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The mediating role of knowledge integration in effect of leadership styles on enterprise systems success

The post-implementation stage

Razatulshima Ghazali, Mohammad Nazir Ahmad and
Nor Hidayati Zakaria
*Information Systems Department, Faculty of Computing,
Universiti Teknologi Malaysia, Skudai, Malaysia*

Abstract

Purpose – The purpose of this paper is to show empirically how knowledge management, particularly knowledge integration (KI), acts as a mediator between different leadership styles and Enterprise Systems (ES) success. It proposes a model of KI as a mediator between two leadership styles (the transformational and transactional leadership styles). The study also aims to expose the most relevant leadership styles to be practiced by leaders when managing the ES post-implementation stage.

Design/methodology/approach – Valid data were collected from 263 survey respondents in Malaysian companies. The authors employed structural equation modelling and used the path modelling approach to investigate the underlying relationships between the variables. The authors then tested the mediating effects of KI by using the bootstrapping procedures proposed by Preacher and Hayes, which suits the path analysis method.

Findings – The results provide empirical evidence on the relationships between the variables and on the role of KI mechanisms as a mediator between leadership styles and ES success, especially in the ES post-implementation phase. Both leadership styles have to be practiced by leaders while managing an ES.

Research limitations/implications – Future research can investigate the role of KI mechanisms as moderators between both leadership styles. The study can also be expanded by looking in-depth at other leadership styles.

Practical implications – This paper is useful for management researchers and as a guide to management practice for business managers.

Originality/value – This paper proposes a model that examines the vitality of KI effect in ES post-implementation stage by different leadership styles. The results expose the importance of leaders' adoption of KI mechanisms and call for manager attention to the importance of using the right leadership styles when managing ES.

Keywords Leadership styles, Knowledge integration, Enterprise Systems' success, ES post-implementation stage

Paper type Research paper

1. Introduction

This paper attempts to fill the gap in knowledge and practice by offering a theoretical model of KI as a mediator between different leadership styles and Enterprise Systems (ES) success, particularly in the ES post-implementation stage. As far as we are aware,

the proposed model is the first effort to empirically investigate leadership styles, namely, the transformational and transactional leadership styles, and the need to adopt KI in the ES post-implementation stage.

In order to exploit the benefits of an ES, including reduced labor costs, operational process integration, enhanced customer relationship interaction and increased reporting and accounting efficiency (Kanellou and Spathis, 2013; Kumar and Gupta, 2012; Ram *et al.*, 2013; Su and Yang, 2010), many organizations are willing to take the risk of making the huge investments required for ES implementation. However, many ES implementations fail, particularly in the post-implementation stage (Wagner and Newell, 2007; Zhu *et al.*, 2010). In a systematic literature review (SLR) on ES critical success factors, Ahmad and Cuenca (2013) reported that the highest ES critical factors (100 percent) occurred because of a lack of management support and commitment, especially in the implementation of ES in developing countries. Ahmad and Cuenca also demonstrated the importance of knowledge in an ES, which must be supported by the full commitment of leadership, especially in the post-implementation stage, because ES are complex application systems which are mingled with various processes, modules, and fields of expertise.

Thus, the implementation of knowledge management (KM) with ES is a must (Chou *et al.*, 2014; Kumar and Gupta, 2012; Teittinen *et al.*, 2013; Tsai *et al.*, 2011; Vandaie, 2008; Yeh and Xu, 2013). KM practices also can help reduce training costs as the KM processes which are referred to as knowledge integration (KI) (i.e. knowledge sharing, knowledge transfer, and knowledge creation) are already used by leaders in their daily tasks (e.g. brainstorming sessions, training, intellectual symposiums) (Enberg, 2012; Grant, 1996a; Haddad, 2008; Vie, 2012). Nevertheless, the lack of KM practices, particularly KI, by leadership in an organization could cause delays in ES implementation, especially in the ES post-implementation phase (Enberg, 2012). Stemming from this, the leader - as the person responsible for ensuring that the organization's goals and objectives are achievable - should take an active role in ES survival (Zhu *et al.*, 2010). Nevertheless, leadership with a variety of management styles can contribute to ES success by effectively managing the complexity of ES knowledge in the ES post-implementation stage (Chou *et al.*, 2011).

The paper is structured as follows: Section 2 provides an overview of the theories that form the foundation of this paper. Section 3 discusses the hypotheses development, followed by Section 4 which discusses the research design and methods as well as a comprehensive description of our results. Section 5 discusses the implications and limitations of the study. Lastly, the conclusion is presented in Section 6.

2. Theoretical foundation
This section briefly reviews the theories used in this research in relation to ES success, leadership styles, and KI mechanisms.

2.1 Enterprise system success
In the IS literature, ES success is measured by reference to multiple aspects. For the purposes of this study, we use Gable *et al.*'s (2008) IS-impact model due to its particular focus on ES measurement factors. The decision to choose this model is also influenced by the finding by Gable *et al.* that 60 percent of previous IS success model studies had employed DeLone and McLean constructs, and that at least a portion of these studies did not properly and reflectively employ a subset of the constructs as an overarching measure of ES success. Hence, Gable *et al.* proposed a holistic measure of IS that considers both the backward (impacts to date) and forward (quality, impact anticipated) dimensions.

The backward and forward dimensions constitute the IS-impact, which is defined as a measure at a point in time of the stream of net benefits from the IS, to date and anticipated, as perceived by all key user groups. Gable *et al.* also theorized that the constructs are formative dimensions of the multidimensional concept, namely IS-impact, which adopts four of the six constructs developed by DeLone and McLean. The IS-impact model consists of four IS success dimensions, namely, individual impact, organizational impact, information quality, and system quality. These four success dimensions are adapted in our research model to measure ES success.

2.2 Leadership styles

In leadership theory, the transformational and transactional leadership styles signify two complementary points of view (Tyssen *et al.*, 2014). Building on the work of Burns (1978) who introduced the terms "transformational leadership" and "transactional leadership," Bass (1985) applied this categorization to organizational management. Bass defined transformational leaders as leaders who attempt and succeed in raising the awareness of colleagues, subordinates, followers, clients, or constituencies regarding issues of consequence (p. 17), and transactional leaders as leaders who "mostly consider how to marginally improve and maintain the quality of performance, how to substitute one goal to another, how to reduce resistance to particular actions, and how to implement decisions" (p. 27). The understanding of the transformational and transactional leadership styles was refined in an empirical study by Avolio and Bass (2004) which investigated these leadership styles among respondents in the USA. They developed the multifactor leadership questionnaire (MLQ) to measure both leadership styles. The characteristics of the transformational leadership style are categorized into four general components, namely, idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration. The characteristics of the transactional leadership style are categorized into two components, namely, contingent rewards and management by exception (both active and passive). We adopted and adapted the MLQ in the present study to identify the leadership styles among the leaders in the investigated organizations.

2.3 KI mechanisms

Nonaka (1994) and Nonaka and Takeuchi (1995) postulated the importance of nurturing knowledge in organizations. This importance was emphasized by Grant (1996a, b) in the knowledge-based theory of the firm which proposes the integration of the specialized knowledge in the organization. According to Grant, the integration of individuals' specialized knowledge creates organizational value as a key capability. In the knowledge-based theory of the firm, KI consists of four mechanisms, namely, rules and directives, sequencing, organizational routines, and group problem solving. Grant defined KI as the ways in which explicit knowledge (e.g. the use of systems, documents, and procedures) and the know-how knowledge of individuals (e.g. skills) are integrated in organizations. Due to the complex characteristics of an ES - especially in the ES post-implementation stage when there are a lot of crucial activities underway (e.g. maintenance, aligning the business process with new systems, training employees on the new system) - active communication is required among the key ES personnel (e.g. the vendor, maintenance staff, managers) and ES users (Wagner and Newell, 2007). Consequently, active communication among key ES personnel and ES users supports many of the fundamental tasks in the ES post-implementation stage, such as training, maintenance and the decision-making process, both inside and outside the organizational boundary (Chou *et al.*, 2014;

Lopez, 2009; Newell *et al.*, 2004; Shao *et al.*, 2012). The ES requirement for active communication among key ES personnel and users is less relevant to the KI mechanisms of sequencing and organization routines which only need minimum communication (Grant, 1996a, b). Moreover, the implementation of an ES is the responsibility of the whole organization and not a the responsibility of one person (Nicolaou and Bhattacharya, 2006). Therefore, for the purpose of this study and based on related ES studies, we adopted "rules and directions" and "organization routines" (including group problem solving) as the KI mechanism variables in our research. In the next section we discuss the development of the hypotheses and the research model.

