

Influence of Knowledge Leadership on IT Project Performance and Quality Practices: Examining the Role of Leader Risk-Mitigation Efforts

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ABSTRACT

The present study investigates how knowledge leadership affects project performance and quality practices in information technology (IT) projects. A questionnaire-based survey was designed to collect responses from 198 mid-level employees of five big Indian IT firms. The data was analysed using PLS-based SEM technique. The findings revealed that knowledge leadership skills, cooperation and trust, and knowledge integration positively influence project performance and project quality practices. The risk-mitigation efforts of a knowledge leader moderate the relationship between knowledge leadership, project performance, and quality practices. The current research has contributed to limited leadership and project management literature available. Knowledge-oriented leadership is a mixture of transformational and transactional leadership and has significant implications on the innovation performance of technology-intensive organizations.

KEYWORDS

Knowledge Leadership, Knowledge Management, Project Management, Project Performance

INTRODUCTION

Information Technology or IT practices is one of the ten established Knowledge Management (KM) practices that define modern business organizations (Hussinki et al., 2017). Though the total spending on IT solutions and tools by industries is rapidly increasing, it is crucial to understand that each IT project has unique complexities and suffers from communication, team management, and resource allocation challenges (Andersen, 2016). From a strategic viewpoint, the problem persists because of the lack of operative and effective knowledge management system. In technical organizations, such a system can capture the varied behavioural and individual-level factors that affect right knowledge acquisition, creation, and sharing (Vachon & Klassen, 2008; Dalkir, 2017).

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Leadership has a two-way positive causal relationship with KM success. It acts as an enabler for successful KM implementation, and a successful KM, in turn, reinforces knowledge leadership (Jennex et al., 2012). In the context of IT project management, understanding the leadership role of a project manager is vital as he/she is accountable for a project's success or failure (Anantatmula, 2010). Knowledge-holders are the primary resources for team and project performance that strengthens the importance of knowledge leadership in knowledge-based firms (Merat & Bo, 2013).

It is observed that despite fewer advances in project management (PM) discipline, many projects fail (Williams, 2005). To date, the practitioners and academicians are perplexed by the poor performance and frequent failures of IT projects (Haq et al., 2019). Apart from the cost and schedule deviances and overruns, factors such as low team morale, lack of skills and domain knowledge, low commitment from employees and other stakeholders play a critical role in IT project failures (Kerzner, 2006). However, organizational constraints that try to control costs, resource allocation, and human efforts, undermine the positive impact of informal dynamics for knowledge creation in project management. In the context of IT, a project's good performance or success is defined as the ability of the project to get completed within a predefined time and budget. It also entails the criterion of low reported bugs from the customer (Sirisomboonsuk et al., 2018).

It is a well-known fact that leadership focuses on people issues (Avolio & Bass, 1988). From the perspective of knowledge management in knowledge-intensive firms, the effects of varied leadership styles have been studied. Though contemporary leadership style such as *transformational leadership* has been studied in the context of knowledge-intensive firms (Bass, 1999), researchers are not clear about the outcomes of such leadership style under conditions of employee's high psychological empowerment (Millar, Chen, & Waller, 2017). Moreover, the underlying concept of a transformational leader is highly ideological, and a gap still exists between the "ideal" and "actual" leader behaviours (Viitala, 2004). Researchers found *shared leadership* across hierarchies is effective than any focused leadership in knowledge-intensive organizations (Merat et al., 2013). However, leadership in a firm may not be practical or suffice with one of the centralized or shared approaches (Gronn, 2002).

It has been observed that under pressure to deliver successful projects, top management tends to follow the "wisdom" of a few in the organization (McKelvey, 2008) who are known as "knowledge leaders". Skyrme (2000) proposed that "*knowledge leadership refers to constant development and innovation – of information resources, individual skills and knowledge, and learning networks*". Therefore, the importance of knowledge leadership is felt where the role of leaders is specified as facilitators or integrators of learning and development (Macneil, 2001). Quantitative investigation of "knowledge leadership" is severely lacking in leadership literature where the void is apparent in sectors like IT and manufacturing. Moreover, with the advent of smart technologies, software development and integration have become complicated. Modern software development projects are unique and complex in their setup, design, and ownership which significantly contribute to a project's performance (Andersen, 2016). As leadership skills (a more pragmatic knowledge-driven approach) that are required to manage modern projects are different from the traditional project management skills, examination of knowledge leadership on project performance and project quality management processes deemed essential.

IT organizations need to ensure that the project deliverables do not only fulfill their intended purposes but also meet high customers' satisfaction. Therefore, the quality of a project focuses more on process-based efficiency, innovation potential, and continual improvement capabilities (Schwalbe, 2010), than only meeting the objectives and deadlines. Delivery of a quality project is further related to a project manager's ability and effort to manage the quality process in place. However, PM literature has reported mixed results in terms of the impact of quality management services on project performance (Hong et al., 2008). Therefore, in this paper, the authors have considered *project quality management practices* as a separate, distinct construct and aim to investigate how knowledge leadership influences such process.

Research suggests that project risk negatively affects project performance. Numerous studies have been trying to identify, evaluate, and minimize the risk factors associated with high budgeted projects (e.g., Liu, Zhao, & Yan, 2016). The test of skills and knowledge of a knowledge leader in project management practices may be realized by the leader's risk assessment ability that includes risk identification, risk estimation, and evaluation. High failure rates of IT projects put a question mark on such abilities of an IT project leader (Lin & Shao, 2000). In line with the argument by Jennex and Durcikova (2020), the authors propose that IT project management - the vital component of a KM system, requires specialized guidance. It must explore the capability of knowledge leaders as "system engineers" to perform risk assessment/ risk management of the IT projects. The degree of preparedness for uncertain conditions to achieve project milestones and deadlines along with maintaining high-quality standards require great leadership efforts. Such a perspective has been rarely explored in KM and PM literature. In this paper, the authors have tried to examine the moderating effects of risk-mitigating efforts by a knowledge leader in the relationships between KL and project performance and KL and project quality practices.

