Journal of Management and Administrative Sciences
https://jmas.pk
(ISSN 2790-7899)
Vol. 3, No. 2, December 2023

INFORMATION ASYMMETRY AND RISK IN AGILE PROJECTS: THE ROLE OF PROJECT GOVERNANCE AND TRUST

Mian Sajid Nazir[1*]

1. *Institute of Administrative Sciences, University of the Punjab, Lahore, Pakistan:* sajid.ias@pu.edu.pk

Article Information

Article history:
Submitted: 14th May, 2023
Accepted: 13th December, 2023
Published: 21st December, 2023

Volume No. 03
Issue No. 02
ISSN: 2790-7899

Keywords:
Project risk;
Project governance;
Trust;
Information asymmetry;
Agile

Abstract

Over the years, researchers and practitioners have been puzzled over the low efficiency and poor performance of the IT projects. Previous literature has tried to uncover the variety of critical factor, including project governance, project risk management and agile project methodology, which can trigger the performance of the project. Information asymmetry concept has been widely used in different areas and subfield of management research and its existence is the main assumption of many leading theories on organizations such as agency theory. However, the area remains underdeveloped. The main objective of the study is to examine the impact of project governance and agile methodology on project performance in the presence of information asymmetry and project risk as mediator and trust as moderator. The survey yields 374 responses from the IT industry of Pakistan. Hayes Process and IBM SPSS were utilized for data analysis. The study finds that project governance and agile project methodology have significant positive impact on the level of information asymmetry directly. The study also found significant relationship between level of information asymmetry and project risk, whereas serial mediation and moderation was found to be insignificant. The findings of the study have managerial and theoretical contribution for this unique area of research. It will also help the IT firms of developing countries who want to improve their performance through the use of project governance and agile project methodology.

Introduction

The projects have been evolving and making their mark in the different industries such as construction, manufacturing, and real estate development. According to the Haq, Liang, Gu, Du & Zhao (2018), projects as strategic tool has the potential to help the organization reach their desired goals. Many organizations have been using it to bring about organizational change and the underlying dependence of this change is on Information technology (IT) (Biesenthal & Wilden, 2014). The project managers have also obtained higher revenues as they complete project on time

or ready for penalty for delay (Yang, Zhao & Lan, 2014). In the today's competitive environment, the succession of projects is one of the critical factors for the managers to improve the performance. According to Badewi, (2016), the presence of uncertainty in the projects whether large and small affect its scope, budget and schedule.

Extensive year of research in the field of project management have given the IT industry variety of success factor which when applied to the project can increase its chances to be successful. Initially, the first set of critical success factors were mentioned by Pinto and Slevin (1987) which were characteristics of the project team leader, external environmental events, urgency, power & politics, project mission, monitoring and feedback, channels of communication, project plan, top management support, client consultation, technology used in the project, and troubleshooting expertise. The concept of project governance gained popularity in 2005 and there is a strong pull towards the governance of project because of the scandals such as ENRON and WorldCOM (Muller, 2009; Muller & Judgev, 2012). These governance scandals led to the passing of bill called Sarbanes-Oxley Act which is a prime example of governance and how it is implemented in everyday business activities, disciplines and regulations in the organization. #Williamson (1979) introduced one of the earliest definitions of governance, where the author described it as engagement of two entities in an economic transaction, which required them to monitor, control and protect the interest of each entity. Turner and Keegan (1999) first provided an insight into the governance of project-based organization and the purpose is to support projects to reach their potential of supporting organizational objectives. Governing projects can allow the project managers to monitor the activities of the system and resources to increase project success (Mahaney & Lederer, 2011; Too & Weaver, 2014) as the project governance is aligned with the governance model of the organization (Haq et al., 2019). In the context of project, governance is a multi-level phenomenon and encircles the parent organization, any supplier, the project, and the relationship between them (Turner and Muller, 2017). In the Information science (IS) literature, the governance framework deals with the inter-firm outsourcing of the software development projects. The information feedback system or other monitoring activities discourages the agent in indulging in activities which are for his own self-interest. Researchers have focused on the project governance from different perspectives and scope. Some of the researchers have focused on the governance from the lens of behavioral control (Muller, 2010), some through the lens of project management, whereas some have paid attention to the project environment governance through different mechanisms (Muller, 2011).

King and Marks (2008) also mentioned that monitoring activities can lead the agent to share information which is not known to the principal and thus decreasing the level of information asymmetry or privately held information. Scholars (Guo, Chang-Richards, Wilkinson & Ti, 2014) have also argued that better project risk management practices are found because of efficient project governance. Effective project governance mechanism such as monitoring can help in resolving various issues that hinders the performance of IT projects such as information asymmetry. Information asymmetry is a state where one party in the business relationship has more or unique information than another (Bergh et al., 2018). The concept of information asymmetry is central in the subfields of management such as corporate social responsibility, strategic management, human resource management, organizational behavior and entrepreneurship. The challenges created by the presence of information asymmetry is fundamental to many theories such as agency theory, transaction cost economics, resource-dependence theory and signaling

theory to name few (Bergh et al., 2018). The understanding of information asymmetry is based on the isolated subfield of management and different theories but no established level of knowledge regarding information asymmetry as the management concept exists.

IT industry operates in a dynamic environment and a highly competitive market. The firms need to deliver on time and meet customer expectations by giving reliable and flexible solutions. The demands of the customers are always increasing and evolving; hence, the firms need to be agile in catering to those demands. Traditional approaches such as "Waterfall" and "V" cannot cope with such dynamic environment and the rapid technological change. As a result of these setbacks, an agile methodology emerged which focused on short iterative cycle. The term agile was first used in 2001 (Beck et al. 2001) and was named an evolutionary technique of project management (Gilb, 2007). An agile is a process in which the project team manages the project by breaking it to several small stage or iterative cycles involving constant collaboration with clients and stakeholders for continuous improvement and to meet customer expectations (Rasnacis & Berzisa, 2017). Agile methodology focuses on cooperation between the client and the developer and helps the team to adapt to new changes. According to Ambler (2012), project which utilizes agile methodology, deliver their goals more quickly and sooner and are more adaptable to change. The incremental delivery of steps in agile also helps the project team to respond easily to requirement risk and other emerging risks in the project. The use of agile methodologies and practices in the software industry have proved to be effective and improve the quality of the project (Lindsjorn et al., 2016). It helps the project managers in studying and identifying the limitations and risk by reviewing it again and again during the project life cycle. It also helps the manager by focusing on the main goal of the project and customer expectations, as it is important to deliver the project according to the requirement of the client (Maruping, Venkatesh & Agarwal, 2009).