3. Hypotheses development
Drawing from the extant literature, we derived five research hypotheses as described in this section.

3.1 Transformational leadership in ES success
The transformational leader seeks to arouse and satisfy higher needs, while engaging closely with the worker. This situation can motivate the worker and reduce their level of stress when dealing with ES post-implementation problems, thus enhancing the job productivity and quality. In addition, many recent studies have explained how transformational leadership positively affects subordinates both physically and spiritually, which could subsequently affect organizational performance (Cho *et al.*, 2011; Groves and LaRocca, 2012; Hur *et al.*, 2011; Menges *et al.*, 2011). Cho *et al.* (2011) empirically showed that a transformational leadership style is positively related to IS success. However, they pointed out that the generalizability of their research was limited as the findings were drawn from a Korean sample. We believe the relationship between the transformational leadership style and ES success needs to be re-measured in other countries and cultural settings, and in our research the data are drawn from a Malaysian sample. Furthermore, based on the results from the preliminary study we conducted, transformational leaders are found to be energetic when managing an ES. Moreover, they tend to work beyond expectations. Thus, we hypothesied that:

H1. Transformational leadership is positively related to ES success dimensions.

3.2 Transactional leadership in ES success
Connelly and Ruark (2010) reported that transactional leadership combined with positive emotions (e.g. happiness or optimism) could have a positive impact on the ability of subordinates to meet expectations. Furthermore, Podsakoff *et al.* (2006) showed that consistency in providing rewards and punishments based on performance is one of the traits of transactional leaders who are seen to be fair and who earn the trust, satisfaction, commitment, and efforts of their followers. Thus, ES workers are willing to achieve goals as long as they are rewarded in a consistent manner. Moreover, transactional leaders are capable of obliging subordinates to obey the rules or directives, as the relationship bonding the leaders and subordinates is based on rewards or punishments. Those who disobey the rules or directives will be punished and those who meet expectations will reap the rewards. In addition, our preliminary study showed that managers who adopt the transactional leadership style could enforce their subordinates to use the ES in their daily tasks as the subordinates will be punished if they disobey the rule. Therefore, we believe that transactional

leadership also has a significant role in managing the ES post-implementation stage. We hypothesized that:

H2. Transactional leadership is positively related to ES success.

3.3 Transformational leadership and KI as mediators in enterprise system success

One main characteristic of the transformational leader is their ability to focus their concentration on strategic thinking and on intellectual activities, enabling them to engage with subordinates in the tasks of analysis, formulation, implementation, interpretation, and evaluation (Bass, 1985). This characteristic has a strong correlation with KI mechanisms such as brainstorming sessions or intellectual discussions with key ES personnel to improve the ES or during ES maintenance processes. Our results during the preliminary study also showed that brainstorming sessions between leaders and subordinates on ES problems or enhancements have an impact on the smoothness of ES operations in regard to the organization's daily tasks. The study by Haddad (2008) supports this finding. Another characteristic of the transformational leader is that they are keen to motivate their subordinates to extend themselves (Bass, 1997). They encourage subordinates to equip themselves with proper and adequate knowledge, especially when facing difficulties in using the ES in their daily tasks. Transformational leaders will provide the subordinates with proper training, reflecting their trait of taking action before a problem persists. Since training and educating are KI mechanism components, there is a connection between the transformational leadership style and the use of KI mechanisms in their leadership. Therefore, we came to the hypothesis that:

H3. Transformational leadership is positively related to the use of KI mechanisms.

3.4 Transactional leadership and KI as mediators in enterprise system success

Jung and Avolio (2000) conducted experiments on the brainstorming task and found that the transactional leader's contingent-reward behavior directly increased the quality of subordinates' performance and indirectly increased the quality of subordinates' performance and their satisfaction as an impact of the trustworthiness of the leader. In addition, the manager with this leadership style engages with their subordinates based on the immediate subordinates' personal needs or as agreed upon in the employment contract. So, as long as the transactional leaders clarify the role and task, the subordinates try to complete the tasks as they believe they will be rewarded (Bass, 1985). In this situation, subordinates are motivated to equip themselves with proper training and knowledge to use the ES, as long as they are rewarded. The KI mechanism of rules and directives is strongly related to the transactional leadership type as these leaders tend to punish or reward their subordinates if they disobey or obey the rules or directives. Furthermore, transactional leaders are capable of obliging the workers to obey the rules or directives as the relationship between them is based on rewards or punishments. Those who disobey the rules or directives will be punished and those who meet expectations will get the rewards. Therefore, we hypothesized that:

H4. Transactional leadership is positively related to KI mechanisms.

3.5 KI as a mediator between leadership styles and ES success

KI mechanisms occur in organizations almost every day, through events such as brainstorming sessions, training, and procedures documentation, without overt acknowledgement of the leaders. Moreover, the lack of KI in the ES post-implementation stage could lead to the failure of the ES implementation in the organization (Jung and

Avolio, 2000; Pries-Heje and Dittrich, 2009). The leadership involvement in utilizing KI while managing the ES post-implementation stage is a necessity as the leaders have the power to influence the workers under their control or authority (Dansereau *et al.*, 2013; Nwankpa and Roumani, 2014; Shao *et al.*, 2011; Zhu *et al.*, 2010). For example, leaders have the authority to allocate sufficient budget for the survival of the ES in the post-implementation stage and to force their subordinates to use the ES either by promising rewards or punishments which could lead the subordinates to obey the rules (Zhu *et al.*, 2010). They also could encourage and motivate the subordinates to have a feeling of ownership of the ES and this can cultivate the process of gaining knowledge either through training or intellectual discussion. Moreover, our preliminary studies provided evidence of the effectiveness of KI mechanisms in facilitating leadership while managing the ES post-implementation stage such as regular meetings with key ES personnel to improve the ES to get the best result from the system and when problems occur (i.e. fixing bugs, reporting errors, dealing with network problems). Leaders report that they will face great difficulty if there is no communication (e.g. meetings, training, brainstorming) with key personnel and subordinates while handling an ES, as these new systems need vast knowledge and active communication, both internally or externally of the department or organization (Chou *et al.*, 2014; Newell *et al.*, 2006; Sedera and Gable, 2010). The present study aims to empirically investigate whether or not KI mechanisms play an important role in the impact of the two leadership styles on ES success. Therefore, we hypothesize that:

H5. KI mechanisms mediate the relationship between the transactional and transformational leadership styles and ES success.

Based on the findings reported in past research, an SLR on KI in the ES domain, interviews with IT officers and senior managers in two companies (in order to get a better perspective on the importance of KI in the ES post-implementation stage) and the five hypotheses generated for the present study, the research model was developed, as shown in Figure 1. In the next section, we describe the research design and method.

