014	Ray et al., 2014	ISR	Examined the role of engagement in encouraging participation in online communities	Community engagement is a key mediator between antecedents like community identification and knowledge self-efficacy and consequences like knowledge contribution	Conceptualized community engagement as the enthusiasm of members for contributing to their community
2006	Webster & Ahuja, 2006	MISQ	Examined the impact of disorientation on web navigation systems on user engagement and performance	Experimental results support the notion that disorientation decreases engagement and greater engagement increases performance	Engagement conceptualized as flow without the control aspect
2019	Xu et al., 2019	JAIS	Examined how the use of symbol sets impacted audience engagement on social media	Posts conveying information, when accompanied by more natural symbol sets evinced audience engagement	Conceptualized social media engagement as intimacy (likes), interaction (comments) and influence (shares)



## Appendix C

### Description of MainStreet

MainStreet evolved from a stand-alone corporate extranet to a fully integrated agent- and broker-driven resource center that allows user customization. The platform is designed for flexibility and scalability to accommodate future technological needs and enhancements. It is built upon Microsoft SharePoint Server and integrates with internal systems through common industry standards. This includes the membership management system, listing management system, lead management system, content management system, active directory, central email server, customer-facing website, and mobile applications. MainStreet also integrates with external vendor systems providing diverse content and services.

MainStreet services include the following:

- Agent Profile: A personal page for agents to post and share professional details, including service area, listing sites, areas of expertise, awards, and industry designations.
- Commercial Resource Center: Commercial data, statistics, and research for commercial real estate sales.
- Design Center: On-demand design studio, containing more than 2,000 print and digital postcards, flyers, brochures, newsletters, video tours, and web commercials. May be personalized to individual needs.
- Discussion Forum: Area for brokers and agents to ask questions, share knowledge, and comment on industry trends and events.
- Download Center: Library of 50,000 digital files uploaded by RE/MAX headquarters, regions, offices, and sales associates. Contains educational material, business resources, and competitive intelligence targeted to broker-owners and office managers, commercial agents, luxury home specialists, REO short-sale and distressed property experts, and ecofriendly real estate specialists.
- LeadStreet: Lead management dashboard which funnels potential clients to agents through the REMAX.com website.
- Marketing Center: Legally approved images, logos, marketing claims, slogans, and latest ad campaign materials for radio, television, print, outdoor, and online marketing purposes. Provides a management tool to launch marketing campaigns via email, Facebook, Twitter, YouTube, LinkedIn, or Google+.
- RE/MAX University: More than 1,200 on-demand training videos covering aspects of building a real estate business. Contains training pathways, training videos, agent/broker training on demand, off-site training, webinars, and technology training. Provides interactive tools for agents to develop learning plans and meet continuing education requirements. Content is provided by RE/MAX headquarters, external real estate training professionals, and high-performing agents invited to share best practices.
- RE/MAX Weekly: Affiliate-focused news service and weekly email to keep agents abreast of the latest industry news.
- Supplier Center: Connects agents to over 100 approved suppliers to purchase branded products, marketing materials, brochures, and magazines.
- Technology Blog: Summary of popular technology trends, new software, and mobile apps. Contains archives detailing how to use new technologies to improve real estate business practices.
- Travel Center: Full-service travel agency assisting affiliates with business travel needs.
- Web Roster: Search and communication tool to support between-agent referrals. Facilitates referral fee negotiation and transfers relevant customer details between agents located anywhere in the world.

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