The projects that utilize agile methodology, the requirements of the principal are in constant analysis and the principal is given verification at each stage, which reduces the level of information asymmetry. Agile methodology in contrast to traditional project methodologies treat risk as a natural element and assumes that risk will be identified and mitigated at the iterative phase of the project (Wachnik, 2015). Agile methodologies help in completing the IT projects by reducing the information asymmetry between the principal and the agent because its constant communication between the principal and agent is established between each sprint of the project (Wachnik, 2014). However, there exists a gap, which studies information asymmetry as a mediator for reducing the level of risk in a project while using agile project management practices. Agile project methodology is still an emerging trend in the project methodologies and technologies. Many of these tools still need empirical evidence. Serrador and Pinto (2015) in their research studied the impact of agile methodology for project success and how project planning impacts agile methodology. Many of the organizations are using traditional project management while some are using hybrid methodologies. Some of the organizations have now started moving towards the agile project methodology. Organizations, which are using the agile methodology, are reporting higher success rate in projects, which has attracted other sectors as well to move to agile methodology (Luna, Kructen & deMoura, 2015).

The relationship between project risk and IT project performance has been a well-researched topic. The researchers to establish whether the level of project risk has any impact on the performance of IT projects have done many studies. Risk in theory has been correlated to the development of trust (Das & Bing-Sheng Teng, 2004). In many trust model and system, which

consist of risks, the user must handle the relationship between the risk and trust. Trusting behavior exposes risk and influence the trusting intention (Josang & Presti, 2004). Trust is a disposition who willingly rely on another person to perform actions, which benefit him or protect him or are according to the one's interest in the given domain (Berg, Dickhaut & McCabe, 1995). Buvik and Tvedt (2017) conducted research on the relationship among trust, commitment and knowledge sharing in the project teams and how trust directly or indirectly affects the knowledge sharing. Moe and Smite (2008) conducted multiple case study to study the key factor, which causes lack of trust in globally distributed software development projects and the impact of lacking trust on the success of the project. However, there is a still a gap in the studies in the moderating effect of trust in the area of IT projects. There is also limited literature and studies on the impact of trust in knowledge sharing in the project environment (Ding, Ng, & Cai, 2007; Maurer, 2010). In Information System (IS) / Information Technology (IT), project trust is built in the core business more as compared to construction industry. It is important to study the moderating effect of trust as it enables cooperation, which is important for project performance (English, 2008). Trust helps in enhancing the cooperation of project stakeholders and improve working relationships (Erden, 2003).

In "2008 State of the Industry Report", the Pakistan Software Houses Association for IT and ITES (Information Technology Enabled Services) industry stated that these industries are transformed in Pakistan and had the estimated revenue of US$ 2 billion annually by the year 2009 (P@SHA, 2008). During the year 2018-19, the growth of IT and ITES export have increased at 8.18%. Half of the growth in the IT industry is depended on the software and high-end service projects, which are funded by foreign bodies such as IBM, Microsoft and Motorola. The success of the IT industry depends on both the private and public sector of Pakistan. In order to elevate the progress of the IT projects in Pakistan, the government of Pakistan has provided subsidies in the area of ISO and CMMI certification and tax holiday for all IT based exports has also been further extended till June 2025 (PSEB, 2020). According to Standish Group's CHAOS reports in 2014, the success rate of IT projects was less than thirty-five percent only between 1994 and 2015 (Standish, 2014). These numbers are alarming and a thought to ponder upon by practitioners, researchers and academicians alike. All the stakeholders need to collaborate to find the appropriate mechanisms to enhance the performance of the project that would lead to success of the project. In literature, there is a lack of consolidated evidence which is available in the context of project performance of information technology projects in the developing countries (Ashraf et al., 2010). In the literature, the impact of governance has been studied on the project success (Joslin & Muller, 2016, Shiferaw et al., 2012) project management (Too & Weaver, 2014; Aubry, Richer & Lavoie-Tremblay, 2014), organizational success (Marnewick & Labuschagne, 2011) and risk management (Guo, Chang-Richards, Wilkinson & Li, 2014). Additionally, project risk is one of the critical phases in the project life cycle as it helps in identifying significant risks, which can affect the outcome of the project. Therefore, Project governance is one of the main elements, which this study evaluates, and attempts to study its relationship with project performance of IT projects in developing countries.

The aim of the study is to explore the relationship between project governance, agile methodology, and information asymmetry and project risk for project performance. The role of trust is further considered as the possible moderator between information asymmetry and effective risk management. The main objectives of the study are:

a) To investigate the relationship between project governance and information asymmetry
b) To examine the relationship between information asymmetry and project performance in the context of IT and software industry of Pakistan.
c) To investigate the moderating role of trust between information asymmetry and effective risk management.
d) To determine the mediating effect of information asymmetry on the relationship between project governance, agile project methodology and project performance.

Literature Review:

In this section of the study, literature of the variables project governance, agile project methodology, information asymmetry, effective risk management, and trust with respect to project performance. The section also discusses the knowledge gap and the theoretical perspective of the study. Based on the extensive literature review, the hypotheses of the study are also elaborated in this section and the research framework of the study is proposed in Figure 1.

Project Governance:

The main focus of project governance is the governance of a single project as compared to corporate governance which focuses on the governance of the whole association (Joslin & Muller, 2016). Pinto (2014) describes project governance as "*the use of systems, structures of authority, and processes to allocate resources and coordinate or control activity in a project*." In the general management studies, the role of corporate governance, management performance and its shareholder value is very well researched (Amzaleg et al.,2014). However, the professional literature does not discuss project governance in the light of any specific theory, but the tenants of corporate governance theories are implied. Principal-agent problem, information asymmetries within the project are verifiable considered in rules relating to oversight, control, alignment, also, affirmation of project management systems just as disclosure and detailing of project information (PMI, 2016).