4. Research design and method
We employed structural equation modeling (SEM) by using the path modeling SEM (PLS-SEM) approach and the SPSS statistical tool to investigate the underlying relationships between the variables in order to validate our hypotheses. Our unit of analysis was the individual level. Figure 2 illustrates our research design diagram. Steps 1, 2, and 3 in the research design have been discussed above. In this section, we discuss Step 4 in more detail.
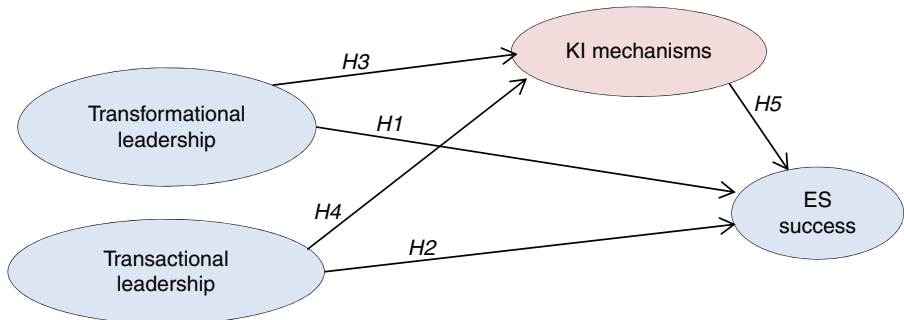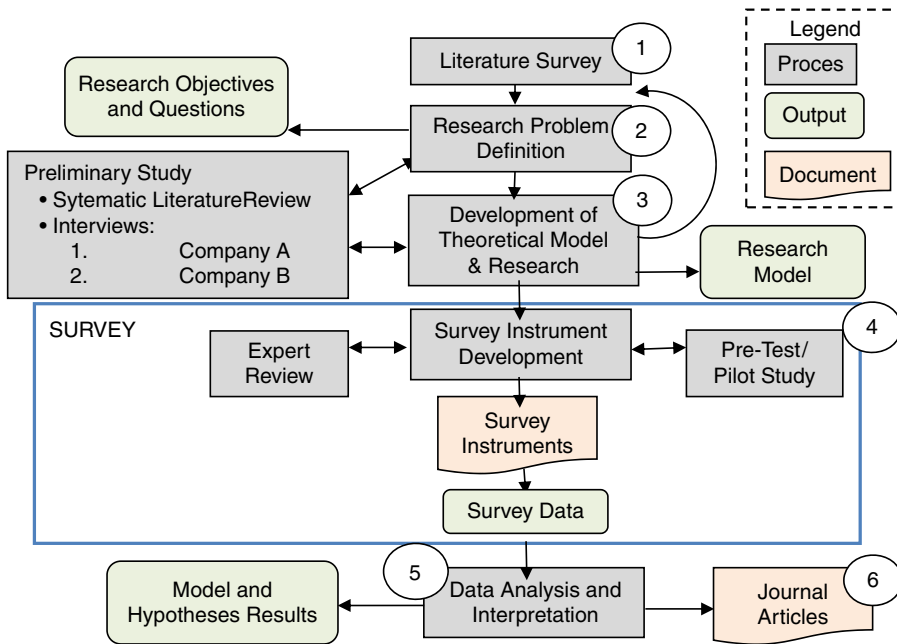

Figure 1.
Research model

Figure 2.
Research design
diagram

4.1 Independent variables

Our research model employs three independent variables, namely, KI mechanisms, transformational leadership, and transactional leadership. The decision to employ the formative or reflective construct in the model was based on the guidelines set by Hair *et al.* (2014).

4.1.1 KI mechanisms. Building on Grant's (1996a, b) studies that propose four KI mechanisms, namely, rules and directives, sequencing, organization routines, and group problem solving, we adapted these KI mechanisms for the ES environment which requires active communication among the key personnel and users and also beyond the organization's boundary. Based on the work by Huang and Newell (2003) and Haddad (2008) on implementing KI mechanisms for complex systems, such as an ES, we adopted two KI mechanisms, namely, rules and directives, and organization routines. The empirical study by Haddad provided evidence on KI mechanism implementation in complex system problem solving. Thus, we adopted the six-item KI mechanism for organizational routines from Haddad with some adjustment for the ES environment for the purposes of this study. The six-item KI mechanism for rules and directives based on Grant was also adapted for the ES environment. Adjustments were made following an expert review of the companies. Based on the guidelines, the KI mechanism independent variable was employed as the reflective construct.

4.1.2 Transformational leadership and transactional leadership. The work in Bass (1985) was empirically refined by Avolio and Bass (1999) into the MLQ which we adopted in this study. The MLQ categorizes the transformational leadership style in four components: idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration. Transactional leadership is categorized into two

components: contingent reward and management by exception (both active and passive). We adopted and adapted three items for each category. The independent variables of both leadership styles were employed as formative constructs.

4.2 Dependent variable

Our model has only one dependent variable, namely, ES success. The decision to employ the formative or reflective construct for ES success was based on the guidelines proposed by Hair *et al.* (2014, p. 47). We adopted Gable *et al.*'s (2008) IS-impact measurement model which is specifically focussed on investigating ES success. Moreover, since Gable *et al.*'s model also particularly focusses on investigating ES success in the post-implementation stage, we adopted four dimensions to measure ES success, namely, individual impact, organizational impact, IS quality, and information quality. The questionnaire sought information from the respondents on these four dimensions. The respondents had used an ES for at least six months after complete installation of the ES in their organization. We employed three-item measurements for each dimension. The ES success variable employed the formative construct.

4.3 Control variables

A department business environment question was asked as the control variable because different business environments have different goals and objectives when using an ES in their daily tasks. ES technical support teams concentrate on maintenance or enhancements to enable the ES to be used more efficiently. Meanwhile, ES users use the system in their daily tasks to generate reports, conduct analysis, or make decisions. The length of experience working with an ES was also a control variable, as the length of experience might influence the effectiveness of the ES users' skills and could affect their judgments when answering the ES success dimension questions in the survey. However, the responses of users with less than 6 months' experience were still taken into consideration because their views can be useful from the KI mechanism perspective. The education level was also monitored as it could be a factor that limits a respondent's ability to answer the questions accurately (MacKenzie and Podsakoff, 2012).

4.4 Instrument development

Based on previously validated measurement scales, we adapted the MLQ (Avolio and Bass, 2004), the IS-impact measurement model (Gable *et al.*, 2008) and KI mechanisms' measurement based on Haddad (2008) to ensure construct validity. Furthermore, in order to enhance the construct validity, we also conducted an expert review among leaders and IT experts. We used a seven-point scale (from "1-strongly disagree" to "7-strongly agree") (Dawes, 2008). We combined two guidelines to develop the survey measurements (i.e. MacKenzie *et al.*, 2011; Hair *et al.*, 2014). The pilot study was conducted in two companies and we received 53 valid responses. We tested for validity and reliability based on a systematic procedure for applying PLS-SEM guidelines (Hair *et al.*, 2014, p. 97) for formative and reflective models.

4.5 Data collection

The final survey was distributed after some improvements were made to the questionnaire. An initial search was made on the internet for well-known and established organizations in Malaysia that might use an ES including government agencies and private organizations. We then contacted the IT personnel of the respective organizations

to get information regarding the ES in order to ensure all the research needs would be met. Of these, the main criterion was that the organization had been using an ES for at least a year, because the company that has been able to use an ES for more than a year is considered to be in the post-implementation or maturity stage. The number of ES users in the organization was also taken into account (more than 100 users) because we determined that only large organizations would have enough capital to maintain and use an ES. Of the 13 organizations that were contacted, four did not meet the research requirements as the organizations did not use an ES or because the number of ES users was too small. Another four organizations were not willing to participate in the research. In the five organizations that met the criteria and agreed to participate in the research, we disseminated 400 surveys to the relevant personnel in charge, together with the university's data collection permission letter, an executive summary of the research, and a post-paid envelope for returning the completed surveys. We framed our research at the individual level so the targeted respondents were ES users who were asked to evaluate the leadership styles of their managers. They were also asked to share their views about the KI practices in their organization and to make an evaluation of the ES they used in their daily tasks. In total, 263 valid survey responses were collected. The analysis of the data is discussed in the following section. Table I presents the constructs and wording used in the survey.