Gasik (2015) suggested the role of knowledge management within the PM discipline as one of the high-potential areas for future research. Though previous studies have provided few empirical pieces of evidence, the role of knowledge leadership in PM is still an under-researched area. The core objectives of the paper are as follows:

1. How knowledge leadership affects project quality and project performance, especially in the context of IT projects.
2. How the knowledge leader's risk-mitigating efforts moderate the relationship between knowledge leadership, project performance and project quality practices.

The rest of the paper is organized as follows: The *Literature review and hypotheses formulation* section covers the literature review of the study intending to develop the conceptual framework and the hypotheses. The following *Methodology* section presents the research design, data collection procedure and common-method bias test for the study. The *Results* section deals with the path-analysis results. The *Discussion* section explains the results corroborating with the earlier studies and highlighting points of similarities, departures and implications. Finally, the *Conclusion* section encompasses the research paper's theoretical and practical contributions, limitations, and the scope of future study.

Literature Review and Hypotheses Formulation

Knowledge Leadership

In the modern world, knowledge is a core commodity, and its rapid production is crucial for innovation and organizational survival. However, with the exception of few studies (e.g., Jennex & Olfman, 2006; Srivastava & Joshi, 2018), no explicit literature can be cited on leadership models in the Knowledge Era (Uhl-Bien, Marion, & McKelvey, 2007). Though some modern leadership theories (e.g., technology leadership, transformational, authentic and charismatic styles) have highlighted information search, acquisition and use of information as desirable leader behaviours, very few have focused on the management of knowledge and knowledge capabilities of a leader to implement ideas (Bell De Tienne et al., 2004; Politis, 2001). The ideology of knowledge leadership style is to bring a culture of managing knowledge in the organization where continuous learning, experience and expertise, and innovation have a higher value over command and control (Yang, Huang, & Hsu, 2014; Viitala, 2004).

In project management, adaptive issues pertaining to new learnings and emergent behaviours (Heifetz & Laurie, 2001) need to be tackled quite differently as compared to technical problems that are solved with already known knowledge and procedures (Parks, 2005). Therefore, it is inevitable that a leader should enable the informal dynamics within the team for knowledge production. However,

organizational constraints that try to control costs, resources allocation and human efforts, undermine the positive impact of informal dynamics for knowledge creation. Under the influence of these constraints, management tends to follow the “wisdom” of a few in the organization (McKelvey, 2008) known as “knowledge leaders”. Therefore, knowledge leaders are treated as facilitators of learning and development (Macneil, 2001). Knowledge leadership assumes such roles of a leader where the emphasis is developing knowledge and learning networks along with a constant nurturing of individual skills to support group goals (Skyrme, 2000). However, conceptualizing knowledge leadership and its effects are still rudimentary in research (Yang, Huang, & Hsu, 2014). In the following sub-sections, the conceptual relevance between the dimensions of knowledge leadership *viz.*, *leadership skills*, *cooperation and trust*, and *knowledge integration and innovation* (Davenport & Prusak, 1998; Yang et al., 2014) with project performance and quality management practices are presented.

Leadership Skills and Project Performance

Previous research indicates that leadership skill has a positive relationship with team members’ mutual influence and knowledge management that facilitate greater access to critical resources for a project’s success (Gerstner & Day, 1997). Knowledge leaders are both technical and social “problem solvers” who create conditions for project members to cultivate their skills, contribute their learnings and experiences, and acquire relevant knowledge from inside and outside organization’s pool of expertise (Crawford, 2005). Generally, a project’s performance is measured as the extent of deviation on a planned schedule, budget and scope (Sauer, Gemino, & Reich, 2007). ‘Good’ and ‘Super’ performance indicates a very low deviation on all the above parameters. The authors posit that a knowledge leader is technically skillful to plan the budget based on the criticality of the tasks involved. With the knowledge of his/her past experiences on similar projects, the leader can rightly allocate resources and define the project scope. A knowledge leader must be intuitive enough while scheduling the project task deadlines, which include enough time for experimentation or rapid prototyping. By skillfull project planning, a leader can avoid severe team co-ordination failures and provide enough room for quality deliverables.

Cooperation, Trust and Project Performance

Experiential learning within a team is possible if team members are sensitive towards each other and have high trust in their leader (Castiglione, 2006). As the nature of work shifts from individual to collaboration-centric (Tripathi & Ghosh, 2018), participative styles of leadership are preferred in modern organizations. Trust in leaders is instilled from the perceptions of the leader’s character that reflects in his competence, integrity, care and concern for others (Dirks & Ferrin, 2002). The knowledge leadership role shares a unique association with reliance-based and disclosure-based trust (Lee, Gillespie, Mann, & Wearing, 2010). When team members perceive their leader as caring and nurturant, they disclose their views and opinions without fear and share sensitive work-related information with the leader.

Team collaboration and trust are the pivotal factors of knowledge management practices as they facilitate knowledge acquisition, sharing, and application (Kotlarsky & Oshri, 2005). Moreover, based on ‘systematic-heuristic processing framework’, Dirks and Ferrin (2002) suggested that trust in a leader’s explanations stimulate employees towards heuristic processing of information. Therefore, a greater acceptance of the leader’s direction may be observed in the team.