In the context of governance, the agency theory speculates the managers in the organization as agent may use their control and information to use the resources of the organization opportunistically to achieve something, which is not in accordance with the objectives of the shareholders who is the principal (Jensen and Meckling, 1976). Marshal and Weetman (2002) found in their study that the regulation of reporting on financial audits removed the information asymmetry and principal focuses more on the monitoring which results in agent focusing more on achieving the goals set by the principal. Thus, it may be argued that deploying project governance monitoring mechanism in a project may reduce the level of information asymmetry present between the principal and the agent and improve the project performance because project governance not only monitor and control various project stages and functions but also helps in maximizing the benefit for the stakeholders. The present literature on project governance focuses on the western countries and not much study has been done in the context of developing countries. Hence, to study this effect, the following hypothesis has been developed.

H_1: There is a significant relationship between effective project governance and information asymmetry.

According to Haq et al. (2019), project governance's objective in the project is to improve its performance. From the lens of different theories, governance can be understood as the set of principles, which consists of accountability, authority, leadership, direction and control (Sankara

et al., 2007). The performance of the project is studied from the perspective of the product performance and the performance of the process (Haq, Changyong, Dongxiao & Yinchao, 2016). In order to organize the transactions of the project, governance consists of initiating, terminating and maintenance of relationships with different stakeholders (internal and external) to make a contribution towards project success. These two constructs were studied in the literature by Lu et al. (2015), who found significant relationship between the project governance towards the performance of the project. Project performance can be easily measured at the specified level of the iron triangle, but this is not always possible in all the cases especially when the time is of most importance (Popaitoon & Siengthai, 2014). Previous studies have identified that the project performance relies on many factors which are related to behaviour and communication such as the involvement of internal and external stakeholders, customer satisfaction, profitability and radical change in the environment (Popaitoon & Siengthai, 2014). With the help of the extensive literature review of the past forty years, Khan, Turner and Maqsood (2013) successfully developed the project success criteria using the twenty-five items in five criteria dimensions. It includes project efficiency, organizational benefits, project impact, future potential and stakeholder satisfaction. As the majority of the literature is conducted in western countries or in the Australian context, the results cannot be generalized to the developing countries. The effect of the project governance on the project performance of the IT industry is argued to be different by Haq et al. (2016). Hence, in order to measure this effect, the following hypothesis has been proposed.

Hypothesis 2: There is a significant relationship between project governance and project performance.

Agile Methodology:

In 1991, the term agility was used by Nagel and Dove in the area of manufacturing and disseminated as a concept which describes the ability to change the configuration of the system in response to the unforeseen circumstances or changes. At the end of the decade of 1980, the term agility also appeared in the area of project management and mainly illustrated in the area of development of software. In the literature, the term agile is also associated with software development projects. In the 1990's publications, which promoted agile development, became more predominant. In 2001, software developers summarized the main ideas of agile methodology in Agile Manifesto. There is a lack of consensus among the empirical studies for the factors, which are indicative of software development agility in a project and its environment (Strode et al., 2009). Agility must be integrated at the different hierarchical level such as the development team, project team, program, and business processes, etc. According to Wysocki (2011b), project managers in order to align their efforts with the organizational expectations, uses traditional methods for projects for which they are not suited. Hence, alignment is necessary for agile at all organizational levels. The organizational culture in which the project is taking place also plays an important that in order for the teams to cope with the change requests, the top management must support agility and they should have willingness to take risks. The following table 1 summarizes the difference between the agile methodology and traditional methodology in software development.

Table 2.1 Tradition approaches vs. agile approaches (Riesener et al., 2019)

Traditional Approaches	Agile Approaches
Follows a top-down approach.	Team experiment with different techniques and gradually arrives at the best solution.
Follows a leadership style of working.	Free flow of communication is present and anyone in the team can present their ideas.
Pre-planning is done for the various phases of the project.	More flexible and the workflow changes based on change requests.
For requirement gathering, customers are only involved in the initial phase.	In agile, the involvement of customers throughout the life cycle is necessary.
The ownership of the project lies with the project manager.	In agile, the concept of shared ownership is used.
One-time delivery of the product.	Delivery of the product is made in incremental phases.

Agile project management focuses on two core concepts: minimizing risk by having short iterations, which have clearly defined deliverables and the second, is communication with stakeholders and partners. These two concepts help the project team to be more flexible in adapting evolving demands of customers. Literature is filled with agile methodology in the software industry. Turk et al. (2005) stated limitations of the agile and the problems which the developers and the project managers face during the agile process. There have also been studies done which analyze the plan driven based project methodology with agile based project methodology (Abrahamsson, Babar & Kruchten, 2010). In Agile it is found that system, processes and people are correlated which leads to the success of the project (Phillips, 1998). Wachnik (2014), analyzed how to reduce information asymmetry in the IT projects. The result of the study showed that the participant who was using agile methodology in their projects as compared to respondents who used waterfall method where strong level of information asymmetry was found. Agile method requires constant contact between the principal and the agent, so the principal receives updates about the project and the progress. Reduced information asymmetry is also because of the fact that agile allows the project to be divided into smaller tasks which are easier to manage. Hence, we can hypothesize that if the project is using agile methodology the level of information asymmetry will be reduced and project performance will be improved.

Hypothesis 3: There is a significant relationship between agile methodology and information asymmetry level.

Hypothesis 4: There is a positive relationship between agile methodology and project performance.