4.6 Model measurement

The model was measured by analyzing the internal consistency reliability, convergent validity and discriminant validity. The measurements of reflective constructs and formative constructs are different (Hair *et al.*, 2014, p. 47). Tables II and III present the results of the measurement of each reflective and formative construct.

The results for the reflective construct (KI mechanisms) (Table II) showed that the value of the "organization_routine3" indicator was below the threshold value (0.285). However, when the deletion was made, the composite reliability and the average variance extracted (AVE) value decreased. Therefore, the indicator was retained.

The results for the formative construct (Table III) showed that, although all the formative indicators were not significant, the outer loading values were all above the threshold value (i.e. higher than 0.5). Therefore, all the indicators were retained. The outer weight of the ES success indicator "individu_impact1" had the highest value (0.6581). This indicator was related to the respondents' agreement with the statement "My decision-making is more effective using the IS (Information Systems)." This indicates that the ES was beneficial to the workers, which could influence the productivity of the organization.

Among the indicators for transformational leadership and transformation leadership, the outer weight of the transformational leadership indicator "inspire_motivation2" had the highest value (0.3376), followed by the transactional leadership indicator "contingent_reward2" (0.3144), and the transformational leadership indicator "individu_consider3" (0.3031). The transformational leadership indicator "inspire_motivation2" was related to the question about how the leader expressed confidence to the staff that they will achieve the goals. This result indicates that leaders should pay more attention to inspiring confidence in their subordinates. The result for the transactional leadership indicator "contingent_reward2" indicates that leaders have to provide recognition or rewards (e.g. appraisal, good marks, praise) to their subordinates when they achieve goals. The result for the transformational leadership indicator "individu_consider3" indicates that leaders have to help subordinates develop themselves. In the next section, we report the structural model assessment analysis based on PLS-SEM.

Construct and indicator	Wording
ES success	
individu_impact1	My decision making is more effective by using the IS
individu_impact2	The IS enhances my job effectiveness
individu_impact3	I have learnt much through the presence of the IS
organization_impact1	Using the IS has resulted in reduced staff costs
organization_impact2	Using the IS has resulted in an improved business process
organization_impact3	Using the IS has resulted in cost reductions
info_quality1	Information from the IS is concise
info_quality2	Information from the IS easy to understand
info_quality3	Information from the IS is in a form that is readily usable
IS_quality1	The IS is easy to use
IS_quality2	Data from the IS is current enough
IS_quality3	The IS meets the unit's/department's requirements
Transformational leadership	
ideal_influence1	I feel good to be around my leader
ideal_influence2	I am proud to be associated with my leader
ideal_influence3	My leader goes beyond self-interest for the sake of the staff
inspire_motivation1	My leader talks optimistically about the future with us
inspire_motivation2	My leader expresses confidence to the staff that we shall achieve the goals
inspire_motivation3	My leader expresses with a few simple words what we could and should do
intellect_stimuli1	My leader helps us to see the problems from many angles
intellect_stimuli2	My leader suggests some new ways to us to solve the problems
intellect_stimuli3	My leader enables us to think about old problems in new ways
individu_consider1	Our leader treats us as individuals rather than just members of a group
individu_consider2	My leader considers an individual to be unique
individu_consider3	Our leader helps us develop our potential
Transactional leadership	
contingent_reward1	Our leader expresses satisfaction when we accomplish our task
contingent_reward2	Our leader provides recognition/rewards (e.g. appraisal, good marks, praise) when we reach our goals
contingent_reward3	Our leader calls attention to what we can get for what we accomplish in our task
manage_except1	Our leader tells us the standards we have to know to carry out our work
manage_except2	Our leader directs attention to us if we are not meeting the standards
manage_except3	My leader focusses attention on irregularities, mistakes, exceptions and deviations from standards
KI mechanisms	
directive1	Our leader orders us to share IS knowledge with colleagues
directive2	Our leader instructs the staff to perform IS focus groups, solve IS problems or share IS knowledge easily
directive3	Our leader gives directions for us to learn or share IS knowledge with other IS experts/IS special teams
rules1	My leader gives instructions to IS experts/IS special teams regarding IS work documents (e.g. procedures, logs, test data, system architecture charts, requirement/specification documents) to make it easier for others to do future references

Table I.
Constructs and
wording in the
survey

(*continued*)

Construct and indicator	Wording
rules2	Our leader makes rules for us to make job rotation so that we can be moved around functions and programs to gain broad skills
rules3	Our leader orders us to make information audits (of standards, processes, procedures)
organization_routine1	Our organization conducts annual IS supplier conventions/IS monthly symposiums
organization_routine2	My organization has an IS brainstorming session with the leaders and IS experts (e.g. problems, creative minds/solutions) weekly/monthly
organization_routine3	Our organization has weekly/monthly, joint problem solving by IS special teams/IS supplier experts
organization_routine4	Does your organization conduct routine discussions/meetings to discuss IS problems or IS future directions?
organization_routine5	Does your organization conduct monthly IS training for new staff?
organization_routine6	Does your organization conduct special communication forums (e.g. strategic supplier advisory group for IS sharing lessons learned) weekly/monthly/ annually?

Table I.

Rules of thumb	KI mechanisms	
Composite reliability, higher than 0.708 (in exploratory research, 0.6-0.7 is acceptable). Cronbach's α is considered to be a conservative measure of internal consistency reliability	0.9533	
	Indicator	Loading
Indicator's outer loadings higher than 0.708. Indicators with outer loadings between 0.40 and 0.70 are only removed if deletion can increase composite reliability and AVE above the suggested threshold value (composite reliability higher than 0.708, AVE higher than 0.5)	directive1	0.7511
	directive2	0.8052
	directive3	0.8114
	rules1	0.7634
	rules2	0.8191
	rules3	0.8071
	organization_ routine1	0.726
	organization_ routine2	0.8009
	organization_ routine3	0.285[a]
	organization_ routine4	0.8251
	organization_ routine5	0.7915
	organization_ routine6	0.7903
AVE higher than 0.5	0.6305	
Discriminant validity?	Yes	
Indicator's outer loadings on a construct are higher than all its cross-loadings with other constructs.		
Square root of AVE of each construct is higher than its highest correlation with any other construct (Fornell-Larcker criterion)		

Note: [a]The "organization_routine3" construct was not deleted because the deletion decreased the composite reliability and AVE

Table II.
Reliability and
validity of reflective
construct (KI
mechanisms)

4.7 Structural model assessment
There are five steps in the structural model assessment in PLS-SEM (Hair *et al.*, 2014, p. 169). However, due to the constraint of having only one reflective construct, we could not perform the fifth step which requires more than one reflective construct. Therefore, we only performed the steps which were applicable to our research model as follows:

