Resistance to ERP: Deep Structure Analysis of ERP-Based Job Roles and ERP Task Interdependence

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ABSTRACT

Resistance to IS interferes with effective use of an integrated collaborative ERP system, especially for new hires. Research into IS Resistance investigates ways to mitigate barriers to effectively utilizing ERP investments. This experiment uses a rich conceptualization of usage (defining usage by three dimensions of system, task and user) to investigate antecedents to IS Resistance in the ERP context and introduces the construct of ERP Interdependence. Conceptually, teams using an ERP system enact a Transactive Memory System (TMS) wherein an individual may elect to obtain information from the ERP or team members.

Analysis of a three-way interaction (ERP interdependence, task interdependence on team members, and technical complexity) indicates that resistance to ERP can be mitigated by carefully selecting early job roles and specific tasks. This study identifies the need for more granular research into initial ERP job roles and types of ERP functionality in early use. Findings emphasize to researchers the value of employing detailed conceptualizations of systems usage. Practitioner managers will benefit from the findings *of using resistance as a pro-active diagnostic and emphasizing the importance of initial ERP job assignments.*

Keywords: Resistance to IS, ERP Interdependence, Task Interdependence, Job Roles, Moderation, Three-way Interaction, Technical Complexity

1. Introduction

Productive usage of new information system implementations is of great concern to managers due to the need to utilize the new system to improve company performance and achieve beneficial Return on Investment (ROI) for integrated Enterprise Resource Planning (ERP) System investments. A great risk and frequent occurrence is the resistance of users to a new ERP implementation. User resistance to information systems is a critical issue for organizations (Kim & Kankanhalli, 2009; Rivard & Lapointe, 2012) as resistance may occur at any level in the organization (individual, group and organization wide) and user-level reactions strongly affect the group and organization levels (Burton-Jones & Gallivan, 2007). User habits and inertia are examples of status quo bias which act to inhibit usage of a new system (Polites & Karahanna, 2012). User-level resistance may occur passively by persistence of the prior status quo (Freeze & Schmidt, 2015; Kim & Kankanhalli, 2009; Lapointe & Beaudry, 2014; Lapointe & Rivard, 2005), or actively through forms of system mis-use. The problem of workarounds is seen as a hidden and dysfunctional adaptation to IS (Alter, 2014; Ignatiadis & Nandhakumar, 2009; Strong, Volkoff, & Elmes, 2001). Any form of resistance to ERP may be considered highly dysfunctional when it leads to an organization's lack of productive use of IT or disruption of business operations.

The existence of such a wide variety of information systems, widely diverse job roles and high task interdependency demanded by these integrated systems indicates the need for more specific conceptualizations of each system and the varying forms of system usage. Prior research on technology adoption has called for more sophisticated conceptualizations of systems usage and ones that focus on specific contexts (Straub & Burton-Jones, 2007). These richer conceptualizations of technology usage can be extended by a refined definition of job attributes that call for the use of specific ERP transactions and reports. Job role have differing interdependencies on both the ERP system and their organizational colleagues. These attributes can be used to assess initial ERP usage and their impact on ERP resistance.

A re-occurring obstacle to ERP productive use is resistance to IS implementations (Ellen, Bearden, & Sharma, 1991; Freeze & Schmidt, 2015; Lapointe & Rivard, 2005) and the occurrence of ERP workarounds (Alter, 2014; Ignatiadis & Nandhakumar, 2009; Strong, Volkoff, & Elmes, 2001). Many ERP implementations are met with strong resistance from current employees who must learn new business processes and quickly gain technical skills to perform job functions in the new system. Once resistance occurs, management responses to counteract resistance are often not effective (Rivard & Lapointe, 2012) or resistance is hidden by use of system workarounds (Alter, 2014; Deng & Chi, 2012-13; Ignatiadis & Nandhakumar, 2009; Strong et al., 2001;). Therefore, a proactive approach is preferable where early experiences mitigate the occurrence of resistance to the system. Different job roles pose different demands on employees in how they utilize transactions in the ERP system and how their job function is controlled through the ERP. Little research has delved deeply into the specifics of collaborative system characteristics, differing job tasks, task-specific usage of ERP transactions, or the demands on individuals when they are expected to learn new business processes as controlled and monitored through an ERP system. This study extends prior research by looking at the deeper structure of ERP usage at the cross-section between business process demands per job role, the usage of ERP transactions and its outcome effect on resistance to ERP. This paper answers the call for “very rich” measures of system usage defined in three dimensions: system, user and task (Burton-Jones & Straub, 2006, p. 233). Specifically, this paper defines the dimensions of system usage as: 1) a collaborative ERP system, 2) new hires as users and 3) specific revenue and procurement tasks.

Rather than viewing IS resistance purely as a negative occurrence, the resistance to ERP construct can also be viewed as an informative diagnostic for management as it can signal areas for improvement (Ford, Ford, & D'Amelio, 2008; Ford & Ford, 2010). Resistance may be high, not only due to reactions to inherent system capabilities, but also when business processes are not well-understood, task interdependencies are not acknowledged, or due to lack of user knowledge or deficient technical support. There is great value in being able to identify pro-active approaches to mitigating resistance to ERP. This paper investigates specific ERP transactions used within job tasks as they affect the outcome of Resistance to ERP. The goal is to mitigate IS resistance which can be a deterrent to technology adoption and use (Grabski, Leech, & Schmidt, 2011; Kim & Kankanhalli, 2009; Rivard & Lapointe, 2012).

Prior calls for ERP research state "There is a growing need to examine how resistance to ERP and ERP workarounds change over time, what actions management can use to counteract them, and how these ERP workarounds impact management control" (Grabski et al., 2011). This paper looks into the structure of initial ERP usage via four different job roles in order to investigate the types of ERP interactions that could exacerbate or mitigate the resistance to ERP. To differentiate an individual's perceptions of interdependence on ERP, a new construct was developed for Interdependence on ERP, based on the established construct of Task interdependence on team members (Sharma & Yetton, 2003; Sharma & Yetton, 2007).   With use, the ERP System can take on the role of a knowledge element in the work team. Such a work team can effectively be considered a transactive memory system (TMS) involving human and technology members. A TMS is a knowledge management practice whereby team members differentiate their knowledge by specializing in different expertise domains. Team members then collaborate interdependently to share expert knowledge with others as needed. These collaborations provide each team member with a larger memory, through collaborative transactions, than individual memory alone retains. This practice expands the expertise available to each team member by expanding their domain of expert knowledge.

Social psychology and team research have repeatedly demonstrated that a TMS is influential in improving performance in small teams. This research introduces the concept of viewing IT systems, specifically an ERP system, as an additional source of expert knowledge and therefore a transactive memory (TM) element in a team-based TMS. In other words, it conceptualizes an ERP system as a knowledge resource alternative to the expertise of team members. Learning how to better utilize ERP as a part of a TMS could expand the team expertise and improve process execution. In an ERP context, real time data supports knowledge workers in performing their specific job functions. ERP serves as a member of the TMS and is the preferred source for accurate and current information about the activities of the business process and the most current state of company data. The ERP system also enforces and monitors business process steps which may result in resistance from some team members, particularly those less proficient in ERP usage skills or less knowledgeable about the business process specifics. In cases of high resistance to ERP, member interactions and decision consultation would likely be sought from team members in the TMS rather than by relying on direct ERP usage.