Information Asymmetry and Effective Risk Management:

Information asymmetry also known as privately held information refers to information or facts which are known to the agent but not to the principal and vice versa. An agent or principal can use this withheld information to misrepresent facts or achieve personal goals. Agency theory specifies that agent who has information that is not known to the principal may use it to for self-interest (Baiman, 1982). In 1970, agency theory extended to include risk sharing by introducing agency-principal problems to the theory (Ross, 1973). This situation can enable the agent to

confront the principal with excessive demands (Ceric, 2014). According to the literature, there are six strategies, which can be used to minimize the information asymmetries between the participants of the project (Ceric, 2014; Wang, 2011; Tuskis, Zavadskas & Peldschus, 2009; Turner & Muller, 2004):

a) bureaucratic control
b) information systems
c) incentives
d) corporate culture
e) trust

Michael Spencer proposed signaling theory in 1973. The premise of the theory is on the need to reduce information asymmetry between the organization and its stakeholder or a principal and an agent by deliberately disclosing information which is important and necessary (Connely, Certo, Ireland & Reutzel, 2011). Agency theory, in general, assumes that the agent is either risk-averse or work-averse. This includes disclosing of bad news in the projects to the owner. Disclosing of bad new and its consequences lingers longer in the mind of the agent as compared to reporting the good news. Hence, agency theory states that the reluctance to report bad news to principal is driven by the organizational climate (Jensen & Meckling, 1976). The market of "Lemons" is a popular expression which is widely used in economic theory which was developed by Akerlof in 1970 in his seminal paper. According to this theory, the phenomenon of "lemons" arises in the market when there is information asymmetry between two parties and where the overall quality of the services offered is reflected on the entire group of one party rather than one individual entity. Lemon on Market Theory (LMT) is being applied in wide variety of disciplines like economics, management, finance and law. The use of this theory in information systems (IS) research is also growing on topics like e-commerce and auctions (Lee et al., 2010). The figure 1 shows the nomological network for the Lemon Market Theory.

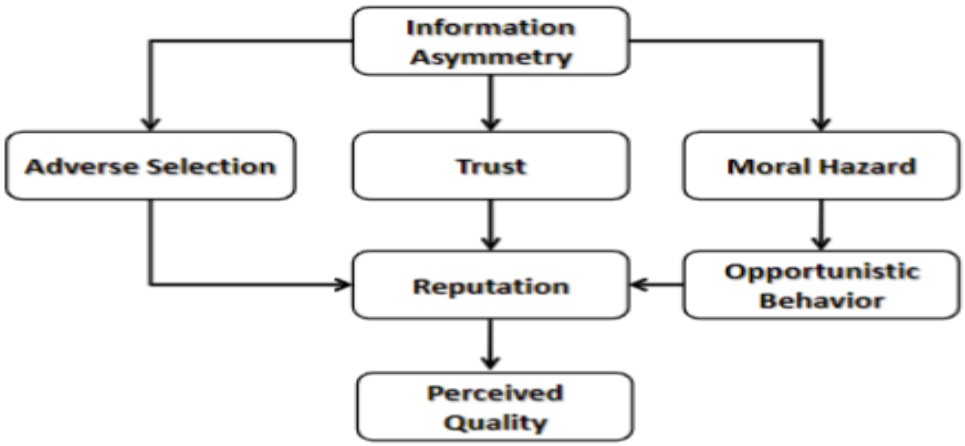

Figure 1: Nomological Framework for the LMT (Devos, Deschoolmeester & Landeghem, 2011)

The level of analysis for the LMT is a market where two entities meet. These entities can be individuals or firms. The independent construct for Lemon Market Theory is the information asymmetry. (Christozov et al., 2009) considers information asymmetry a natural property between two entities when they are communicating in the market. When both entities have different

background and expertise and use different jargon. When information asymmetry is present, the distribution of the information between the transacting parties is unbalanced. Some authors have also referred to the situation of information asymmetry as imperfect information (Afzal et al., 2009). In the field of IS/ IT, lemon market theory is applied in one form or another. Presence of information asymmetry between one buyer and one seller ignites the possibility of lemon market. Signs of the lemon market on an individual level are usually checked by adverse selection. Wachnik (2016) stated that by choosing agile methodology, it will reduce information asymmetry and will have efficient project risk management by spotting different risk factors during formal and informal meetings with the principal. Literature is filled with research, which gives suggestions for reducing risk in the project by focusing on the source of risk, which is possible if the project manager has all the information. Hence, we can assume that sustained information asymmetry in the project will lead to effective project risk management.

Hypothesis 5: There is a significant relationship between level of information asymmetry and effective risk management.

Trust, Effective Risk Management and Project Performance:

The relationship of trust, risk and project performance has been theoretically expounded in the literature. Few researchers have attempted to empirically test the nature of the relationship between these constructs. There are conflicting findings in the literature about the impact of trust on project performance. It is important to have a reliable instrument to measure the trust level at this level. Trust has been found in the research to foster the organizational citizenship behaviour and reduce the potential of any conflict (Zaheer, McEvily & Perrone, 1998). It is not clear whether the trust is a subset of risk or risk is antecedent to trust. Risk and trust have been theorized to have a reciprocal relationship. Risk creates opportunity for trust which then leads to the behaviour of risk taking (Rousseau et al., 1998). Trust enables cooperation and according to Tyler (2003), the success of a project or an organization is related to how cooperative or efficiently they manage cooperation. Na Ranong and Phuenngam (2009) in their study listed trust as one of the critical success factors for effective risk management. The role of risk between trust and project performance has been studied by taking it as a moderator (Rao, 2015; Zwikael, Pathak, Singh & Ahmed, 2013) but there is a gap in empirical study about the moderating role of trust between risk and information asymmetry. Building on the research of Na Ranong & Phuenngam (2009), we propose the following:

Hypothesis 6: There is a significant relationship between effective risk management and IT project performance.

Hypothesis 7: Trust moderates the relationship between effective risk management and Information Asymmetry.

Risk management is also the continuous process of identifying, analyzing and mediating the threats or danger that weaken the activities probability of success. Researchers and proprietors consider the presence of risk management practices as “nice to have” on the project as opposed to the centre segment of project control (Boehm, 1991). The main objective of using risk management techniques is to increase organizational value (Dalcher, 2012). The organization can benefit from effective risk management while also increasing the effectiveness of human effort in the company (Brannen & Salk, 2000). Hence, the literature suggests that efficient risk management mediates the project performance (Naeem, Khanzada, Mubashir & Sohail, 2018) and information

asymmetry (Wachnik, 2013). The following mediating hypothesis for effective risk management is proposed:

Hypothesis 8: There is a mediating effect of effective risk management on information asymmetry and project performance.