Construct and indicator	VIF	Outer weight	Outer loading	t-value
ES success				
individu_impact1	4.678	0.6581	0.8565	4.2303***
individu_impact2	5.667[a]	0.0996	0.7718	0.5895 (ns)
individu_impact3	5.456[a]	−0.3427	0.7335	1.6994 (ns)
organization_impact1	2.790	0.4414	0.8194	3.9146***
organization_impact2	4.581	0.112	0.7811	0.7695 (ns)
organization_impact3	3.803	−0.04	0.7632	0.3476 (ns)
info_quality1	4.701	0.2695	0.7986	1.7677 (ns)
info_quality2	5.458[a]	−0.3048	0.6802	2.0797**
info_quality3	4.456	0.2307	0.7671	1.6529 (ns)
IS_quality1	5.637[a]	−0.0468	0.6776	0.2635 (ns)
IS_quality2	4.938	−0.0369	0.7066	0.2339 (ns)
IS_quality3	4.429	0.0931	0.6994	0.593 (ns)
Transformational leadership				
ideal_influence1	4.292	−0.2445	0.6634	1.8093 (ns)
ideal_influence2	4.570	0.0282	0.7425	0.2141 (ns)
ideal_influence3	4.061	0.0153	0.7561	0.0883 (ns)
inspire_motivation1	4.572	0.064	0.8725	0.4689 (ns)
inspire_motivation2	3.928	0.3376	0.8836	2.7512**
inspire_motivation3	3.259	0.0179	0.7926	0.129 (ns)
intellect_stimuli1	4.706	0.1498	0.8654	1.1158 (ns)
intellect_stimuli2	4.880	0.0381	0.8725	0.261 (ns)
intellect_stimuli3	4.414	0.2678	0.9114	1.8954 (ns)
individu_consider1	2.771	0.1099	0.7645	1.2048 (ns)
individu_consider2	3.424	0.033	0.7774	0.2376 (ns)
individu_consider3	3.662	0.3031	0.8834	1.9765**
Transactional leadership				
contingent_reward1	3.047	0.1514	0.8608	1.4299 (ns)
contingent_reward2	2.852	0.3144	0.8823	3.3092***
contingent_reward3	4.151	0.2389	0.9059	1.7852 (ns)
manage_except1	4.169	0.1292	0.8731	0.9992 (ns)
manage_except2	3.706	0.1167	0.8576	0.8554 (ns)
manage_except3	2.428	0.2009	0.8111	2.1673**

Table III.
Reliability and
validity of formative
construct
(transformational,
transactional
leadership and
ES success)

Notes: [a]We use the common cut-off value of VIF > 10 or its tolerance equivalence. **$p < 0.05$; ***$p < 0.01$
Sources: Diamantopoulos and Winklhofer, 2001; Diamantopoulos *et al.*, 2008; Jarvis *et al.*, 2003; MacKenzie *et al.*, 2011

1. Assess the structural model for collinearity issues. No collinearity issues were found when we made the analysis using SPSS. All the variance inflation factor (VIF) values were below the threshold value (< 10) (Diamantopoulos *et al.*, 2008; Diamantopoulos and Winklhofer, 2001; Jarvis *et al.*, 2003; MacKenzie *et al.*, 2011). Table IV presents the results.

2. Assess the significance and relevance of the structural model relationships. In order to assess the significance of the relationships or path coefficients between two constructs, we ran the bootstrapping procedure. Table V and Figure 3 present the structural equation model analysis results.

Based on our analysis, we found that two hypotheses were not empirically supported (*H1* and *H2*) as both path coefficients were not significant. This indicates that transformational and transactional leadership styles require the support from KI

	Tolerance	VIF
First set		
KI mechanisms	0.356	2.809
Transactional leadership	0.212	4.717
Transformational leadership	0.239	4.185
Second set		
Transactional leadership	0.243	4.116
Transformational leadership	0.249	4.012
ES success	0.677	1.477
Third set		
Transformational leadership	0.427	2.342
ES success	0.507	1.974
KI mechanisms	0.305	3.276
Fourth set		
ES success	0.507	1.974
KI mechanisms	0.278	3.599
Transactional leadership	0.379	2.830

Table IV.
Collinearity of
research construct
summary

	Path coefficient	*t*-value	Significance level	*p*-value	90 percent confidence interval
KImech→ESsuccess	0.692	6.8206	***	0.00	(0.50, 0.89)
transacL→ESsuccess	−0.0122	0.0793	ns	0.94	(−0.21, 0.18)
transacL→KImech	0.5289	6.7125	***	0.00	(−1.24, 2.30)
transformL→ESsuccess	0.0264	0.1759	ns	0.86	(−0.17, 0.22)
transformL→KImech	0.3002	3.9014	***	0.00	(0.11, 0.50)

Notes: ns, not significant; [a]We use the common cut-off value VIF > 10 or its tolerance equivalence (Diamantopoulos and Winklhofer, 2001; Diamantopoulos *et al.*, 2008; Jarvis *et al.*, 2003; MacKenzie *et al.*, 2011). ***$p < 0.01$
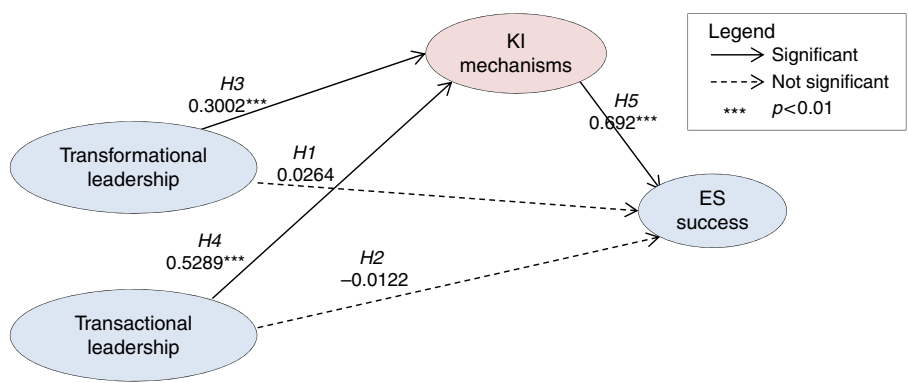
Table V.
Significance testing
results of the
structural model
path coefficients

Figure 3.
Structural model
analysis result

mechanisms. This observation is supported by the analysis of the path coefficients of *H3*, *H4*, and *H5* which were significant ($p < 0.01$). Next, we investigated the total effect of our two formative constructs "transformL" and "transacL," via the mediating construct "KImech" influencing the construct "ESsuccess." From the total effect, we could evaluate the strength of the impact of "transformL" and "transacL" on "ESsuccess" via "KImech." A summary of the total effect is presented in Table VI and illustrated in Figures 4 and 5.

Among the four driver constructs, KI mechanisms had the strongest total effect on ES success (0.692), followed by the effect of transitional leadership on KI mechanisms (0.5289), the effect of transactional leadership on ES success (0.3538), and the effect of transformational leadership on KI mechanisms (0.3002). Meanwhile, the weakest total effect was the effect of transformational leadership on ES success.

The total effect is the sum of the direct and indirect effects that are fundamental for this study. Indirect and direct effects are used to test the mediating effect of one construct on another construct. In this step, we also tested the mediator to investigate whether or not both constructs (i.e. transformational leadership and transactional leadership) were fully mediated by the KI mechanisms. We investigated the direct and indirect effects of the mediating construct (i.e. KI mechanisms) by using the bootstrapping procedure as this procedure makes no assumptions about the shape of the variable's distribution or the sampling distribution and can be used with a small sample (Preacher and Hayes, 2004,

	Total effect	*t*-value	Significance level	*p*-value	90 percent confidence interval
KImech→ESsuccess	0.692	6.8206	***	0.00	(0.50, 0.89)
transacL→ESsuccess	0.3538	2.1953	**	0.03	(0.16, 0.55)
transacL→KImech	0.5289	6.7125	***	0.00	(−1.24, 2.30)
transformL→ESsuccess	0.2341	1.4659	ns	0.14	(0.04, 0.43)
transformL→KImech	0.3002	3.9014	***	0.00	(0.11, 0.50)

Notes: ns, not significant; KImech, KI mechanisms construct; transacL, transactional leadership construct; transformL, transformational leadership construct; ESsuccess, ES success construct. **$p < 0.05$; ***$p < 0.01$