A challenge faced by new ERP users is that utilizing ERP-based knowledge requires both the ability to navigate the ERP system as well as a clear understanding of the business process steps, interactions and dependencies. ERP systems implement many internal controls such that users can encounter obstacles caused by their own usage errors or the omission of appropriate information when using an ERP transaction. Effectively communicating with team members (in a TMS) requires inter-personal communication skills. Effectively using a complex ERP system additionally requires the individual develop both technical navigation knowledge (of where and how to do an ERP-based activity) and the process knowledge of when to use what transaction in the ERP system (i.e., before the individual would rely on the ERP system as a resource in their TMS, one must learn both where and how to find information and when to use specific functions within the ERP system). Only then, would the ERP be considered a viable member of the team member's TMS. These skills should be multidisciplinary and are organized into declarative and tacit knowledge structures (Freeze & Schmidt, 2015). Team and organizational influences can promote effective results by supporting use of the system (Yen, Hu, Hsu, & Li, 2015). This process of gaining an understanding of the ERP system is analogous to the team member introducing themselves to their teammates, becoming comfortable with their domain of expertise and sharing their domain of expertise. The activity of learning ERP serves to create a TMS directory entry about the knowledge and location of expertise within the ERP. With greater ERP skills comes the effective use of an ERP as a 'full and valuable' member of the TMS.

This study departs from the typical IT application acceptance research approach and instead views technology from a social cognition perspective. Prior research (Schmidt, Sasidharan, & Freeze, 2014) shows that it is not enough for individuals within a team to interact with team members, but it is important that users utilize high quality knowledge sources in their workplace social network. To perform well, users should seek knowledge sources of high quality to support both the process conceptual knowledge as well as accurate and timely business data. The use of an ERP is presented as the choice of each individual who could alternatively communicate directly with a team member. To assess the choice regarding the TMS element, a new construct of 'Interdependence on ERP' was conceptualized based on the construct of 'Task Interdependence' on team members (Sharma & Yetton, 2003). Thus, an individual within a TMS is faced with the options of choosing to communicate with the ERP or with a team member as alternative information sources during operations of a time-sensitive business process. This choice is naturally limited by the individual's level of competency in using the ERP interface. As described by

Kang and Santhanam (2003), workflow systems (such as an ERP) require a hierarchy of knowledge for effective use, starting with navigation skills, then procedural knowledge and eventually attaining higher levels of system problem solving abilities. The following three research questions (RQ) are the focus of this study:

RQ1 – Does task interdependence on ERP influence Resistance to ERP?

RQ2 – Do specific ERP job roles result in different levels of Resistance to ERP?

RQ3 –Do varying (high and low) levels of task interdependence on two different forms of TMS elements (personified ERP and the human team member) interact to reduce IS resistance by a new user?

By investigating the technology from the TMS theoretical perspective and including ERP as an element in the team's TMS, this study takes a novel perspective to better understand the underlying cognitive concepts related to knowledge management and resistance to ERP use. Special focus is placed on two cognitive areas: a) how perceptions of high complexity inhibit use of ERP (i.e. increase resistance to IS/ERP) and b) how relying on assistance from a technology (ERP system) versus from human team members is viewed within a close, interdependent work team while performing demanding, dynamic business processes.

The remainder of the paper begins with the theoretical background associated with the personification of IT and the associated ERP system's personified characteristics. This will be followed by a review of the Transactive Memory System literature. The theoretical background section concludes with a review of IT Resistance, team roles and control variables. The research model and resulting hypothesis will be presented with a concluding discussion of the three-way interaction. Next, the experimental setup and data collection methods will be reviewed, followed by an analysis of the results. Finally, the contributions, conclusions, limitations and future research of this study will be reviewed

2. Theoretical Background

Resistance can interfere with the important relationship between user satisfaction as it effects individual impact, located in the later stage of the IS Success Model (Delone & McLean, 2003). IS use has been shown to be effected by the user's Attitude (Venkatesh, Morris, Davis, & Davis, 2003) and the Technical Complexity (Freeze & Schmidt, 2015) of the system. Central to the approach of viewing an ERP system as an element of a TMS is that the other TMS elements, team members, can view the ERP system as an automated or personified memory element. Prior research supports the perspective that user's personify technology systems especially with close, repetitive and prolonged usage. As with any new technology introduction, there can be some level of resistance to use, as can also occur with the introduction of a new human member into the team, and thus potentially into the TMS. Group cohesion has been empirically linked to group effectiveness (Kayworth & Leidner, 2002) and the placement of an ERP as a group member can enhance that effectiveness.

2.1. Rich Definition of ERP System Usage

Some studies group ERP systems into a general 'information systems' category along with non-collaborative individual productivity applications such as spreadsheets. Such an over-generalized classification fails to appropriately acknowledge ERP's process-oriented nature and inherent process controls. Burton-Jones and Straub (2006) call for greatly refining conceptualizations of systems to reflect greater variations in system types as well as to acknowledge the diversity of system usage. They espouse rich measures of usage which reflect the three dimensions of system definition, user types and task definition. Thus, it is important to position ERP as a collaborative inter-dependent integrated system and to position users within their business process and task (Burton-Jones & Straub, 2006). Appropriate classification is critical to empirical ERP investigations as it situates the IT artefact usage within a richer system usage classification as a multi-user, specific process-based task within a collaborative system domain. The collaborative system classification is based on the definitions which specify the dimensions of "Collaborative Applications" as having a goal of "Improve[d] collaboration and coordination among users to complete a business process" and a task environment of "Integrated tasks of a business process". Collaborative systems importantly include characteristics of "Extensive built-in control that enforces shared work processes" and their patterns of usage exhibit "Frequent exception handling" (Kang & Santhanam, 2003). Process enforcement through built-in controls can be experienced as high interdependence on ERP and the high incidence of exception handling can be a source of challenge and complexity, especially to inexperienced users.

Theories of learning related to information system application acknowledge several stages or levels of understanding to becoming proficient with an application. Prior research in collaborative system knowledge repeatedly finds that there are many levels of software knowledge to attain productive use (Bostrom, Olfman, & Sein, 1988; Santhanam, Seligman, & Kang, 2007; Sein, Bostrom, & Olfman, 2001). Kang and Santhanam (2003) focused on collaborative business process systems and identified a knowledge hierarchy for growing technical expertise. The collaborative system hierarchy of knowledge starts with a foundational level of application knowledge including command based navigation and procedural knowledge of the feature (Kang & Santhanam, 2003). Subsequently, with experience and study, further levels of knowledge for tool-conceptual and business procedures may eventually be attained. This framework for learning collaborative systems highlights the progressive stages of ERP learning which starts with tool command navigation and tool-specific procedures; only then to be followed with the business procedures and inter-dependent problem solving.

2.2. ERP System as TMS Element

It is conceptualized that the ERP system acts as a TMS element, (i. e. that this ERP serves as a personified-IT team member in a Transactive Memory System (TMS)). This extends traditional TMS theory and utilizes a social perception of technology (Weill & Olson, 1989). Viewing the ERP system as an element in the TMS leads to an interpretation whereby greater reliance, or interdependency, on this element of the TMS can reduce the cognitive demands inherent in performing interdependent tasks. Use of ERP serves to reduce delays in getting information and can reduce cognitive demands once the user is familiar and has routinized use of the ERP interface. A reduction in cognitive demand can impact IT resistance. The question that can then be asked is 'How does ERP Interdependence, Task Interdependence on team members, and Technical Complexity influence Resistance to ERP? '

As a TMS member, the ERP system provides valuable information and performs valuable activities such as a) sharing stored master data reflecting past policies and decisions enacted by management (e.g. suppliers from which to purchase, materials to utilize in production, credit limits for customers); b) providing real time status information collected and used in the performance of business transactions, and c) 'monitors' and 'enforces' the necessary steps and conditions required in the performance of each business process.