Agents who engage in self-interest behaviours may withhold information, misrepresent it or can falsify the information the principal (Baiman, 1982). Snow, Keil and Wallace (2007) conducted a survey on IT managers and found that sixty percent of them had biased status report of the projects which were investigated. Another study by Guinan, Cooprider and Faraj (1998) revealed that hidden information led to negative stakeholder evaluation of performance of sixty-six project teams in fifteen different companies. Thus, we propose the following hypothesis:

Hypothesis 9: There is a significant negative relationship between the level of information asymmetry and IT project performance.

The following research model has been proposed for the study.

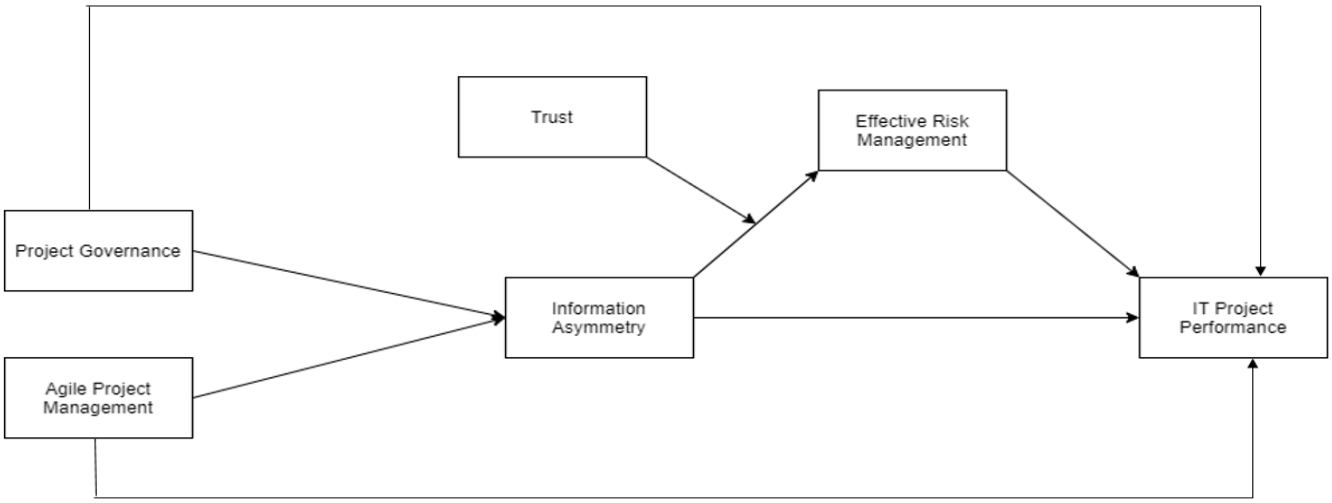

Figure 2: Conceptual Research Model

Research Methodology:

There are two main approaches used in research: qualitative and quantitative (Saunders, 2011). Qualitative research comes under the umbrella of interpretivism philosophy where the inductive method is used without having a prior theoretical background. Once the theory is derived, it will be confirmed using existing theories, hence it will also be grounded. In contrast, quantitative research approach uses deductive approach and proceeds from the construction of theoretical background and hypothesis. In this approach, quantitative data is collected and analyzed using statistical inference (Easterby-Smith et al., 2012).

In order to obtain good results and effectiveness in research, a good research design must be used (Wiersma & Jurs, 2005). The most commonly used techniques in the research are qualitative-quantitative research. Quantitative research design is mostly preferred because of its effectiveness and reliability as compared to the qualitative (De Vaus & deVaus, 2001) and it produces more authentic results (Chase, Teel, Thornton-Chase & Manfredo, 2016). When reporting the strength of the variables, quantitative approach is more suitable as in qualitative approaches cannot find the strength or relationship between the variables (Froman & Owen, 2014).

A mixed method study which utilizes both qualitative and quantitative study could also be used but it was not according to the scope of the study. The current study utilizes quantitative approach as a cross-sectional study. The collected data was used to analyze the theoretical framework. A correlational design is used in the study to evaluate the associations and relationships between variables (Ingham-Broomfield, 2015). This design was most appropriate as the author is examining the strength among variables. The survey questionnaire is cost-effective, less time consuming and the examination of data are also easy. Data was collected from the respondent in neutral environment with no interference from the researcher. The data was collected within the time frame of three months. As the nature of the study was cross-sectional, the data was collected only once from the participants. The target of this study is the IT professionals engaged in information technology projects of Pakistan on which the study result will be generalized. The sampling of the study is based on the purposive convenience sampling (Patton, 1990). It is the most commonly used sampling method (Acharya, Prakash, Saxena & Nigam, 2013). The method is chosen for the convenience of the researcher who is undertaking the study to fulfil the requirement of her Master's degree. This sampling method is also cost-effective (Marshall, 1996), easy and helps in the expediting data collection. Using Krejcie and Morgan (1970), sampling formula, sample size for the finite population is calculated. Hence, the sample size of the study is 278. Non-probability convenience sampling technique has been used in the study.

Measures of the study:

Demographic information on the respondents will also be collected including their gender, age, qualification, job designation, work experience and project relation work experience. The demographic profile will be constructed to study the nature and dominance direction of the society. It will also be used to study if young project managers are more inclined to start their project using governance and agile methodologies and on what positions they are working. This will help in providing an overview of the IT Project Industry in Pakistan.

Table 3.2 Descriptions of Questionnaire items and Authors

Sr. no	Variables	No. of Questions	Scale and Questions adopted from
1	Project Governance	8	Haq, Liang, Gu and Ma (2016)
2	Agile Project Methodology	10	Butler, Vijayasarthy and Roberts (2019)
3	Information Asymmetry	11	Mahaney & Lederer (2011)
4	Project Risk	10	Wallace, Keil and Rai (2004)
5	Trust	12	Costa and Anderson (2011)
6	Project Performance	7	Nidumolu (1996) and Rai & Al-Hindi (2000)

Data Analysis Techniques and Tools:

For the purpose of analyzing the data and derive the results, IBM SPSS 25 (Process macro) was used. Reliability analysis refers to the degree to which the scale in the questionnaire is producing and giving consistent result. It measures the internal consistency of the questionnaire to check if the questionnaire is measuring what it is supposed to measure (Yarnold & Soltysik, 2005). One of the common methods for checking the reliability is the Cronbach's alpha coefficient. It was

developed by Lee Cronbach in 1951 to measure the internal consistency of the questionnaire. This test checks if multiple questions such as in Likert Scale which are used in this study as well are reliable or not. If the score of Cronbach's alpha is more than 0.65, the questionnaire is considered reliable. However, the value of more than 0.7 is usually preferred (Yarnold & Soltysik, 2005).