Table VI.
Significance testing results of the total effects

Figure 4.
Total effect of transformational leadership on ES success via KI mechanisms
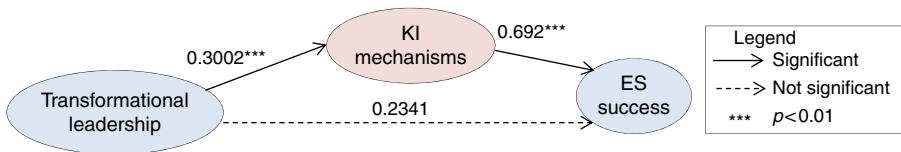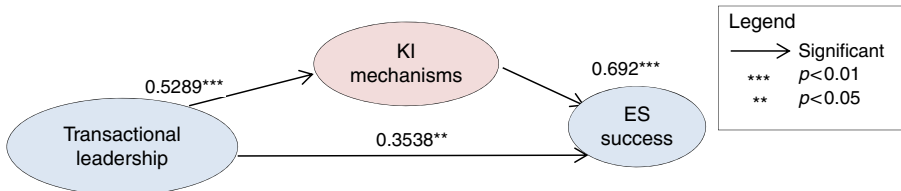

Figure 5.
Total effect of transactional leadership on ES success via KI mechanisms

2008). Other mediating effect tests such as the Sobel test (Sobel, 1982) only rely on distributional assumptions, which do not hold for indirect effect (Hair *et al.*, 2014, p. 223). Therefore, based on Preacher and Hayes (2004, 2008), we conducted the test according to the guidelines shown in Figure 7 which followed the steps of the mediator analysis procedure in PLS-SEM (Hair *et al.*, 2014). As illustrated in Figure 7, in the first step, we tested for significance if the mediator (KI mechanisms) was removed from the model. We then ran the bootstrapping test with 5,000 sub-samples. Table VII presents the results. (Figure 6).

As shown in the results in Table VII, the relationship between "transformL" and "ESsuccess" was not significant. Thus, the "transformL" construct was fully mediated by the "KImech" construct (i.e. the transformational leadership relies on KI mechanisms to be significant). Therefore, in the second step (Figure 7) we only focussed on the relationship between the "transacL" construct and the "ESsuccess" construct. In this step, we included the mediator variable (KImech). This step was intended to examine whether or not the indirect effect of the "transacL" construct via the "KImech" construct as a mediator on "ESsuccess" was significant. First, we compute the bootstrapping standard deviation from 5,000 bootstrap sub-samples. The calculation of the standard deviation value of the indirect effect was computed by using the STDEV function in MS Excel. The bootstrapping standard deviation value of the indirect effect is 0.057 (this value may vary due to the bootstrapping random process). From the bootstrapping standard error, we obtained the empirical t-value of the indirect effect by dividing the original value of the indirect effect of "transacL" and "KImech" (0.692×0.529) by the bootstrapping standard error value, 0.057 (i.e. $p_{12}.p_{23}$/standard deviation of bootstrap) that is (0.692×0.529)/ $0.0057 = 6.422$. Thus, with a t-value of 6.422, we concluded that the transactional leadership relationship via KI mechanisms as a mediator was statistically highly significant with a p-value of 0.0001. Hence, we assessed the VAF in order to examine whether transactional leadership was fully mediated, partially mediated or not mediated

	Path coefficient	t-value
transformL→ESsuccess	0.2508	1.8935(ns)
transacL→ESsuccess	0.3918	2.9886***
Notes: ns, not significant. *** $p < 0.01$		

Table VII.
Significance analysis
of path coefficients
without the mediator
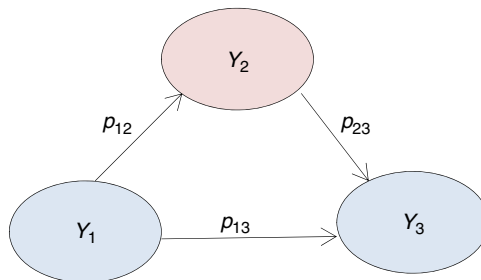
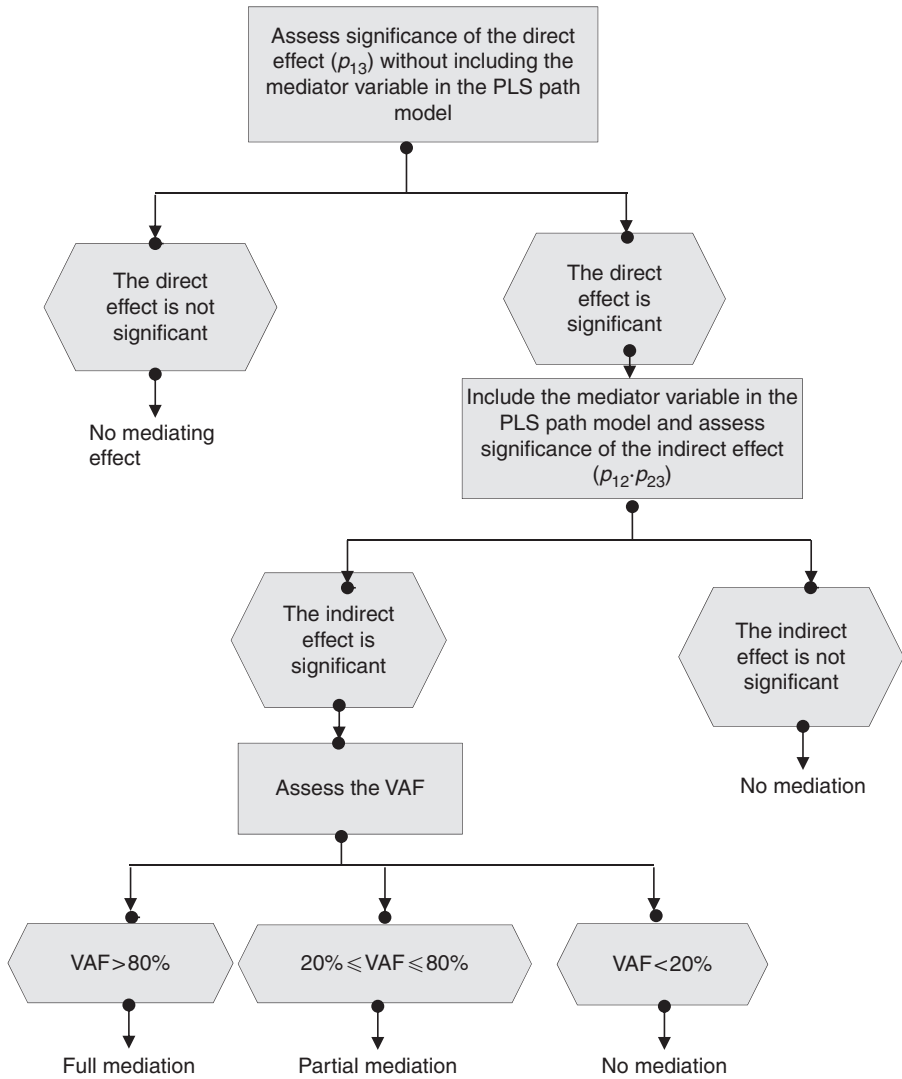**Source:** Hair *et al.* (2014, p. 220)

Figure 6.
General mediator
model

Figure 7.
Mediator analysis
procedure in
PLS-SEM

Source: Hair *et al*. (2014, p. 224)

by KI mechanisms. In order to calculate the VAF value, we divided the indirect value of transactional leadership and ES success via KI mechanisms which we calculated previously (0.0.692×0.529) by the total effect value; (0.692×0.529)+(−0.0122) (i.e. $p_{12}.p_{23}$)/($p_{12}.p_{23+}$ p_{13}), thus the value of VAF is 1.0345 or 103.45 percent. As a result, 103.45 percent of the effect of "transacL" on "ESsuccess" was explained by "KImech." Since the VAF value was more than 80 percent, it showed that "KImech" fully mediated the "transacL" construct. Therefore, both leadership styles were fully mediated by KI mechanisms. In the next step, we calculated the coefficient of the determination (R^2) value as a measure of the model's predictive accuracy.