For purposes of defining the full team involved in executing ERP-based business processes, it is valuable to include the ERP system as an element of the TMS. Just as various co-worker personalities and work-styles will impact a team, the ERP system exerts a large influence on how co-worker's interact. The ERP system is a critical central element due to the tight coupling among inter-dependent tasks in the business process which is supported, monitored and enforced by the ERP system. This approach of defining ERP as a TMS element positions it as an influential memory element and an alternate team member. The ERP system being viewed as a team member and peer actor is based on the theory of Computers are Social Actors (CASA) (Nass, Moon, Fogg, Reeves, & Dryer, 1995; Nass, Fogg, & Moon, 1996). Prior research has shown that strong social bonds can form between human and computer, accelerated by simply labeling them as a 'team' (Nass et al., 1995). There is also support for simple forms of technology to be personified. The personification of technology theory says that by interacting with ERP as a TM element, individuals are responding rationally to a 'human-made artifact'. One study found that personification of technology does not require that the technology have any form of artificial intelligence (Nass et al. 1995).

In ERP usage, the processes and practices enforced by the system are said to reflect industry 'best practices'. The internal controls, such as user access controls based on roles and authorizations, represent mechanisms based on policies of upper management. In effect, the ERP system prescribes, supports and often enforces a set of procedural steps which require both interaction with the ERP system, human team members and others external to the team. In general, the ERP system is often placed at the center of interactions among human actors performing required business processes. At a minimum, the ERP system records status from business activities (transactions) and is continually available with a complete, real-time set of business information. These functions position the ERP system as an extremely knowledgeable and reliable team member. These attributes make the ERP system a highly valuable TMS element for those team members who accept (i.e. are not resistant) and who have developed the system usage skills needed to utilize ERP.

2.3. Transactive Memory Systems (TMS)

A transactive memory system is a collection of differentiated knowledge sources called transactive memory (TM) elements. These TM elements are experts who share information via interactions (i.e. transactions) between the interdependent individuals who operate in cooperation by sharing expertise and knowledge. The existence of TMSs were first identified studying couples and how they differentially stored knowledge and experiential memories in support of interdependent goals (Wegner D. M., 1986; Wegner, Erber, & Raymond, 1991). A TMS operates based on a shared understanding of 'who knows what' in the group. The structure of a TMS has been defined as consisting of two main elements of a set of transactive memories and a shared TMS directory (Lewis, 2004). A TM element is a member that accesses and is influenced by knowledge held in the memory of another person acting as a TM element.

A TMS directory is often thought of as a shared understanding of the knowledge contained in individual TM elements across the group. This directory is created by interactions during the team formation process. The TMS directory is continually updated and adjusted throughout the lifetime of the TMS. The directory is critical to the operational value of the TMS since specific knowledge much first be located before it can be accessed and shared. An ERP system can be considered a TM element based on the knowledge residing in the ERP systems memory (master data and transaction data), the transactions engaged in with the other TMS members, and the fact that each business transaction is stored as it is performed using the ERP system. This positions the ERP system as holding the full set of current and accurate business transaction data. Such business data is highly valued and frequently needed by other TM elements.

Navigational skills are needed by the human TM elements to effectively access critical information held in the ERP TM element. This is similar to the social orientation of adding new members to the TMS. While learning ERP, an individual updates their TMS directory about valuable knowledge the ERP TM element holds which includes various ERP functions and what types of information is accessible by using those functions. So, greater ERP proficiency is expected to lead to ERP interdependency on the ERP TM element. The TMS directory update process includes the TMS processes of information allocation and retrieval coordination (Wegner D. M., 1995). Information allocation is the process that handles new information as it comes into the group and is communicated to the appropriate TM element to facilitate encoding and storage. The ERP element can therefore be considered an extended part of the TMS definition.

Studies of TMS are often focused on task-oriented information so ERP is a natural candidate for being an important TM element given its important role in facilitating the performance of business tasks, promoting data validity, accessing master data and storing transaction data. Given the real-time nature of an ERP system, it is likely the TM element with the most current, up-to-date and complete business transaction information. These attributes make the ERP an important and frequently accessed TM element. TMS formation emerges from shared training (Moreland & Myaskovsky, 2002), or from memories of shared experiences (Wegner D. M., 1986), and can be based on shared knowledge regarding external resources (Austin, 2003). Dyads and small interdependent teams are shown to benefit from the existence of TMS (Borgatti & Cross, 2003; Moreland & Myaskovsky, 2002). The existence of a TMS has been repeatedly shown to positively influence productivity in small groups (Wegner et al., 1991) and other dyads as well as in small interdependent teams (Borgatti & Cross, 2003; Moreland & Myaskovsky, 2002).

In business situations of ERP usage, group interaction occurs not only directly between individuals but with and through the ERP system's coordinating functional modules. Such systems are utilized to control and coordinate between different job functions as individuals perform their part of interdependent business processes. ERP systems are designed to support the processes of entire organizations and include support for both upstream (i.e. purchasing and inventory status) and downstream (i.e. sales and marketing) processes.

2.4. IS Resistance

Resistance to various forms of Information Systems and technology has been studied since early in the proliferation of computing to desktops. User resistance to IT is defined as an adverse reaction, or opposition of users to perceived change related to new IS implementation (Markus, 1983). For organizations to maximize the benefits of technology, especially an ERP system, the users need to accept and become proficient in system use.

The IS Resistance integrated framework was informed by technology acceptance literature and ‘status quo bias’ perspective and the equity implementation model (Kim & Kankanhalli, 2009). The ERP system technology they studied was a very modest system that did not include major ERP modules typically used in large companies. Common corporate ERP systems include manufacturing (such as MRP) and financial modules, customer relationship management (CRM) modules and supply chain management (SCM) modules (Kim & Kankanhalli, 2009). Support was found for many direct and indirect effects that acted as mitigators of IS Resistance. Mitigating resistance was found to be heavily influenced by the direct effects of perceived value and high switching costs, while indirect effects include colleague opinion and self-efficacy for change acting though switching costs and switching benefits.

3. Research Model and Hypotheses

The research goal is to investigate the effects of Task Interdependence on ERP (TI-ERP) and Task Interdependence on teammates (TI), as well as Perceived Technical Complexity (TC) in reducing IS resistance. This investigation posits that early experiences, and any resulting resistance to ERP, vary based on job roles due to deep structure differences in job specific use of ERP transactions. Based on TMS theory, effective teams utilize expertise across the TMS. Here, both team members and the ERP system are considered TM elements. The dependence on the ERP system as a TM element is captured with the adapted factor of Task Interdependence on ERP (TI-ERP) based on the TI construct. This TI-ERP variable introduces another possible moderation variable that interacts with the variables of Task Interdependence and perceived Technical Complexity to help further illuminate the understanding of factors that impact IS Resistance. The commonly accepted conceptual understanding of moderation (Baron & Kenny, 1986) is followed with two-way interactions hypothesized between each pairings of independent variables. The priority is understanding the interactions among all three variables (TI, TC and TI-ERP) with the model leading to a three-way interaction influencing IS Resistance.