Cronbach's Alpha reliability test was conducted to test the internal consistency of the questionnaire. Mediation of the model was checked using regression analysis to measure the indirect effect of effective risk management. PROCESS macro is an add-on to SPSS, which helps in the estimation of mediation, moderation and moderated mediation models with multiple regressions or logistic regressions (Hayes, 2013). Linear Regression was used to check for moderation. Indirect effects can also be moderated which implies that the mediation effect itself is conditional. Index of Moderation Mediation by Hayes (2015) wase used as it provides direct test for evidence of moderated mediation. A correlation analysis shows the relationship between two variables (either positive or negative). If they both have a strong relationship, then if one variable changes, the other changes in a specific direction as well. If the correlation coefficient has the value of +1 or -1, it is said to have perfect positive relationship or perfect negative relationship, respectively. If the value lies between 0.8 then it is a fairly strong positive relationship and if the value is between 0.6, it is considered a moderate positive relationship (Benesty, Chen, Huang & Chen, 2009). The R square value in the regression model statistics is also known as the coefficient of determination. It shows the goodness of fit of the model and explains the variation in the model.

Results Analysis:

After the collection of the data through Google Forms, different statistical tests using IBM SPSS were applied. Table 4.1 presents the demographic profile of the respondents. More than 500 Questionnaires were distributed via Google form and out of which 374 employees responded. Table 4.1 shows that from all respondents, the number of male's percentage was 90.6% and 9.4% were females. About 64.7 % of respondents had a Bachelors' degree, 32.4% have a Master degree and 0.5% had a Ph.D. The rest of the other participant had either a professional certificate or diploma. Above 30.7% of respondents are less than 25 years old in age. About 55.9% were aged between 26 to 35 years and rest are older than 35 years old. The percentage of respondents for more than 5 years is 31.5 %. Regarding project experience, 14.7% have less than one year of experience and 31.3 % have more than five-year experience. The rest of the others had one to five years' experience.

Table 4.3 Demographic Profile

Variables	Percentage
Gender	
• Male	90.4
• Female	9.6

Education	
• Bachelors	62.7
• Bachelors with professional certification	0.3
• The diploma in software engineering	0.3
• Masters	32.4
• PhD	0.5
• With professional certificate	1.9
Age	
• Less than 25	30.7
• 25 to 35	55.9
• 36 to 45	9.9
• 46 to 55	3.2
• More than 55	0.3
Project Experience	
• Less than 1 year	14.7
• 1 to 2 year	24.9
• 3 to 5 year	29.1
• Above 5	31.3
Work Experience	
• Less than 2 years	18.2
• 2 to 5 years	43.6
• 5 to 9 years	14.9
• Above 10 years	23.3

Cronbach's alpha reliability test is exhibited in Table 4.2. The scope of alpha coefficient reliability is from 0.84 to 0.93 demonstrating the high dependability and inward consistency in measurement. Project Governance has 8 items, and its Cronbach alpha is 0.84. Agile Project Methodology and Project Risk Management has 10 items each having Cronbach alpha 0.92 and 0.93 respectively. Information Asymmetry has 11 items with Cronbach alpha 0.81. Similarly, trust has 12 items having 0.88 reliability.

Table 4.2 Cronbach's Alpha for each Variable (N=374)

Sr. No.	Variables	No of items	Reliability
1	Project Governance	8	0.84
2	Agile Project Methodology	10	0.92
3	Information Asymmetry	11	0.81
4	Project Risk Management	10	0.93
5	Trust	12	0.88
6	Project Performance	7	0.85

Table 4.3 displays the correlation between the variables. Project Governance and Agile Project Methodology are positive and significantly related to Project Performance (r=.426, p<.01), and (r=0.499, p<0.01) respectively. Further, Project Governance and Agile Project Methodology are significantly and positively related to Information Asymmetry (r=.250, p<.01) and (r=.351, p<0.01) respectively. Information Asymmetry is significantly and negatively related to Project Risk (r= -0.181, p<0.01) and Project Risk has non-significant relationship with project performance (r=- 021, p>0.01). Trust has positive and significant relationship with Project Governance, Agile Project Methodology and Information Asymmetry (r=-.407, p<0.01) , (r=-.670, p<0.01) and (r=.296 , p<0.01) respectively but non-significant relationship with Project Risk (r=-.072, p>0.01).

Table 4.3 Correlation Results

	Variables	Mean	SD	1	2	3	4	5
1	Project Governance	3.60	.70					
2	Agile Project Methodology	3.80	.70	.500**				
3	Information Asymmetry	3.63	.65	.250**	.351**			
4	Effective Risk Management	3.33	.98	-.019**	.040	-.181**		
5	Trust	4.77	1.06	.407**	.670**	.296**	.072	
6	Project Performance	3.73	.68	.426**	.499**	.273**	-.021	.453**

*N=374**. Correlation is significant at 0.01 level (2-tailed). *Correlation is significant at the 0.05 level (2-tailed).*

Results of regression analysis for Project Governance, Agile Project Methodology, Information Asymmetry, Effective Risk Management, and Project Performance are given below from Table 4.4 to Table 4.7.

Table 4.4 Regression Analysis- PG on PP

Project Performance					
Variables	**β**	**S.E**	**Beta**	**T**	**Sig.**
Project Governance	.414	.046	.426	9.089	.000

Regression analysis was executed to test the impact of Project Governance on Project Performance. The result showed that the relationship between Project Governance and Project Performance was positive and significant (β = .426, p< 0.01).