Knowledge Integration, Innovation and Project Performance

In IT firms, high importance is attached to technical and business domain knowledge (Tiwana, 2004). It is suggested to integrate these two types of knowledge for the efficient and effective design of software. Knowledge integrative capability is the ability to integrate knowledge within and outside the organizational boundaries (Henderson, 1994). However, a project manager’s integrative and innovation capabilities can act as a significant influencing factor in the success of the project. The leader must

possess the knowledge to use appropriate tactics to collate and integrate team's human resource assets (knowledge, skills, abilities and morale) to achieve project goals (Lee & Bohlen, 1997). Moreover, Hong et al., 2008 posit that in system-integration projects, leadership capability is the most critical determinant for the development of a team member's knowledge on processes that subsequently affect project delivery in a positive way. Studies conducted by Henderson (1994) and Henderson and Cockburn (1994) have demonstrated that R&D project performance is related to the degree of KM practices adopted in the project. It has been observed that project performance varies across firms based on the degree of tacit or specialized knowledge acquisition and its integration (Teece et al., 1997). The authors argue that a project manager's knowledge integration and innovation capabilities play a vital role in the success of a project, as it facilitates knowledge sharing and application among team members. Donate and Pablo (2015) conceptualized knowledge leadership as the ability of leaders to promote learning from mistakes and focus quality of work to increase creativity. In the study, a positive relationship was found between knowledge leadership and knowledge management practices such as knowledge exploration and exploitation.

In the project management literature, few studies have empirically investigated the effects of knowledge leadership on IT project performance. Based on the above arguments which establish a conceptual relevance between KL and project performance, the following hypothesis is proposed.

H1: Knowledge Leadership Positively Influences Project Performance.

Knowledge Leadership and Project Quality Management Practices

Based on an analysis of 50,000 software projects built between 2003 and 2012, only 39% of the projects met the required quality requirements. 43% of the projects were below the desired quality level and the remaining 18% were canceled before completion or delivered and never used (The Standish Group, 2013). The 'iron triangle of cost, time and quality' is sacrosanct for most project managers (Atkinson, 1999) and they consider "on-time and budget" delivery as the only success criteria. It is suggested that "quality activities" within the project positively impacts project performance (Karklina & Pirta, 2018) by providing helpful tools to the project management and its team members. A few project managers appreciate the risk of a project because of its uniqueness, complexity and intricate design features but fail to envision the outcomes of risks that links with inherent project quality. Moreover, in the field of project management, the importance of quality is not clear. Research has revealed many examples where projects are delivered on-time and within budget but have failed to meet the end user's expectations (Baccarini & Archer, 2001). Thomson et al. (2007) observed that the perceived quality of project reporting was far from perfect and significantly influenced the task-level and psychological outcomes of project members.

By adopting a gap analysis approach in service quality management literature, few principal gaps were identified (Winch, Usmani, & Edkins, 1998), out of which two are significantly relevant to the IT industry. Firstly, knowledge about customer's expectation about the service and translating the same into service quality specifications are major lacks in service quality management. Secondly, most of the managers fail to bridge the gap between service quality specifications and actual service delivery. Research indicates that though leadership plays a critical role in the implementation of quality management practices (Kosmol et al., 2018), a new form of leadership is essential that can emphasize on leader's effort on continuous learning, traits of "intellectance" and systematic experimentation and participatory behaviours with a strong customer orientation (Lakshman, 2006).

As knowledge leadership promotes a climate of continuous learning (Vitala, 2004), systematic gaining and sharing knowledge with a keen eye on integrating details and specifications, a shared mental model of a quality conscious climate can be developed among team members (Ghosh & Tripathi, 2020). As KL leaders are expected to assimilate knowledge and expectations from cross-functional, cross-hierarchical and inter-organizational groups, such leaders have a strong TQM

outlook and implement such project quality standards by understanding the global quality benchmark practices. The authors strongly believe that the quality of a project does not only relate to the final delivery (performance-oriented) but the underlying process which focuses on efficiency, innovation and continual improvement. The various approaches of leadership (e.g., behavioural, contingency and charismatic (House & Aditya, 1997; Yukl, 2002) have failed to conceptualize leaders as managers of quality (Lakshman, 2006). However, there is no empirical evidence regarding employee's subjective experiences about leaders' behaviours on the quality practices being followed for software product development. In this paper, it is hypothesized that:

H2: Knowledge leadership positively influences project quality management practices.

Project Risk Mitigation Efforts Moderate the Relationship Between Knowledge Leadership and Project Performance

In the purview of an IT project execution, project risk refers to a serious threat condition that impedes the successful completion of the project (Keil et al., 2013). It has been observed that risk negatively affects project performance, and thus numerous studies have been trying to identify, evaluate and minimize the risk factors associated with information system projects (Liu & Wang, 2016). Research indicates that an effective governance structure can curtail the negative effects of risk and uncertainties on project performance (Atkin & Skitmore, 2008). Efficient risk management is needed for an effective governance structure (Zwikel & Smyrk, 2015).

Risk is an essential condition of trust irrespective of its origin, be it sociological, psychological or economic (Coleman, 1990). Coleman (1990) suggested that the need for trust and co-operation arises only in risky situations. In a risky project situation, in-group and out-group conflicts between members may result in "closing of the mind" to learn or share knowledge from their manager. Moreover, due to perceived in-compatibility and in-congruencies of beliefs and idiosyncrasies of members with that of their leader (Cummings & Teng, 2003), a lower degree of knowledge sharing between the leader-member dyad is inevitable.