3.1. Team Roles

The use of teams in organizations contribute to the organizational goal to increase organizational effectiveness (Smith, Mills, & Dion, 2010). Individual job roles in relationship with ERP technology can contribute to organizational performance (Weill & Olson, 1989). The source of these TMS are a result of the ability to "access knowledge from three sources: the organization's memory, each individual's memory and external market information" (Freeze, Sasidharan, & Lane, 2012). Four roles are included with the ERP system, making up the TMS, which would access these knowledge sources. The roles supporting the integrated business processes consist of two upstream roles (Inventory Specialist-IS, Purchasing Agent-PA) and two downstream roles (Marketing Coordinator-MC, Sales Manager-SM) (Figure 1). Each team member is able to access knowledge across the TMS from other team members and the ERP system in order to support effective job performance.

Each team member executes their set of job-specific ERP transactions, in coordination with the other three job roles, in order to successfully perform their job role by using the ERP system. Each participant will experience a different type of ERP usage based on their assigned job role. Each job role is performed using its own decision

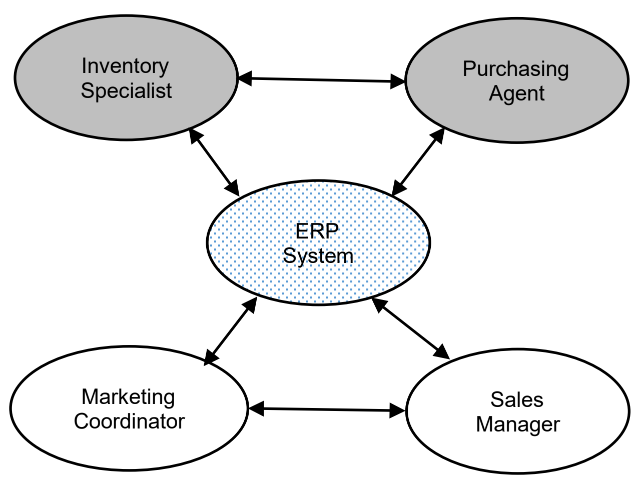

Figure 1 – Coordinating Team Roles

transactions and by monitoring a related set of ERP reports (Table 1).

3.2. Control Variables – Hypothesis H1

Job Assignment	Code	Type	Other role likely to use
SM	VK32	Transaction	MC
SM	ZVA05	Report	IS, MC, PA
IS	F.01	Report	SA, MC, PA
IS	MD61	Transaction	MC, PA
IS	ZMB52	Report	SA, MC, PA
MC	ZADS	Transaction	None
MC	ZMARKET	Report	SA, IS
MC	ZVC2	Report	SA, IS, PA
PA	MD01	Transaction	None
PA	ME59N	Transaction	None
PA	ZME2N	Report	None

Table 1 – Role and Cross Role Use

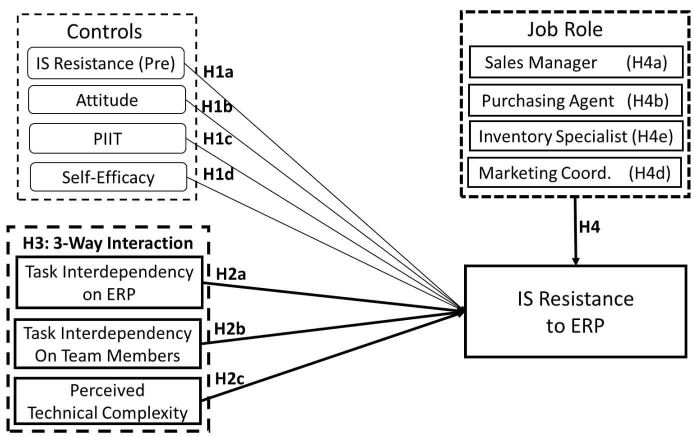

Figure 2 – Research Model

The research model (Figure 2) includes both the control variables and the main effects. The hypothesis are addressed in order of Control Variables, Main Effects, Interaction Variables and Job Roles. A number of variables have routinely been found effective in predicting IT acceptance and use. The leading IT use predictors are included as control variables in the model, including resistance (Kim & Kankanhalli, 2009), attitude to IT use (Venkatesh et al., 2003), personal innovativeness with IT (Agarwal & Prasad, 1998), and computer self-efficacy (Compeau, Higgines, & Huff, 1999).

Reducing IS Resistance for users is a primary goal for organizations in order to maximize benefits of their ERP system. System users may bring with them an existing resistance to system use that can be influenced by peers in the TMS, and may be modified from productive and supportive guided usage experiences. Prior levels of resistance to IS are expected to impact the ability to mitigate IS resistance. Therefore, prior resistance is a known predictor of the future Resistance and leads us to the first hypothesis:

H1a: Prior IS Resistance will positively impact future IS Resistance

The attitude individual users bring to new system implementations has been studied in multiple settings in prior literature. These settings include the constructs of attitude toward behavior (Davis, Bagozzi, & Warshaw, 1989), user's intrinsic motivation (Davis, Bagozzi, & Warshawm 1992), and affect toward use (Thompson,Higgins, & Howell, 1991). Both the early TAM/TAM2 model and the later UTAUT model findings support that user's positive attitude toward technology use will result in higher behavioral intention to use that technology. Attitude is a parsimonious control variable from the technology acceptance literature. From the early TAM (Davis et al., 1989) and its revised version of TAM2 (Venkatesh & Davis, 2000), to the more comprehensive collection of antecedents in the UTAUT (Venkatesh et al., 2003), Attitude is a predictor of expected behavior towards technology use. TAM2-UTAUT studies include two main antecedents (ease of use-effort expectancy and perceived usefulness-performance expectancy) in predicting attitude or behavioral intention (Venkatesh et al., 2003). As those two variables influence attitude directly, only Attitude to IT use is used here as a parsimonious control variable. A higher intention to use a technology operates in opposition to resistance to IS. This leads to the following hypothesis.

H1b: A positive Attitude to ERP usage will decrease IS Resistance

Personal Innovativeness in the domain of Information Technology (PIIT) was introduced as a moderator to both perceptions about and the intentions to use a new IT (Agarwal & Prasad, 1998) and operationalized to effect task-specific self-efficacy (Agarwal, Sambamurthy, & Stair, 2000). PIIT has further been adapted as a mediator and direct effect on Organizational Performance (Hsu & Sabherwal, 2012). PIIT would benefit an individual in performing job-specific tasks by supporting exploration and deeper use of transactions in a complex ERP system. Deeper use should reduce resistance to use.

H1c: A positive level of PIIT will decrease IS Resistance

The negative relationship of Computer Self-Efficacy (SE) to resistance has been studied for many years in multiple disciplines (Ellen et al., 1991). SE has been confirmed to be malleable and an individual's general SE beliefs shown to predict task-specific SE beliefs in the context of specific software SE and ease of use (Agarwal et al., 2000). Research on task-specific SE beliefs are based on enactive mastery experiences which are gained through progressive trials in a task domain (Bandura, 1977). In the context of team system usage, task mastery is essential to reducing the resistance of system usage and the achievement of organizational goals.