Table 4.5 Regression Analysis- APM on PP

Project Performance					
Variables	**B**	**S.E**	**Beta**	**T**	**Sig.**
Agile Project Methodology	.485	.044	.499	11.11	.000

Regression analysis was executed to test the impact of Agile Project Methodology on Project Performance The result showed that the relationship between Agile Project Methodology and Project Performance was positive and significant (β = .499, p< 0.01).

Table 4.6 Regression Analysis - APM and Information Asymmetry

	Information Asymmetry				
Variables	**β**	**S.E**	**Beta**	**t**	**Sig.**
Agile Project Methodology	.329	.045	.351	7.23	.000

Regression was executed to test the impact of Agile Project Methodology on Information Asymmetry The result showed that the relationship between Agile Project Methodology and Information Asymmetry was positive and significant (β = .351, p< 0.01).

Table 4.7 Regression Analysis- Project Governance and Information Asymmetry

	Information Asymmetry				
Variables	**β**	**S.E**	**Beta**	**t**	**Sig.**
Project Governance	.320	.048	.357	6.98	.000

Regression was executed to test the effect of Project governance on Information Asymmetry. The result showed that the relationship between Project Governance and Information Asymmetry was positive and significant (β = .357, p< 0.01).

Table 4.8 Mediation Analysis

PG → IA →PP **PG → ERM →PP** **PG →IA→ERM→PP**	**Effect**	**S.E**	**LLCI**	**ULCI**
Total effect	0.414	0.045	0.324	0.503
Direct effect	0.370	0.463	0.279	0.461
Indirect effect (Total)	0.043	0.016	0.016	0.815
PG→ IA →PP	0.044	0.167	0.017	0.825
PG → ERM →PP	0.000	0.003	-0.005	0.011
PG→IA→ERM→PP	-0.000	0.002	-0.006	0.004

N = 374. Reported estimates are unstandardized. SE = standard error; LLCI = lower limit confidence interval, ULCI = upper limit confidence interval

The data was evaluated to inspect the presence of mediation by using SPSS with Hayes PROCESS (Model 4). The confidence interval for the indirect effect of PG on PP via IA and Project Risk includes 0 (LLCI = -.006; ULCI = .004), suggesting the presence of no serial mediation. Further results explaining the direct effect proposed that PG has a significant relation with PP (.370, p<0.01) and total effect (.414, p<0.01).

Table 4.9 Mediation Analysis

AG → IA →PP **AG → PR →PP** **AG →IA→PR→PP**	**Effect**	**S.E.**	**LLCI**	**ULCI**
Total effect	0.485	0.043	0.399	0.571
Direct effect	0.449	0.467	0.357	0.541
Indirect effect (Total)	0.035	0.019	-0.000	0.076
AG→ IA →PP	0.036	0.019	0.000	0.076
AG → PR →PP	-0.002	0.006	-0.016	0.011
AG →IA →PR →PP	0.001	0.004	-0.006	0.009

N = 374. Reported estimates are unstandardized. SE = standard error; LLCI = lower limit confidence interval, ULCI = upper limit confidence interval

The accessible data were evaluated to inspect the presence of mediation (5,000 random samples) by using SPSS with Hayes' PROCESS (Model 4). The confidence interval for the indirect effect of AG on PP via IA and ERM has included 0 (LLCI = -.006; ULCI = .009), suggesting the presence of no serial mediation. Further results explaining the direct effect proposed that AG has a significant relation with PP (.370, p<0.01) and total effect (.414, p<0.01).

Table 4.10 Moderation Analysis

	Dependent Variable					
	Effective Risk Management					
Variables	**β**	**S.E.**	***t***	***p***	**LL 95% CI**	**UL 95% CI**
IA	-.045	.380	-.119	.904	-.793	.702
T	.337	.277	1.217	.224	-.207	.881
IA*T	-.058	.075	-.770	.441	-.207	.090

Note: N=374, **p< .01, *p< .05, ΔR^2=.03

Hayes process was used to test the moderation hypothesis. Moderation results are shown in Table 4. 10. Insignificant interaction value (β = -.058 p>0.05) shows there is no moderation of Trust(T) between information Asymmetry (IA) and Effective Risk Management.

Discussion:

The study's core objective was to observe the impact of project governance and agile project methodology on IT project performance in the presence of information asymmetry and project risk as mediators and trust as moderator. The proposed nine hypotheses were tested to explain whether the utilization of project governance and agile project methodology can reduce

information asymmetry for better risk management to contribute to the IT project performance in general, and how vital the role of trust is between information asymmetry project risks. The study's findings indicate that project governance and agile project methodology positively and significantly impact project performance. The study included data from both public and private sectors, collected across the country in two months. The study's analysis was based on 374 valid responses by project managers, developers, team leaders, project directors, and senior development managers.

Hypothesis 1 of the study is supported by the findings. It states that there is a significant relationship between project governance and information asymmetry. The linear regression shows a positive and significant relationship between these two variables. This finding is in line with current literature, which shows that project governance can ensure an effective decrease in information asymmetry levels in IT projects (Joslin & Muller, 2016). The monitoring mechanism used in project governance leads to less privately held information as the agent will fear that the principal can become aware of the private information because of the monitoring activities. The support for this hypothesis is also consistent with the findings of Mahaney & Lederer (2015). These findings also provide support for the agency theory in the IT project management context. The results suggest that project managers can try to increase monitoring mechanisms to reduce the level of information asymmetry and identify and correct such problems earlier. The study also complements that information asymmetry resulting from the agency theory can be limited by using detailed reporting or monitoring system in the project.

Hypothesis 2 of the study states a significant relationship between project governance and project performance. The results support the hypothesis that project performance is positively and significantly impacted by the project governance. Literature has evidence that project governance ensures the successful project delivery of IT projects (Biesenthal & Wilden, 2014). Haq et al. (2019) also found positive significant relationship between project governance and project performance in the software development projects of Pakistan. These results are in line with previous research by Sirissomboonsuk (2018) and Bekker & Styen (2007) that project governance will increase project-related outcome like project performance. Joslin and Muller (2016) found that project governance with the use of project methodologies enables 22% of the success of projects. The mean score of project performance in the study shows average result which indicates that the performance of the projects is not up to the mark as they should be. According to Jalil and Hanif (2009), projects in Pakistan lag behind because of cost overruns and exceeding the schedule and these issues cause project management issues. The study also aligns with the findings of Lu et al. (2015), where he argued that project governance as a tool for monitoring ongoing performance is suitable and helps in taking necessary measures in the event any problem arises during the project. The findings also support agency theory, where it is assumed that management cannot be trusted (Aduda et al., 2013). Hence, project management requires strict monitoring by the agents to result in better project performance.