Research indicates that high technological intensive complex projects can also be completed within the agreed-on budget and time if the team environment supports learning (Thamhain, 2004). The trust and co-operation dimension of KL creates a "psychologically safe" team climate (Zhang & Chen, 2015). High-risk mitigation efforts of a knowledge leader send a positive signal to the team that the rules, standards and project guidelines are appropriate to navigate during uncertain times (Colquitt & Rodell, 2015). A recent risk-assessment framework by Jennex and Durcikova (2020) suggested that knowledge leaders must evaluate risk scenarios pertaining to threats to knowledge assets such as financial, performance, reputation, legal and safety. The action-oriented style of a knowledge leader can bridge the "knowing-doing" gap that exists in the mindset of followers for their leaders. It re-enforces trust for the leader and the team reciprocates through high commitment towards work. Therefore, it is posited that high risk-mitigating efforts of a knowledge leader can yield higher project performance than low risk-mitigating efforts.

H3: Project risk-mitigating efforts moderate the effect of knowledge leadership on project performance; in a condition when a knowledge leader invests high efforts in risk mitigation, the project performance is higher as compared to a situation when risk-mitigating efforts are low.

Project Risk-Mitigating Efforts Moderate the Relationship Between Knowledge Leadership and Project Quality Practices

By adopting a mature and sophisticated approach to integrate project risk and quality, managers can manage complex project issues (Griffin, 2015). Identification of "good" and "bad" risks for the project requires a manager's intuition and experience. Knowledge and skills acquired from previous

projects can help project managers to analyse risks even beyond the organizational prescribed risk management framework. In high-risk projects, quality is significantly dependent on planning as compared to low-risk projects (Zwikaël et al., 2014). In low-risk projects, project managers invest less effort for quality management because of the perceived assurance of efficient output delivery. The condition of ‘assured efficiency’ does not hold true for a high-risk project. According to Zwikaël et al. (2014), too much planning may increase the duration and cost of any project. Moreover, too much control can impede innovation (Steiber & Alange, 2013). Therefore, an “ambidextrous organization and management processes” need to be developed to inculcate both innovativeness and efficiency in the processes (Cole, 2002). Such a kind of management sophistication caters to formal processes formed from heuristic rules and probe-and learn mechanisms (Steiber et al., 2013). Here, a leader’s previous experience, knowledge and integration capabilities warrant for such balanced processes.

From a management control theory perspective, Liu et al. (2008) suggested that a high degree of software process standardization increase the project’s performance as well as the software quality metric of flexibility. A well-defined standard for requirements capture, development of code and its evaluation requires a leader’s initiatives on undertaking quality assurance activities as a part of risk mitigation efforts (Liu et al., 2008). High-risk mitigation efforts of a knowledge leader encompass robust scenario planning in collaboration with internal and external stakeholders. The formulation of an effective risk management plan, identification of appropriate risk metrics and appropriately communicating the quality standards to the team - all play a crucial role in laying down project quality practices.

Drawing on the above literature, the following hypothesis has been proposed.

H4: Project risk mitigation efforts moderate the effect of knowledge leadership on project quality management practices such that high-risk mitigation efforts of a knowledge leader ensure higher quality management practices than low-risk mitigation efforts.

METHODOLOGY

After an extensive review of the project management and KL literature, a structured survey questionnaire was developed. Although the construct items were adapted from established scales, the items of each construct were examined by four professionals (two academicians and two industry experts) to establish face validity of the measurement items. All the constructs were operationalized as reflective indicators.

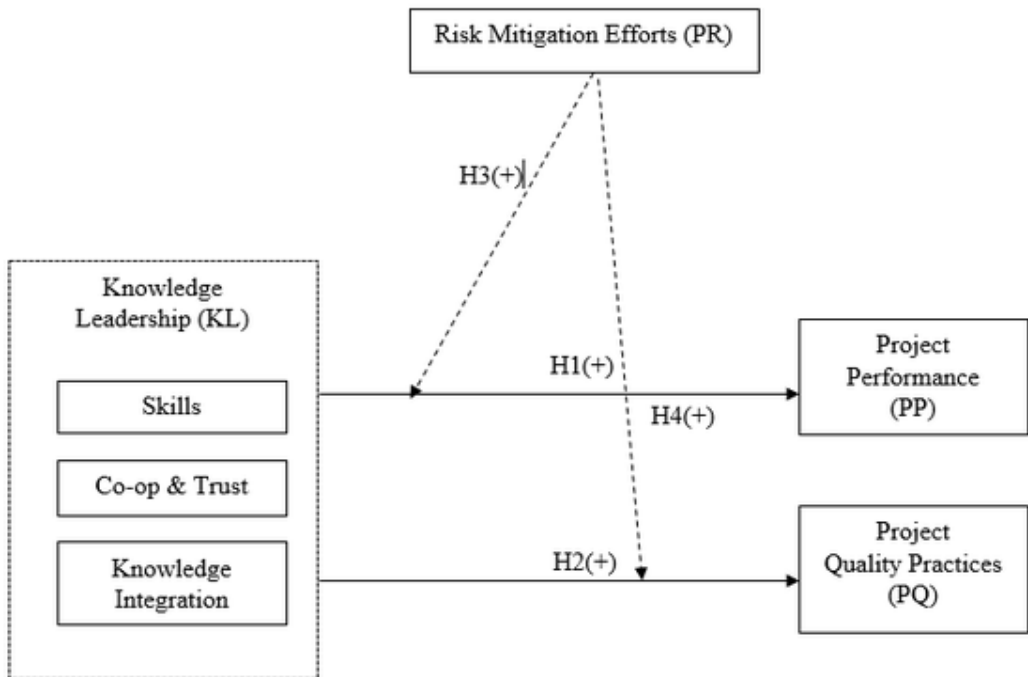
A 7-point Likert scale (1 = Strongly Disagree and 7= Strongly Agree) was used to measure each construct where only *Project Performance* is measured on different anchors (1 = Very Low and 7= Very High).

Table 1 details the constructs, items and sources of the measures used in the study.