H1d: Positive self-efficacy will decrease IS Resistance

3.3. Main Effects – Hypothesis H2

The independent variables of Perceived Technical Complexity (TC) and Task Interdependence (TI) on teammates were based on prior research (Sharma & Yetton, 2003; Sharma & Yetton, 2007). The ERP system serves as an interdependent member of a close-knit team so the TI construct was adapted to represent ERP as a TMS element. The level of interdependency on the ERP system (TI-ERP), a type of TMS element, is expected to be a factor in predicting IS resistance. The TI-ERP introduces a way to consider the ERP system as having close ties to the job tasks where the individual must directly and successfully interact with the ERP to succeed in their job function. An interaction with the ERP system would necessarily differ from individual to individual just as the interactions among team members differ. A key benefit of using ERP is that all transactions are structured, captured and organized as business information. This is a reason why management endorses and requires ERP use. Studies have shown that mandatory use situations differ from discretionary use situations (Agarwal & Prasad, 1999; Venkatesh et al., 2003; Yen et al., 2015). Here, the individual's perception of interdependency on the ERP is assessed, reflecting the actual level of interdependency (i.e. usage) on the ERP. Actual, supported initial interdependence on the ERP system develops usage skills and rewards user with accurate real-time status thus lowering their resistance to using the ERP system. The task interdependency factors of TI-ERP and, TI along with TC, are expected to illuminate the understanding of IS Resistance impact as stated below.

H2a: Increased TI-ERP will lower IS Resistance

H2b: Increased TI will lower IS Resistance

H2c: Increased TC will increase IS Resistance

3.4. Three-way Interaction Effects – Hypothesis H3

The three-way interaction of the TI-ERP, TI and TC represent the TMS that has been developed by the individual members of the organizational team. The varying levels of each input represents the effectiveness of the modifications to resistance. These interactions have varying levels and for simplicity, we will focus on all levels of the interaction being low (Low-Cubed) or all being high (High-Cubed). These interactions are depicted in Figure 3.

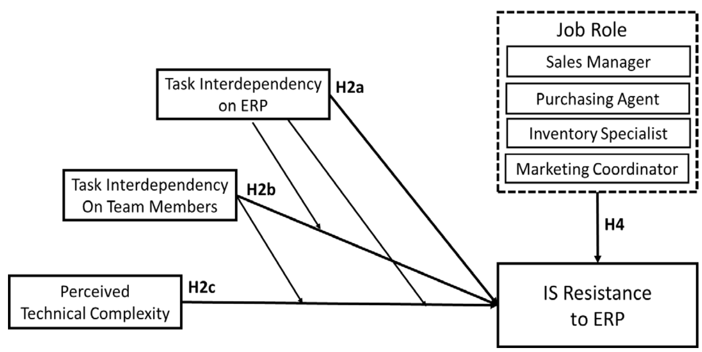

Figure 3 – Three-Way Interaction

Interacting little with ERP (low TI-ERP) and little with team members (low TI), the new user fails to develop an effective TMS system to support them in performing their job tasks. In isolation from helpful team mates (low TI), failing to utilize the information depth of ERP (low TI-ERP) and failing to grasp the expansive functionality of the ERP system (low TC), the individual will lack the knowledge resources of a TMS to support performance of their tasks. Little TMS utilization leads to a higher level of IS resistance. The isolated user may dwell on the more negative aspects of the ERP system such as its restrictive controls (Grabski & Leech, 2007), rigid process enforcement (Morton & Hu, 2008) and ability to perform panoptic monitoring (Sia, Tang, Soh, & Boh, 2002) as impediments which lead to resistance. Such a user may not utilize the vast set of real time information accessible via ERP and may not see ERP as enabling panoptic empowerment (Elmes,Strong, & Volkoff, 2005). Not interacting with ERP or with teammates, the user avoids engaging in the reflection needed to understand inter-dependent processes (Elmes et al. 2005). Failing to enter into the rich TMS offered by the teaming of human and personified ERP, the individual with low TI-ERP, low TI, and low TC is isolated from knowledge and assistance. This user is expected to experience high IS resistance when performing job tasks (Low-Cubed).

H3A: The three-way interaction of Low TI-ERP, low TI and low TC results in the Highest Resistance to IS/ERP.

Interacting more with all parts of the TMS, the greater user interdependence on using ERP (high TI-ERP) and also on their human team members (high TI), develops the necessary interdependent process views and explore the technical complexity (high TC) of the ERP system. Technical support has historically provided knowledge in dealing with new technology problems, but typically lacks the business process knowledge for effective use (Santhanam, Seligman, & Kang, 2007). A high TI with team members provides new users with the technical skills in conjunction with process oriented business knowledge. An ERP system is considered to be complex compared with many other technologies. The user's familiarity and proficiency with their ERP System use can be facilitated by both their high degree of interaction utilizing their team mate's knowledge of the ERP system. This knowledge exchange within the TMS will facilitate the lowest Resistance to IS/ERP and provides hypothesis H4B (High-Cubed).

H3B: The three-way interaction of High TI-ERP, High TI and High TC results in Lowest Resistance to IS/ERP.

3.5. Job Roles – Hypothesis H4

The deep structure investigation into antecedents of Resistance to IS/ERP use is focused on the degree of interdependency on ERP and the effects of well-defined job roles which inherently rely on a differing set of specific ERP transactions. The influence of job role on resistance to IS/ERP is explored by explicitly defining and assigning four distinct job roles (SM, PA, IS and MC). These job roles are defined based on: 1) business process, 2) interaction with teammates, 3) interaction with the ERP system, and 4) the types of transaction (decisions or reports).

Organizational work flow are identified by their job functions. Each job role is accomplished by using different decision-making transactions and each utilizes a number of reports to insure a timely status of internal and market changes. The decision and reporting transactions are all captured by the ERP system. The SM and MC functions make decisions regarding product purchasing, product forecasting and the maintaining of inventory to support the downstream functions. The PA and IS decisions include product pricing and marketing expenditures while continuously scanning the competitive marketplace.

The Sales Manager (SM) role is primarily responsibility for the setting of product pricing and is expected to have the highest level of interaction with all teammates. This interaction includes the need to scan multiple aspects of the ERP system in order to determine both market receptiveness of the product pricing along with the inventory levels and purchasing of products to insure sales. The SM is expected to have the lowest IS resistance due to the high interaction with all other job roles and a higher utilization of IT-ERP information support. This greater utilization of all parts of the TMS provides advantages, resulting in the hypothesis below.

H4a: SM role will have the lowest Resistance to IS/ERP.

The Purchasing Agent (PA) role has a high level of ERP system interaction in order to accomplish their tasks. Their more complex, multi-step work process relies on properly synchronizing multiple decision transactions making it the most demanding ERP transaction usage role. This process is very scripted and offers little variance in the execution of this task, so the user gains a lot of ERP practice leading to a sense of having familiar and commanding use of a set of related ERP transactions. However, there is little need to interface with other team members so TI on team mates is low. This represents a partial use of the TMS by focusing on the ERP TM element. Low interaction with teammates coupled with high interaction with ERP leads to confidence with the ERP system and can result in low IS resistance.

H4b: PA role will have low Resistance to IS/ERP.