3. *Assess the level of coefficient of determination (R^2 value).* R^2 represents the combined effects of the exogenous latent variables on the endogenous latent variable, whereby the R^2 value ranges from 0 to 1. It also represents the amount of variance in the endogenous constructs (transformational leadership and transactional leadership) that is explained by all of the exogenous constructs (i.e. KI mechanisms and ES success). Higher R^2 values also indicate higher levels of predictive accuracy. R^2 values of 0.75, 0.50 or 0.25 could be used as a rough rule of thumb for substantial, moderate or weak predictive accuracy (Hair *et al.*, 2011; Henseler *et al.*, 2009). Table VIII presents the R^2 values for "KImech" and "ESsuccess."

For the "KImech" construct, it was shown that about 64.4 percent of the "transacL" and "transformL" constructs contributed to the "KImech" construct with 1 percent probability of error and the minimum R^2 value was 0.01. From the R^2 value, we could calculate the effect size (f^2) in the next step.

4. *Assess the effect size (f^2).* In this step, we used the R^2 value to calculate the effect size (f^2) and investigate whether or not the specified omitted exogenous construct had a substantive impact on the endogenous constructs. The effect size was calculated by the following equation:

$$f^2 = \frac{R^2_{included} - R^2_{excluded}}{1 - R^2_{included}}$$

$R^2_{included}$ and $R^2_{excluded}$ are the values of the endogenous latent variable when the selected exogenous latent variable is included or excluded from the model. The guidelines for f^2 values are 0.02 (small effect), 0.15 (medium effect), and 0.35 (large effect) (Cohen, 1988). Table IX presents a summary of the f^2 results. In this test, our endogenous latent variables were KI mechanisms and ES success. The exogenous latent variables were transformational leadership, transactional leadership and KI mechanisms.

As shown in the results in Table IX, after the transformational leadership construct was deleted, the f^2 had a value of 0.062 which was considered a small effect *vis-à-vis* the KI mechanisms construct. However, when the transactional leadership construct was

	R^2	Predictive accuracy (with sample size 263; R^2 at least 0.10; 1 percent probability error)	
KImech	0.644	Substantial	
ESsuccess	0.494	Moderate	

Table VIII. R^2 value of endogenous latent variable

Endogenous latent variable	Transformational leadership construct removed			Transactional leadership construct removed			KI mechanisms construct removed		
	R^2 Excluded	R^2 Included	f^2	R^2 Excluded	R^2 Included	f^2	R^2 Excluded	R^2 Included	f^2
KI mechanisms	0.620	0.644	0.062	0.574	0.644	0.197	na	na	na
ES success	0.493	0.494	0.002	0.494	0.494	0	0.371	0.494	0.243
Note: n/a, not applicable									

Table IX. Summary of f^2 results

deleted (i.e. $f^2 = 0.197$), the effect was considered medium *vis-à-vis* the KI mechanisms construct. Meanwhile, the f^2 value were also relatively small (0.002 and 0) and had a very small effect *vis-à-vis* the ES success construct when the transformational leadership construct and the transactional leadership construct were deleted. However, there was a different impact when "KImech" was deleted, with $f^2 = 0.243$, which was considered to have a medium effect on the ESsuccess construct. After completing the measurement of the structural model, next, we performed frequency analysis by using SPSS version 16.0. The results are illustrated in Figure 8. In the next section, we discuss our findings and the implications of the findings for theory and practice.

5. Discussion

The importance of nurturing KI in organizations has been postulated by many researchers (Grant, 1996a; Newell *et al.*, 2004; Vie, 2012) and we have empirically proved the reputation of KI as a powerful tool for leaders when managing the ES post-implementation stage. The evidence from the analysis also showed that both leadership styles need full support from KI mechanisms in order to achieve a positive impact from the ES. The findings also indicate that 64.4 percent of the variance was explained by KI mechanisms. Meanwhile, 49.4 percent of the variance was explained by ES success. This phenomenon shows that the active role of KI mechanisms in the ES post-implementation stage should not be ignored by the management, especially the leaders who are directly involved with the ES. Sedera and Gable (2010), Haddad (2008), and Newell *et al.* (2004) postulated the importance of implementing KI while handling complex tasks in IS, and we empirically proved that it was important to implement KI mechanisms such as rules and directives and organization routines in the ES post-implementation stage in the investigated companies. The organization should focus on conducting routine discussions or meetings to discuss any ES problems and ES future directions with the key ES personnel. In addition, leaders should monitor the rules for job rotations and information audits in order to make sure all subordinates are well equipped with sufficient knowledge to operate the ES and that the ES information is up-to-date.

Consequently, the mediator analysis showed that both leadership styles were fully mediated by KI mechanisms and this result supports the claims in past studies that leaders need a powerful tool such as KI to manage the ES post-implementation stage (Chou *et al.*, 2014; Kumar and Gupta, 2012; Teittinen *et al.*, 2013; Tsai *et al.*, 2011; Vandaie, 2008; Yeh and Xu, 2013,). Furthermore, the finding shows that mixed leadership styles are more successful in applying KI mechanisms for ES success. This result is interesting because it could guide the leader on how to reward and punish subordinates more effectively based on the KI mechanisms they use while managing the ES post-implementation stage. The leader also has to take action in developing and training the subordinates to ensure they have all the relevant knowledge they need to operate the ES; thus the ES post-implementation stage could run smoothly. This evidence supports the argument by Shao *et al.* (2011) that a mixed leadership style is more practical in the ES post-implementation stage. The results from the VAF analysis showed that more than 100 percent (103.45 percent) of the effect of transactional leadership on ES success was explained via KI mechanisms as a mediator, which indicates that the transactional leadership style is should be more dominant in the ES post-implementation stage. However, the role of the transformational leadership style should not be neglected as the evidence also demonstrates shows the importance of the transformational leader's role in the ES post-implementation stage, particularly in regard to the development of subordinates.
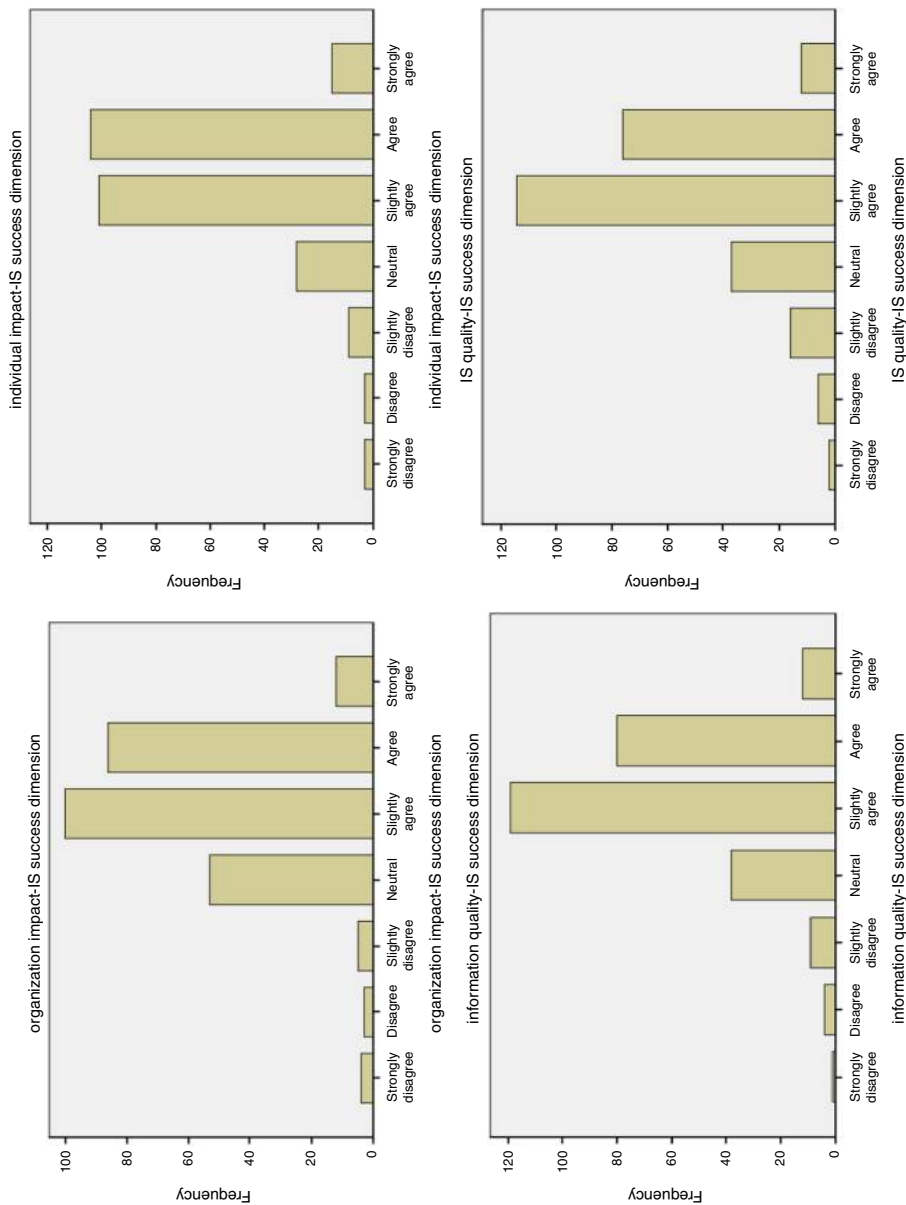
Figure 8.
Frequency analysis