Sample

Questionnaires were distributed randomly to about 209 employees in five IT firms located in India. They were informed that the survey participation is voluntary and all their responses including personal details would be kept confidential and be used only for academic research purpose. Only after taking their consents, data were collected. Responses of employees who had worked in more than one (1) project in the organization were filtered out. The total number of such responses was 200 out of which 198 was used for analysis. The average age and work experience of the employees were 30.13 years and 7.8 years, respectively. The average tenure of working on the previous project was 1.8 months. In the sample, there were 66 female and 132 male employees. Different job roles of employees in the sample were software developers, technical leads, process specialists and testers.

Figure 1. The Conceptual model



Control Variables

Recent studies in the area of project management have controlled for age, tenure in the current project and work experience (Kissi et al., 2013) due to the impact of task domain expertise or knowledge which influence project performance. As the tenure in the current project increases, the favourable or unfavourable experiences in the project can influence the perception of the previous project's performance. In this study, age, experience and tenure in the current project of employees are controlled.

Common-Method Bias Test

The absence of Common-Method Bias (CMB) was ensured in two ways. First, intercorrelation among the variables was less than 0.9, indicating the absence of CMB (Bagozzi & Yi, 1991). Second, the variance inflation factors (VIF) was less than the threshold limit of 3.3 for each variable. Thus, both of the above conditions indicate the absence of CMB in the sample, and therefore processed for data analysis.

Results

Confirmatory Factor Analysis

The relevant items of each scale used were first assessed for their reliability and validity. The reliability of the items was evaluated by examining the composite reliability (CR), Cronbach's alpha and rho_A values for all constructs. The values of CR, Cronbach's alpha and rho_A for all constructs were found to be more than 0.70 (refer to Table 2).

Table 1. Constructs, items and factor loadings

Construct	Dimensions	Items	Factor Loadings	Source
		In my previous completed project...		
Knowledge Leadership (KL)	Leadership Skills (LS)	LS1: the project manager understood the importance of customer needs and practiced what he/she preached.	.85**	Adapted from Yang et al. (2014)
		LS2: the project manager always tried to gain new knowledge to set an example to the others.	.94**	
		LS3: the project manager demonstrated excellent knowledge leadership skills.	.93**	
	Cooperation and Trust (CT)	CT1: the project manager understood needs and expectations of the team members and customers and provided necessary resources.	.91**	Adapted from Yang et al. (2014)
		CT2: the project manager and the team members cooperated to solve problems.	.88**	
		CT3: the project manager built an environment of trust.	.91**	
		CT4: the project manager encouraged the team members to share and apply customer knowledge.	.87**	
	Knowledge Integration and Innovation (KI)	KI1: the project manager acted to enhance the team members' innovative ability.	.90**	Adapted from Yang et al. (2014)
		KI2: the project manager developed a reward system to stimulate the team members' learning behavior.	.85**	
		KI3: the project manager integrated practical experiences from different departments, customers and projects to create new knowledge.	.91**	
		KI4: the project manager led the team members to execute innovative ideas.	.90**	
Project Performance (PP)		PF1: my rating on efficiency of operations is ...	.88**	Adapted from Thompson et al. (2007), Sirisomboonsuk et al. (2018)
		PF2: my rating on adherence to schedules is ...	.86**	
		PF3: my rating on adherence to budgets is...	.86**	
		PF4: my rating on amount of produced work is	.90**	
		PF5: my rating on amount of software bugs reported by customer is	.92**	

continued on following page

Table 1. Continued

Construct	Dimensions	Items	Factor Loadings	Source
While working in the previous project of this organization, I felt...				
Project Quality Practices (PQP)		PQ1: The quality metrics review meetings were scheduled throughout the project's duration.	.71**	Adapted from Lunardi et al. (2014)
		PQ2: In my previous project, all quality metrics were clear, measurable, controllable, and reportable	.79**	
		PQ3: In my previous project, the project team was familiar with the project's quality review process	.79**	
		PQ4: In my previous project, the project had an appropriate number of resources assigned for quality assurance and control	.76**	
		PQ5: The project team had established a repository for all quality documentation	.83**	
		PQ6: All team members had access to the quality documentation repository	.84**	
		PQ7: All appropriate team members were notified of their required participation in quality reviews	.83**	
		PQ8: Quality responsibilities were assigned and documented and the applicable personnel is notified	.85**	
		PQ9: Product and process quality standards were established, documented, and communicated	.87**	
		PQ10: Quality thresholds and limits were established, documented, and communicated	.69**	
Risk Mitigation Efforts (PR)		RM1: Important decisions were made in a timely fashion by the project manager.	.78**	Adapted from Sirisomboonsuk et al. (2018), Damianides (2005), Hardy (2006)
		RM2: Inventory of risks relevant to the project was up-to-date.	.90**	
		RM3: The project manager was clear on his position relative to risk:(e.g., risk avoidance, risk neutral, or risk taking)	.83**	
		RM4: The project manager had a clear view on the investments of the project from a risk and return perspective.	.84**	

Descriptive Statistics and Correlations

The convergent validity (CV) and discriminant validity (DV) of all the constructs were tested. The higher factor loadings (range from 0.698 to 0.911) of the measurement items on their latent constructs with a significant p-value indicates a good convergent validity. Additionally, the larger value of the square root of AVE for each construct along the diagonals as compared to the correlation value with other constructs indicates discriminant validity (Chin & Newsted, 1999) (refer to Table 3).