The Inventory Specialist (IS) role has limited ERP system usage focused only on monitoring current inventory levels and forecasting product volume needs. Monitoring inventory is a relatively simple job role. Modification of the forecast is the least frequent decision of all decision activities in a team. There is low utilization of the TMS given the lack of a high level of ERP usage and with limited team interaction result in the IS role exhibiting higher IS resistance.

H4c: IS role will have higher Resistance to IS/ERP.

The Marketing Coordinator (MC) role is primarily responsible for setting the expenditure level for product marketing. Discussion of this objective would primarily be with the SM who monitors the margin between product costs and sales pricing. The only ERP interaction is to transact marketing expenditures. The reduced needs to access ERP and a reduced need to interact with team members shows little reliance on TMS and would lead to a higher IS resistance.

H4d: MC role will have higher Resistance to IS/ERP.

4. Experimental Setup

Data collection was accomplished during Fall 2014 and Spring 2015 semesters and are referred to as simulation engagements. The engagements consisted of twenty four different classes at three locations. No prior training was provided any students taking the courses with respect to the simulation. Courses were selected based on the inclusion of content providing instruction on enterprise resource planning system concepts. The experimental intervention consisted of using an SAP R/3 ERP system during a business simulation (ERPsim – Distribution) in which teams run companies distributing bottled water products and compete for customers (Leger, Robert, Babin, Pellerin, & Wagner, 2007). The students had no experience with any ERP and no transactional knowledge of SAP R/3 at the time of the exercise. This ERP intervention provided concise documentation, a knowledgeable expert and peer support. Such conditions accelerate experiential learning with a new ERP system. Reactions to a technology change based on increasing competency gained through productive interaction with ERP.

Each experimental engagement had between four and eight teams. The goal for all teams of four was to assign one individual responsible for each of the identified four roles. Due to absences and unequal class sizes, some teams of two or three team members participated \ in the engagement, but were excluded from the data set. The data analyzed in this study is limited to teams where all four business roles were assigned to students that participated in all three rounds of the simulation. This resulted in a total of 68 teams (272 participants) available for the analysis. Initial instruction included outlining the market context and describing the overall operation of the businesses. Team success was defined as achieving the highest net income among the competition. All participants were instructed on basic ERP navigation. Each job role was described by primary decision function, specific transactions and relevant reports.

The engagement consisted of three rounds of 20 virtual days and lasted approximately 20-25 minutes per round. The time between each round was used to field general questions and review the financial standings of the organizations. Questions concerning both report interpretation and decision-making ERP transactions were fielded during the active business simulation. Operational questions were answered, but strategic questions were left solely as team decisions.

The analysis consists of the 68 teams where four individuals participated in all three simulation rounds. Each team member was assigned a specific role: 1) Sales Manager (SM), 2) Inventory Specialist (IS), 3) Marketing Coordinator (MC), or 4) Purchasing Agent (PA) and provided an assigned role responsibility job aid. Each team was given two summative job aids that would provide a guide for accomplishing any task or reviewing any available report for all assigned roles. Role assignments and their related data were tracked via the student's login.

Each role's learning curve is based on the individual knowledge, utilization of the TMS as well as the demands of the particular role. A main goal of the ERP system is to have current business information available to all organizational members. For instance, the upstream role of inventory specialist is most likely to access the reports for the purchasing agent and potentially run their decision-making transactions than the downstream roles of sales manager and marketing coordinator. Table 1 – Role and Cross Role Use provides the initial expectations of cross role use of each report and decision transaction.

5. Data Collection

Data collection was accomplished using items from prior literature. This study included the published measures for the independent variables of Technical Complexity (TC) (Sharma & Yetton, 2007), Task Interdependence (TI) (Sharma & Yetton, 2007), Attitude (Venkatesh et al., 2003) and the dependent variable factor of Resistance to IS/ERP (Resist) (Kim & Kankanhalli, 2009). The new measure for personified ERP system on a team, referred to as Task Interdependence on ERP (TI-ERP), was based on 3 items of the measures for Task Interdependence (Sharma & Yetton, 2007). The pre-survey was administered to participants immediately prior to commencing the engagement and the post-survey was administered immediately following the experiment’s conclusion. The three prominent personal traits that contribute to technology understanding, Computer Self-Efficacy (SE) (Compeau & Higgins, 1995), Personal Innovativeness with Information Technology (PIIT) (Agarwal & Prasad, 1998), and Attitude (Davis et al., 1992) along with a Resistance to IS/ERP (Resist-Pre) baseline are all measured in the pre-survey. The variables of Self-Efficacy with Technology (SE) and Personal Innovativeness with IT (PIIT) are indicators of a person’s general approach and ability to utilize new technology. These variables control for an individual’s tendency to readily accept new technologies, as this trait could lead to lower resistance to a new system. The other factors in the study (Resist, SE, TC, TI, TI-ERP) were measured in the post-survey.

Additionally, this study focuses on the assigned roles for each individual participating in the simulation. The initial assigned roles (categories) for each 4 person team were identified using dummy variables. The reference role was selected as the Sales Manager (a downstream role) and indicated as 0-0-0 for the three named dummy variables (Cohen, Cohen, West, & Aikens, 2003). The selection of the Sales Manager as the reference role follows the suggestion that the category selected be the one scoring highest or lowest (in this case lowest) of the independent variable – Resistance (Hardy, 1993). The three named dummy variables included in the regression were Dummy – Purchasing Agent (D-PA), Dummy – Inventory Specialist (D-IS), and Dummy – Marketing Coordinator (D-MC). These assignments were captured both in the pre-survey and verified through the participant’s logon to the ERP system.

6. Analysis

Assessment of all demographic, raw variable statistics and the regression model was performed using the SAS Enterprise Guide 7.1 statistical software package. Demographic variables collected include: gender, marital status, semester of the engagement, age and GPA (Table 2). The mean and number of items for each factor is summarized in Table 3. The interaction terms were created using the centered independent variable summative measures. A graphical representation for the significant three-way interaction influence on Resistance to IS/ERP was created and used for interpretation of the interaction results (Cohen et al. 2003; Aiken & West, 1991).

	Male	Female				Missing
Gender	135	116				21
	Married	Single	Declined			
Marital Status	20	228	3			21
	Fall 2014	Spring 2015				
Semester	64	208				0
	N	Mean	Std. Dev.	Min	Max	
Age	251	21.86	5.63	2	55	21
GPA	251	3.21	.61	0	4.0	21

Table 2 - Demographics

Variables	Abbreviation	Mean	Std Dev	# of Items
Resistance to IS – Post Survey	Resist	2.556	1.484	4
Resistance to IS – Pre Survey	Resist-Pre	2.435	1.358	4
Attitude	Att	5.265	4.661	4
Personal Innovativeness with IT	PIIT	4.117	0.932	4
Self-Efficacy	SE	4.752	0.984	4
Task Interdependence	TI	4.997	1.248	6
Task Interdependence on ERP	TI-ERP	4.963	1.169	3
Technical Complexity	TC	3.711	0.983	3

Table 3 - Factors

The use of interactions in regression equations has been noted to be problematic with respect to issues of multicollinearity. Multicollinearity is addressed by centering the predictor variables which eliminates nonessential multicollinearity (Marquardt, 1980). This allows a more direct interpretation of the interactions and the predictor variables in the regression equation. Centering the predictor variables is accomplished by subtracting each participant's result by the mean value of the factor (Table 3). The model analysis progressed through assessing the factor correlation matrix (Table 4), a review of the centered regression model results (Table 6) and review of the regression variable

Variable	N	Resist	Resist–Pre	Attitude	PIIT	SE	TI-ERP	TI	TC
Resist	233	1.00							
Resist–Pre	246	.532***	1.00						
Attitude	232	-.384***	-.208**	1.00					
PIIT	246	-.075 ns	-.002 ns	.290***	1.00				
SE	246	-.114 ns	-.091 ns	.149*	.356***	1.00			
TI-ERP	233	-.544***	-.297***	.251***	-.085 ns	-.027 ns	1.00		
TI	233	-.466***	-.278***	.242***	-.129 ns	.019 ns	.817***	1.00	
TC	233	.369***	.232***	-.291***	-.064 ns	-.124 ns	-.452***	-.375***	1.00

p < .001 - *** p < .01 - ** p < .05 - * ns = not significant

Table 4 – Correlation Matrix

coefficients (Table 5). Note: all useable survey responses from individuals in teams of four were analyzed.