Meanwhile, the findings also proved that staff costs could be reduced and the decision-making process could be conducted more effectively following ES implementation due to the organization having current data and information readily available (Kanellou and Spathis, 2013; Kumar and Gupta, 2012; Ram *et al.*, 2013; Su and Yang, 2010). Most of the respondents (83.6 percent) reported that their decision making and tasks were more effective due to using the ES and that they have learnt a lot through the operation of the ES. Meanwhile, 75.3 percent of the respondents agreed that the ES could reduce the staff costs and help improve the business process, while also increasing the operating costs (e.g. inventory holding costs, administrative expenses). Most of the respondents (80.2 percent) agreed that the information provided by the ES was concise, easy to understand and readily usable. Moreover, 76.8 percent of the respondents reported that the ES was easy to use, up-to-date, and fulfilled their department's needs. Based on the results gained from the analysis, this study contributes to theory and practice as discussed as follows.

Theoretical implications
The main theoretical implications of this study are sixfold as follows:

(1) This study is the first study to empirically examine the effect of KI mechanisms on transformational and transactional leadership styles toward ES success. Past studies have highlighted the crucial significance of leadership styles while managing the ES post-implementation stage. However, the ways in which managers with different leadership styles manage the ES post-implementation stage efficiently and how the leadership styles directly impact on ES success were still unknown. Therefore, we proposed the model to investigate the contribution and the impact of KI mechanisms as a mediator between the two leadership styles toward ES success.

(2) This study fills the gap in knowledge on KI mechanisms and ES success. Some studies have explored the importance of KM in mediating and facilitating leadership and ES success. However, the role of KI mechanisms in mediating two popular leadership styles in an organization was still unexplored. ES implementation requires contributions from many parties, and this requires active leadership. The subordinates need to adapt to the new environment and become familiar with the newly installed system. Leaders have to wisely manage the subordinates to use the ES to achieve the organizational goals.

(3) This study contributes to the research on KI in the ES domain by considering the ES characteristics that are relevant to the managers' implementation of KI mechanisms in the organization. Past studies have explored the significant relationship between KI and ES success, but none have investigated the role of KI mechanisms from the perspective of KI as a mediator for ES success.

(4) This study enriches the existing theory of KI mechanisms proposed by Grant (1996a, b) by adapting KI mechanisms for the ES environment. The KI mechanisms introduced by Grant are more relevant to the organizational production line which involves a focus on routine and sequencing tasks with minimum communication. However, an ES has different needs as the processes are complex and require active communication among stakeholders with diverse knowledge.

(5) We empirically tested the argument by Huang and Newell (2003) that an ES needs active communication and special attention from stakeholders with vast

knowledge. We tested the organizational routine which consists of brainstorming sessions, joint problem solving, annual convention of ES experts routine discussions about ES problems with ES experts, special ES communication forums, and monthly or annual ES training for new employees. All the indicator loadings were higher than the threshold value (0.708), thus indicating the reliability of the indicators. We also empirically tested the KI mechanisms introduced by Grant (1996a, b) (i.e. rules and directives) and all the indicators of the rules and directives construct were above the threshold value (i.e. 0.708). This indicated the reliability of the indicators as well as the constructs.

(6) Finally, the study postulated the importance of the ES post-implementation stage as ES success depends on the survival of the ES in this stage (Peng and Nunes, 2010). This study presents evidence on the important involvement of KI mechanisms in the ES post-implementation stage considering the potentially significant impact of these mechanisms on ES success.

Practical implications
The main practical implications of this study are five-fold as follows:

(1) From a practical perspective, this study provides insights for the managerial team regarding the need to focus seriously on implementing and practicing KI in the organization, especially when the organization is adopting an ES. Both transformational and transactional leadership styles are important when managing an ES. This study empirically proves the effect of practicing KI in the ES post-implementation stage for both leadership styles.

(2) Our study presents evidence on the importance of leaders adopting KI practices when managing the ES post-implementation stage. Thus, in order to cultivate KI in the organization, leaders have to implement an appropriate reward and recognition scheme for their subordinates. Leaders also have to be more supportive, encouraging, and sensitive to their subordinates in order to promote KI practices.

(3) The study reveals that the transactional leadership style makes the greatest contribution to ES success when KI mechanisms are used as a tool to manage the ES post-implementation stage. Therefore, leaders should practice more aspects of this leadership style and use KI mechanisms when handling post-implementation challenges.

(4) The study shows that leaders need to promote aspects of both leadership styles and nurture KI in the organization when handling ES problems or when re-engineering an ES. Both leadership styles have their own strengths, and leaders should wisely "put on the right hat" when dealing with their subordinates.

(5) Lastly, this study offers evidence that the adoption of KI mechanisms is important in order to enhance the leadership styles that guide an organization toward ES success.

There were some limitations in this study. The study used the average of all the sub-items of the two leadership style constructs to form a synthesized score. In addition, due to the time constraints, the survey was conducted only in the some companies in Malaysia, and the results are not necessarily generalizable to other countries or cultural settings.

Moreover, we investigated only two popular leadership styles. However, the strength of this study is that it provides evidence that leaders need to adopt KI mechanisms when handling the ES post-implementation stage so that their organization will attain the best outcomes from the ES.

6. Conclusion

Building on leadership theory, the knowledge-based theory of the firm and ES success dimension theory, this positivist study offers a useful theoretical model for examining the impact of KI as a mediator of two leadership styles toward ES success in the post-implementation stage. The study also makes a contribution to theory and practice. This study can serve as a foundation for future research which could gainfully investigate each of the sub-items of the formative leadership styles separately as reflective constructs. This approach can be used to investigate which sub-items of the leadership styles are more likely to promote the use of KI mechanisms. Future research can also investigate the role of KI mechanisms as moderators between both leadership styles. The findings of the study can also be expanded by looking in-depth at other leadership styles.

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Corresponding author
Razatulshima Ghazali can be contacted at: razat99@gmail.com