Table 2. Validity and reliability of latent constructs

Constructs	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
Cooperation and Trust	0.92	0.94	0.80
Knowledge Integration and Innovation	0.91	0.94	0.79
Knowledge Leadership	0.95	0.95	0.67
Leadership Skills	0.89	0.93	0.82
Project Quality Practices	0.93	0.95	0.64
Project Performance	0.94	0.94	0.77
Risk Mitigation Efforts	0.86	0.86	0.71

Table 3. Discriminant validity of the research model (Fornell-Larcker criterion)

Factors	Knowledge Leadership	Project Quality	Project Performance	Project Risk
Knowledge Leadership	0.800			
Project Quality Practices	0.761	0.778		
Project Performance	0.673	0.608	0.857	
Risk Mitigation Efforts	0.554	0.596	0.470	0.787

Hypotheses Testing

The relationship between the constructs hypothesized in the conceptual model was analysed using PLS based SEM. As in the theoretical framework (refer to Fig. 1), the outcome variable is reflective, PLS is the appropriate method of analysis (Lowry & Gaskin, 2014). PLS performs both factor analysis and path analysis during its execution. The results of confirmatory factor analysis (CFA) are shown in Table 2. PLS is a “regression-based path modelling technique that estimates path coefficients and partials out variance for the model” (Hall et al., 2012). This technique is suitable for exploratory testing and predictive applications. As our study is an initial attempt to empirically examine the relationship between knowledge leadership, project performance and quality practices, PLS is suitable to test the causal relationships (Lowry et al., 2014; Willaby et al., 2015).

PLS based SEM allows us to simultaneously evaluate both measurement and structural model (Chin, 1998), while it eliminates concerns about the multicollinearity issues (Inkpen & Birkenshaw, 1994).

The findings of the structural model are given in Figure 2.

The primary factor *Leadership Skills* had a significant loading on KL ($\beta = 0.30$; $p = .00$). *Cooperation and trust* factor also significantly loaded on KL ($\beta = 0.40$; $p = .00$). Likewise, the primary factor *Knowledge Integration* was found to have a significant loading on KL ($\beta = 0.39$; $p = .00$).

Structural path-coefficients proved that KL positively influenced project performance (PP) ($\beta = 0.58$; $p = .00$). Thus, H1 was supported.

Structural path-coefficients proved that KL positively influenced project quality practices (PQP) ($\beta = 0.63$; $p = .00$). Therefore, H2 was supported.

Risk Mitigation Efforts (PR) moderated the effect of KL on project performance ($\beta = 0.12$; $p = .041$). Fig. 3 indicates the interactional effect of risk efforts and KL on project performance. High-risk project's performance increased under the influence of high-risk mitigation efforts as compared to low-risk mitigation efforts. Therefore, H3 was supported.

Figure 2. Findings of the structural model

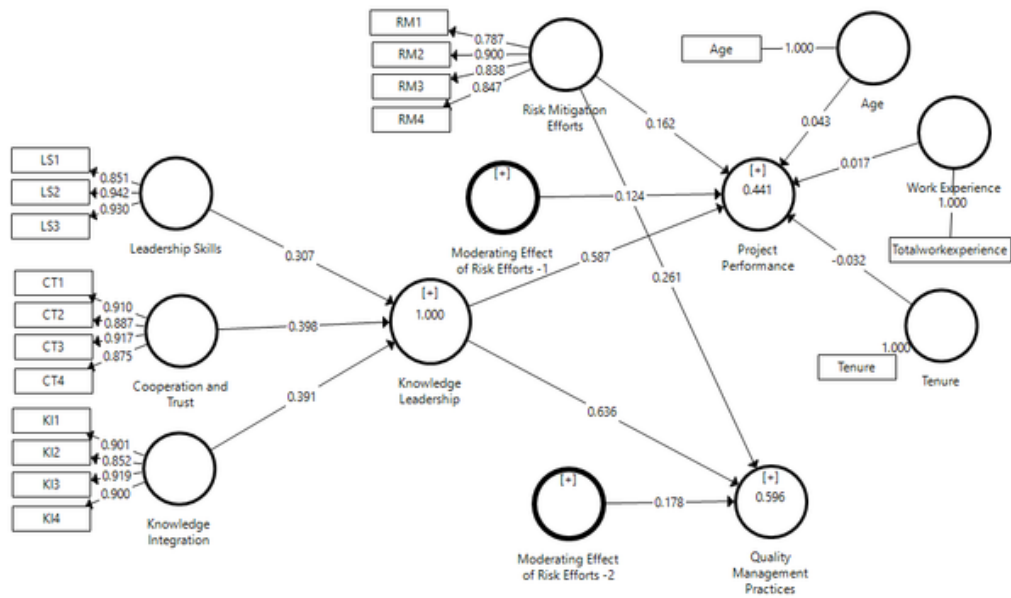
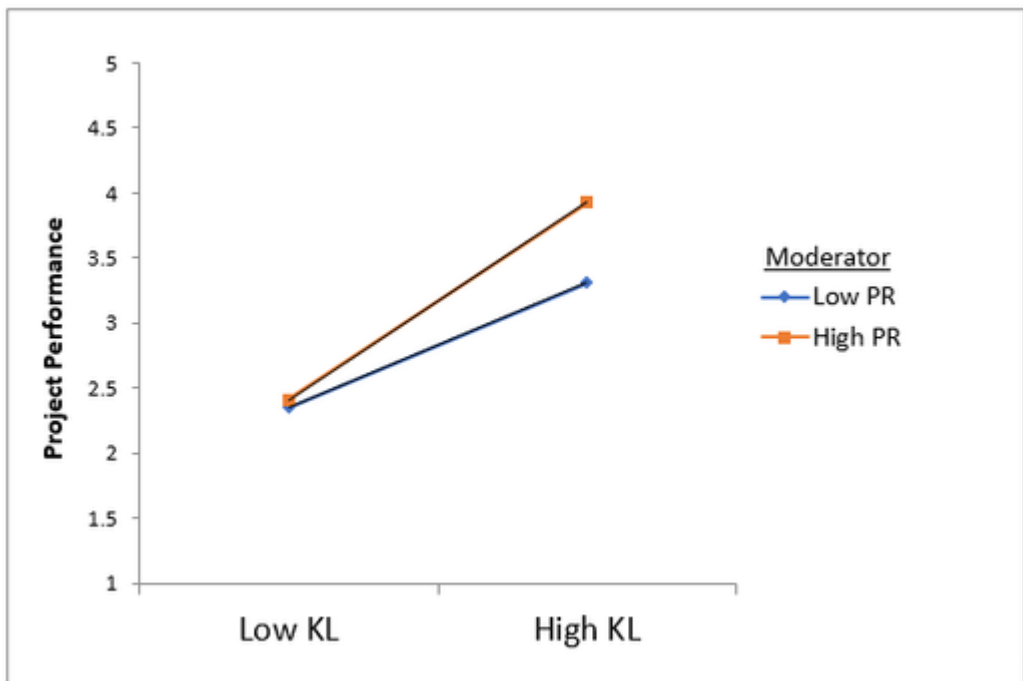