6.1. Correlation Matrix and Regression Model

The correlation matrix (Table 4) indicates a significant correlation at α < .001 confidence level between the initial measurement of Resistance and the independent variables of Resist-Pre, Attitude, TI, TI-ERP and TC. In addition, the independent variables of TI, TI-ERP and TC are all significantly correlated at α < .001 with each other, the Resist-Pre and Attitude variables. All statistical tests use a p-value of 0.05 (or better) for significance (indicated in Table 4). The regression analysis for the three way interaction resulted in a model that was significant at a p-value < .001 confidence level (Table 6). This model provided an adjusted explained

Source	DF	Sum of Squares	Mean Square	F Value
Model	14	233.74	16.70	17.51***
Error	192	194.38	1.01	
Corrected Total	206	428.12		
Root MSE	1.006	R-Square	.5460	
Dependent Mean	2.482	Adj R-Sq	.5129	

Table 6 - Model Results

Variables	df	Parameter Estimate	Standard Error	t Value	Pr > |t|		VIF
Intercept	1	1.103	2.019	0.55	0.586	ns	0
Resist-Pre	1	0.420	0.058	7.24	<.0001	***	1.18
Att	1	-0.188	0.051	-3.72	<.0001	***	1.43
PIIT	1	0.005	0.090	0.05	0.960	ns	1.32
SE	1	-0.047	0.080	-0.58	0.562	ns	1.25
TI-ERP	1	-0.659	0.368	-1.79	0.075	ns	43.26
TI	1	-0.159	0.135	-1.18	0.238	ns	5.01
TC	1	-0.209	0.593	-0.35	0.725	ns	70.09
TI*TI-ERP	1	0.062	0.060	1.04	0.300	ns	1.67
TI-ERP*TC	1	0.070	0.107	0.65	0.514	ns	76.32
TI*TC	1	0.077	0.119	0.65	0.518	ns	4.63
TI*TI-ERP*TC	1	-0.127	0.056	-2.27	0.024	*	3.48
D_IS	1	0.336	0.201	1.67	0.096	ns	1.61
D_MC	1	0.433	0.207	2.09	0.038	*	1.58
D_PA	1	0.454	0.203	2.23	0.027	*	1.59

Table 5 - Regression Variable Coefficients

variance of 51% (r^2_{adj} = .5129) which is above the typical effect range for publications in top IS journals (Mani, Barua, & Whinston, 2010; Tian & Xu, 2015). The significance of the variable coefficients (Table 5) are indicated in accordance with the p-values stated in Table 4.

The Variance Inflation Factor (VIF) is a test that determines any problems with multicollinearity. A typical value for VIF with respect to multicollinearity problems is 10 (Cohen et al. 2003). Centering the variables as recommended, in order to address the nonessential multicollinearity (Marquardt, 1980), resulted in the VIF for the higher order variable being well below the suggested value at 3.48 (Table 5).

As this study focused on interaction effects among the independent variables, the final regression model must contain first order (direct) effects as well as two-way and three-way interactions of independent variables on resistance to IS/ERP. "All lower order terms must be included in the regression equation for the [three-way] coefficient to represent the effect of the three-way interaction on Y [Resistance]". For proper regression model interpretation and representation, the analysis must be accomplished "by including all these lower order terms in the same multiple regression equation with the highest order term" (Cohen et al., 2003, p. 284). Direct effects and two-way interactions are lower order terms and not interpretable in the presence of the three way interaction. To interpret a regression equation containing a three-way interaction, the three-way interaction is best interpreted graphically by plotting high and low conditions of +1 and -1 standard deviations (Aiken & West, 1991) as shown in Figure 4.

A comparison of the how loadings changed as we progressed to the full model was made in order to determine how each set of hypothesis was effected with additional information in the model (Table 7). Each of the models in the progression were significant. The explained variance R^2 and Adjusted R^2, increased with each version of the model. The final model which included the dummy variables for role, provided evidence that indeed the roles made a significant difference in the predictor variable Resistance to IS/ERP.

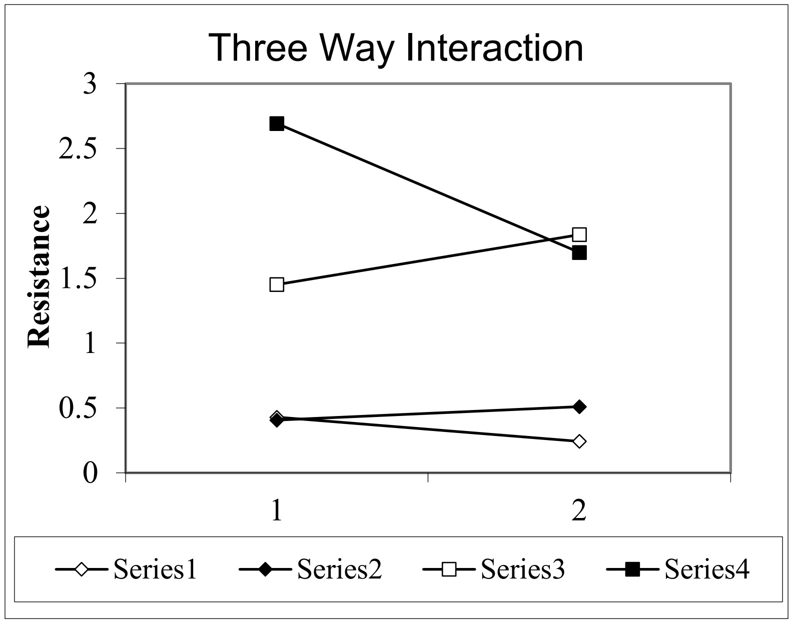

Figure 4 – Three Way Interaction Results

6.2. Interpretation of Findings

Variables	Control Variables		Main Effects		2 & 3 Way Interaction		Roles	
F Value	31.94	***	30.00	***	20.07	***	16.49	***
R^2	.3874		.5135		.5310		.5460	
Adj R^2	.3753		.4964		.5045		.5129	
Intercept	2.352	***	2.879	***	1.209	ns	1.103	ns
Resist-Pre	.511	***	.394	***	.402	***	.420	***
Att	-.294	***	-.204	***	-.187	***	-.188	***
PIIT	.110	ns	.006	ns	.013	ns	.005	ns
SE	-.037	ns	-.055	ns	-.047	ns	-.047	ns
TI-ERP			-.400	***	-.669	ns	-.659	ns
TI			-.032	ns	-.193	ns	-.159	ns
TC			.059	ns	-.262	ns	-.209	ns
TI*TI-ERP					.065	ns	.062	ns
TI-ERP*TC					.082	ns	.070	ns
TI*TC					.084	ns	.077	ns
TI*TI-ERP*TC					-.135	*	-.127	*
D_IS							0.336	ns
D_MC							0.433	*
D_PA							0.454	*

N = 207

Table 7 - Model Comparison

The antecedent constructs of task interdependence on teammates, interdependence on ERP and perceived technical complexity interact such that the variables' three-way interactive effect is the significant predictor of Resistance to IS/ERP. This three-way interaction effect was significant even though no individual first-order factor and no specific two-way interaction was itself found to be significant (although those models were significant). Based on the third-order regression findings, the extreme outcomes for Resistance to IS/ERP are best explained by the all Low conditions in the three-way interaction (Low-Cubed condition) and by the all High Conditions (High-Cubed condition). Therefore, it appears that the mix of these three variables interact closely to alternately 'tip the balance' of the individual control factors as well as the main effect factors influence on the Resistance to IS/ERP outcome. An interpretation is that these three variables act in concert so that their combined effects shift the total Resistance effects to where only Attitude and the construct of Pre-Resistance to IS/ERP continue to influence post Resistance to IS/ERP.

The significance of the three way interaction contributes to the conclusion that both H3a and H3b are supported. A review of the three-way interaction results provide a graphical view of the Low-Cube and High-Cube results for interpretation (Figure 4). Figure 4 allows an interpretation of the Low-Cubed and High-Cubed conditions. Resistance is graphed on the vertical access. The Low-Cubed condition is represented by the top-left shaded square box and corresponds to the Low TC-Low TI-ERP-Low TI condition. This square is the highest resistance point of the graph. The High-Cubed condition is represented by the clear diamond which is located in the lower-right, corresponds to the High TC-High TI-ERP-High TI condition. This diamond is the lowest resistance point of the graph. These two points further confirm the regression results of a three-way interaction that is significant.

The four job roles are supported through the graphing of the three-way interaction results, the significance in the final model and the ad-hoc analysis of the slopes for each job role. The summary of the hypothesis results are in Table 8. With all other variables remaining constant in the final model (especially the dummy variables viewed as 0-0-0, which represents the SM role), these results and the model significance support that the SM role has the largest reduction in Resistance to IS/ERP and therefore supports H4a.

Dummy role variables provide a comparison with the reference SM (downstream process) role and support for each hypothesis is based on the direction of the variable coefficient. The IS (upstream process) role did not show a significant difference in Resistance to IS/ERP to the SM role. Without a significant difference for the IS role, this would indicate that the post Resistance to IS/ERP is not significantly different and therefore indicates a lack of support for H4c. Both the SM and IS roles attained all the benefits of resistance reduction captured by the Attitude and IT-ERP variables.

Hypothesis	Variable	Support
H1a	Pre – IS Resist	Supported
H1b	Attitude	Supported
H1c	PIIT	N/S
H1d	SE	N/S
H2a	TI-ERP	N/S
H2b	TI	N/S
H2c	TC	N/S
H3a	3-Way Low Cubed	Supported
H3b	3-Way High Cubed	Supported
H4a	SM	Supported
H4b	PA	Supported
H4c	IS	Supported
H4d	MC	Supported

Table 8 - Hypothesis Results

There are two roles whose resistance is significantly different from the SM role. Those roles are the PA (upstream process) role and the MC (downstream process) role. The comparison of the SM with PA may be explained based on system feedback for the job performance. The PA was responsible for insuring that there was product available at all times for the team to continue making sales. The monitoring of the inventory was an IS responsibility and this dependence on a teammate may have reduced the benefit of feedback from the ERP. In addition, the availability of ERP feedback on when to order was not part of the system. The timing of the orders was critical, but not ERP dependent. Therefore, the full benefit of interfacing with the ERP was not obtained in the way the SM obtained the benefit. This supports hypothesis H4b that the PA would have an increased resistance to IS/ERP over the SM.

Comparing the SM with the MC, both downstream roles, the MC shows a 0.455 increase in resistance over the SM role. The main explanation of the difference in usage may be based on the job requirements of the two roles. While the SM focused on pricing of the products and monitoring of how their teams pricing matched the opposing teams pricing, the MC was focused on only setting the marketing dollar expenditures with the system. The SM was able to obtain feedback from the ERP via market reports on the opposing team prices, while the MC had no feedback concerning the effectiveness of their pricing strategy. While the MC used the ERP as much as the SM, the feedback on job impact associated with the market report impacted the SM's resistance to a greater extent than the MC's. The result for the MC roles is an increase in Resistance to IS/ERP over that SM and lends support for H4d.

7. Contribution and Conclusions

This study addresses the need for richer conceptualizations of system usage (Burton-Jones & Straub, 2006) by addressing a collaborative ERP system and new users performing specific tasks in the revenue and procurement processes. In summary, the experimental intervention set up a working commercial ERP environment in which the participants interacted with each other and the ERP system to gain experience in job functions while relying on the ERP system to perform their individual job role. The nature of this ERP intervention consisted of clear concise documentation, immediate availability of a knowledgeable expert and team support.

This study supports the finding that careful selection of initial job roles for new users can be an important factor in mitigating Resistance to ERP. Findings also support the value of treating both the ERP system and team members as alternative choices for knowledge sources in a transactive memory system, since individual users may elect to rely on the system or a team mate for information in performing tasks. This research contributed to understanding three antecedent factors of interdependence on ERP, interdependence on team members, and technical complexity that were most clearly explained via a three way interaction. In a combined analysis, only by considering all three factors was a clear assessment of effects on Resistance to ERP revealed.

This model extends the traditional Transactive Memory System by including the ERP system as a personified TM element on the team. This system can be considered a mixed-compositional model where the ERP system and the human members are both considered entities in a form of multi-level research (Belanger, Cefaratti, Carte, & Markham, 2014). The ERP system has been presented as a single entity since separate systems were not used for the upstream and downstream activities as may be the case in some organizations. This view provides consistency of data, information and knowledge available to all human entities in the TMS. The resulting decisions based on the ERP system entity data can then be reinforced and confirmed through human entity interaction. This study confirmed that human entities, in conditions of high technical complexity for their job roles, need interaction with both the ERP system and human entities to mitigate their Resistance to IS/ERP.

8. Limitations and Future Research

While a normal limitation for IS system research is the use of students, this group should also have a low Resistance to IS/ERP due to the belief that their thinking, with respect to digital technology, has adjusted the way they process information (Prensky, 2001). Still, there exists a level of Resistance to IS/ERP that can be placed in the context of the complexity of the tasks associated with the engagement. This research can benefit by engaging human entities that have higher levels of experience in the application of business processes in an engagement to note differences in job roles based on their interactions. There are two immediate investigation that can further illuminate the differences in Resistance to IS/ERP across job roles. First, a relatively balance job requirement was addressed in this research. Further insights could be gained from a comparison with unbalanced job role assignments (i.e. groups of two or three requiring cross role activities). Second, knowing that Resistance to IS/ERP is modified based on job role, a comparison of the current job role assignment could be made with modified job roles (essentially a job rebalancing).

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