Figure 3. The interaction effect Risk Mitigation Efforts (PR) and Knowledge Leadership (KL) on Project Performance



Similarly, Risk Mitigation Efforts were found to moderate the effect of KL on project quality practices ($\beta = 0.17$; $p = .00$). Fig. 4 shows the interactional effect of Risk Mitigation Efforts and KL on project quality practices. High-risk mitigation standards increased the project's quality as compared to a low-risk project risk mitigation effort. Therefore, H4 was supported.

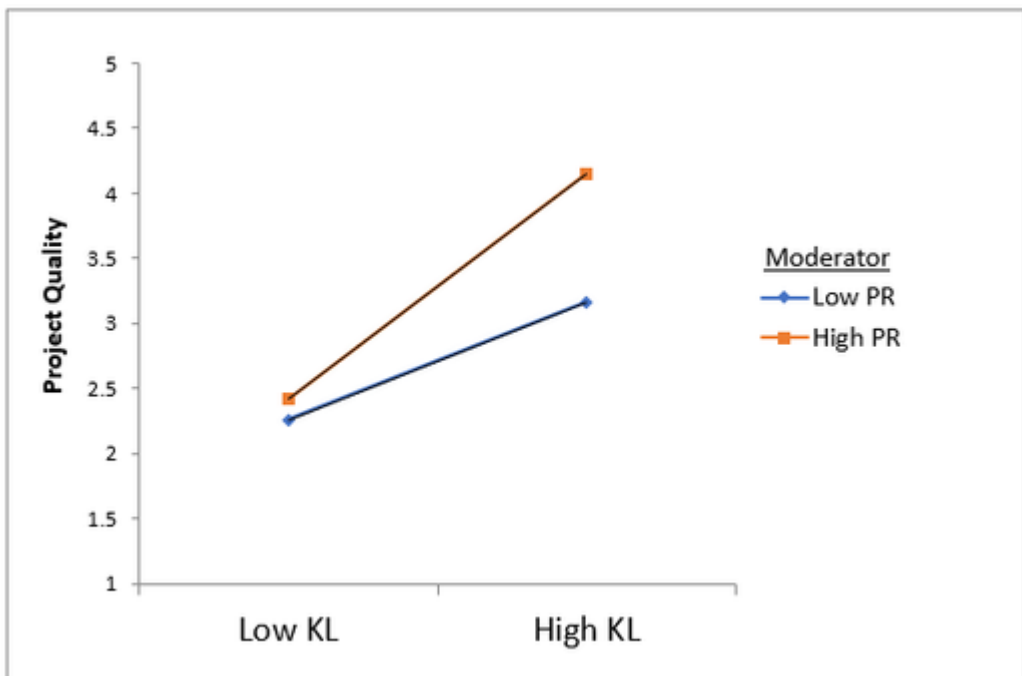
Blindfolding algorithm in PLS-SEM was executed to get the Stone-Geisser's Q2 value which is an indicator of the predictive relevance of the constructs. The Q2 values in cross-validated redundancies for our constructs are as follows (KL: 0.66 9 (very high); PP: 0.33 (high) and PQP: 0.38 (high)).

DISCUSSION

The present challenge in knowledge-intensive organizations is to motivate employees for knowledge creation and knowledge exchange (Millar, Chen, & Waller, 2017). It is a well-established fact that leaders and team members create an environment of psychological safety that nurtures experimentation and risk-taking behaviours among team members (Ghosh & Tripathi, 2020). However, to date, researchers are examining what leadership behaviours should be encouraged to make employees contribute to knowledge capital (Millar et al., 2017). This paper has attempted to address the above by investigating how KL traits influence project performance and quality management processes in IT firms.

In the context of the IT industry where a constant skill up-gradation of employees is desirable, the present study establishes that knowledge and skills of a leader increase project performance in manifolds. Singh (2008) observed that a directive style of leadership is more prominent in Indian software firms that, in turn, negatively influence knowledge management practices. In such a case, co-ordination failures, lack of manager's knowledge and assimilation abilities often fail to bridge the gap between customer's service quality specifications and actual service delivery. A knowledge leader's skills, knowledge and integrative capacity helps in understanding customer's functional and

Figure 4. The interaction effect Risk Mitigation Efforts (PR) and Knowledge Leadership (KL) on Project Quality Practices



technical expectations about the software product and blends them into actual product delivery. In a similar line, Yang et al. (2014) has shown that leadership skills, and knowledge integration and innovation are more closely associated with customer knowledge management than trust and co-operation dimension. Jennex et al (2003) identified general knowledge, technical knowledge and trust in the client-outsourcer relationship as the few critical success factors of IT development projects. Our study validates that a project manager who generally acts as an interface between the client and the outsourcer, if judiciously applies KL style of *leadership*, can significantly influence IT project performance and quality. Unlike transformational leadership where a leader's influence (charisma, inspiration and intellectual stimulation) is bounded by his/her directions, KL focuses on leader's own practical experiences and application of skills and knowledge in solving project and customer's expectation problems.

In times of uncertainty, trust and cooperation factor of knowledge leadership intrinsically motivates team members to contribute, and they share ideas and knowledge without the fear of failure or being ridiculed by their leader (Poltrick & Handel, 2010). The authors of the current study suggest that the factor *trustworthiness and co-operation* is one of the fundamental characteristics of a project manager in IT firms where employees perceive IT jobs to be volatile and insecure as compared to any other jobs. Trust in leaders prompts employees to take risks for creative endeavours (Zhang & Zhou, 2014). The mediating effect of trust and cooperation has also been found significant in ethical leadership studies (Javed et al., 2018; Engelbrecht, Heine, & Mahembe, 2014). This indicates that few characteristics of ethical leadership are present in a knowledge leadership style.

The employees' perception of "quality" in projects is mostly relegated to a 'lip service', and this perception is developed from the leader's inability to understand the value and importance of quality process and audits. The present findings suggest that knowledge leadership shares a high positive relationship with project quality management practices. The findings are in line with the earlier findings of Ouchi (1979) and Liu et al., (2008) where the manager's controlling abilities are associated with his/her understanding of project requirements, their changes and establishing standard operating procedures for quality management.

In this paper, the litmus test for the effectiveness of knowledge leadership was examined under the influence of project risk mitigation efforts exerted by a knowledge leader. High-risk mitigation efforts by a knowledge leader yield high project performance. The results are in sync with the previous study by Jun, Qiuzhen and Qingguo (2011) that observed project planning and control had direct positive effects on process performance. Therefore, the result validated our findings on the positive association between knowledge leadership and quality management practices under high-risk mitigation efforts, emphasizing KL leader's concern for both fit and flexibility. As critical, complex and big IT projects are mainly outsourced/developed in countries such as India, China, Singapore, U.S. and some countries in Europe where technical skills are available, the IT project members' perspective on knowledge leadership, project performance and quality aspects of a project would not differ much despite the countries are different on economical strata.

CONCLUSION

Leadership styles bring significant changes in the KM practices (Cabrilo & Leung, 2019). Knowledge leadership is qualitatively different from other leadership theories which are more relevant to traditional economies. As the influence of transformation leadership on project performance under high risk is uncertain, KL can fill the vacuum being an amalgamation of transformational, transactional and shared leadership. KL has significant implications for the improvement of innovation-performance in technology-intensive organizations. Project managers in the role of knowledge leaders can create knowledge by opening an infinite interaction loop within his/her project team (Bibbes, Rollins, & Johnston, 2017). Here, the focus is on those leader behaviours that help to create, share and utilise knowledge to bring organizational, group and individual-level changes for a successful collective

outcome. However, such a knowledge sharing sustainability climate is achieved when there is top management support of knowledge sharing across each phase of project development (Twum-Darko & Harker, 2017).

Contributions

The current paper has significant contributions in knowledge management practices, especially in ‘administrative and expertise co-ordination’ areas of software development projects (Faraj & Sproull, 2000). The capability of a knowledge leader to integrate with different internal and external knowledge assets implies high administrative coordination abilities. Trust and co-cooperation abilities enhance ‘knowledge appreciation’ and ‘knowledge dissemination’. Moreover, knowledge leadership skills help in ‘knowledge mapping’ activities such as project planning and budgeting, risk mitigation planning and knowledge repository building for the projects. The study on knowledge leadership is pertinent to knowledge-based economies where organizations rely on innovation-driven processes. Organizations apart from providing “soft” skills to a leader in leadership development programs may impart training on “hard” skills to make them relevant in the modern knowledge-intensive programs. In the process, leaders can develop the right amalgamation of “tacit” and “explicit” knowledge to integrate disparate information, skills and behaviour of others.

This study is helpful for those knowledge-intensive firms where outputs are generated from pragmatic or situation-specific knowledge integration through a process of transferring knowledge from multiple sources. This study may help HRs to envisage the need for building a dynamic knowledge capability that is intra and inter-organizational whereas managers understand the mechanisms to bridge the “knowing-doing” gap.

The present study is a welcome digress from earlier literature which has focused specifically on identifying enablers and barriers of project performance such as corporate-contexts (e.g., Cooke-Davies, 2002), leader’s performance (e.g., Belassi and Tukel, 1996) and human factors (e.g., Chan et al., 2004). A more process-oriented and a relationship-based approach of leadership on project performance has been explored in this study.

Limitations and Future Research

Although the current study contributes to the knowledge management and project management literature and has theoretical and managerial implications, it has few limitations. A large sample size is always desirable to extend the validity of the results and conformity. Future researchers should take larger sample sizes to validate the model where *accuracy* is of utmost importance rather than establishing relationships. Here, authors suggest using CB-SEM to test the model as it takes care of measurement error in a significant way.

As the data utilized for this study only represented the employee perceptions about the degree of success of their immediate previous project, other project stakeholder’s perspectives would have added more value to the findings. Future research may examine the effectiveness of knowledge leadership while taking into consideration significant knowledge management and project management frameworks. In future, the effects of variables such as ethical leadership and psychological capital (e.g., Özsungur, 2019) and legalistic entrepreneurship (Özsungur, 2020) on IT project performance and quality practice may be analysed. Moreover, the present model needs to be tested in different cultural contexts, particularly in developed countries to enhance the generalizability of the results. Leader-member exchanges as a moderator of KL can be included as a future research agenda that might influence the relationship between KL, project performance and quality.

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