The Hypothesis 3 of the study is fully supported by the results. It states that there is a significant relationship between agile methodology and information asymmetry level. This result shows that agile methodology and information asymmetry level are significantly and positively related which confirms the findings of previous research (Wachnik, 2016). Wachnik (2016) study states that information asymmetry between the agent and the principal is indicated as significant success factor in implementation of the IT projects. In agile methodology, the requirements of the

project are always assumed to be subjected to constant verification and analysis to shape a flexible and agile IT infrastructure.

The Hypothesis 4 of the study states that there is a positive relationship between agile methodology and project performance. Agile methodology enhances product quality, customer satisfaction, customized team structures, project control which will eventually lead to project performance (Kaur, Jajoo, 2015). The result shows that agile methodology and project performance are significantly and positively related which is similar to previous research such as Tripp and Armstrong (2018), Lill and Wald (2020) and Mendez (2018). The agile project methodology approaches have been developed significantly since the publication of Agile manifesto in 2001. The study demonstrates that agile methods have been widely adopted in developing countries like Pakistan for the purpose of managing projects. The result of the study indicates that, the higher the agile approach reported, the higher the reported project success. The study also provides support to the research by Budzier and Flyvbjerg (2013), whose study found that agile method improves project delivery time.

Hypothesis 5 states that there is a significant relationship between the level of information asymmetry and effective risk management. The results show that there is a significant relationship between the level of information asymmetry and effective risk management. Hence, hypothesis 5 is supported. As per previous research, there is a pivot role of the project manager to minimize all possible risk in the projects. Transparency of information has been improved by new information systems between the project manager and a stakeholder that now has diminished the risk of communication loss (Ullah & Arshad, 2020). In organizations, where the IA level is low, employees have to disclose the information. It will help the project manager to analyze every upcoming risk to provide every possible solution but Siddiqui and Atique, 2020 indicated that there are same approaches in information asymmetry as culture and working ethics in Pakistan as compared to the west which can justify our results.

According to Hypothesis 6 there is a significant relationship between effective risk management and IT project performance. The result of the study shows risk management does not have a significant relationship with project performance. According to Asadullah Khan (2019), developing counties are still lacking in implementing the concept of risk management properly. The hurdles in effective project risk management are lack of a clear link with key strategic priorities, lack of clear senior management and, in government projects, ministerial ownership and leadership, lack of effective engagement with stakeholders, lack of skills and proven approach to project and risk management. Risk management is the action, which comes under the domain of project management, and in the current era, it is gaining significance due to globalization and increased competition. Risk management in projects has been taken as dealing with uncertainty in projects. Previous studies also indicate that organizations that deal better with uncertainty will have a better chance to increase project performance. The results of the study are not aligned with the study of Tahir, Tahir and Shujat (2019), Kamal, Khan, Ali and Babar (2019) and Haq et al (2019) who found a significant relationship between project risk and project performance. In the study by Choudhry and Iqbal (2013), it was stated that in developing countries like Pakistan, there is lack of formal risk management system and shortage of knowledge/ technique regarding the project risk management. They identified barrier to risk management which included complexity, reactive rather than proactive culture of risk dealing and focusing on the risk analysis rather than the identification of risk over period of time and not continuous lead to poor project risk

management. Organizations in developing countries practice risk at some level with varying degree of experience, but it is mostly unorganized, inconsistent and unmanaged. Hence, the result of the study shows no significant impact of project risk on project performance.

Hypothesis 7 of the research studies the moderating impact of trust on the relationship between project risk and information asymmetry. The result does not support the hypothesis. However, there is not much direct support from literature present on trust as moderator which we can link to other rejected hypothesis as agile project management and project governance is positively related to information asymmetry. Moreover, Information Asymmetry and risk management are positively related. So, we can make a point of application of project governance and agile project methodology working a bit differently in Pakistan. IT projects uses formal contracts to help the firms tackle any unforeseen situations during the life cycle of the project which can enhance the performance of the project and reduce information asymmetry level. Hence, this support our findings that trust does not be a moderate factor between effective risk management and Information Asymmetry.

According to Hypothesis 8, there is a mediating effect of effective risk management on information asymmetry and project performance. Results show that there is no serial mediation of effective risk management on information asymmetry between PG, APM, and project performance. The core reason for this rejected hypothesis is the non-significant relationship between project risk management and project performance. In Pakistan, the risk management techniques are still inappreciable, especially in the public sector. Hence practical observation is backed by our findings. Hypothesis 9 states that there is a significant negative relationship between level of information asymmetry and IT project performance. The results support the findings as both are significantly correlated. The result shows a negative relationship of both variables. The result of the study supports previous literature by Guinan, Cooprider and Faraj (1998) which revealed that hidden information led to negative stakeholder evaluation of performance of sixty-six project teams in fifteen different companies.

Conclusion:

Project governance and agile project methodology have been unique combinations in the current evolution of project management. The current study observes the influence of project governance and agile project methodology on project performance through information asymmetry and project risk mediation. The framework has serial mediation of information asymmetry and project risk between project risk and agile project methodology and trust as moderator between information asymmetry and project risk management. The results show the positive and significant relationship between project governance and agile project methodology with project performance. Moreover, the results explain no serial mediation and moderation between concern variables. The larger contribution of the study consists of the study of information asymmetry to investigate the effectiveness of governance mechanism and agile methodologies. This study also provides empirical evidence that the presence of governance mechanism reduces the level of information asymmetry in the project reducing agency theory problem. The findings of the study provide a noteworthy insight into the IT companies' ability to track and enhance the performance of the project and their ability to formulate strategies to enhance performance using agile methodologies. The results of this study may trigger more research on the area of information

asymmetry to reach a holistic picture of project governance structure for IT projects in developing countries.

This study has several important theoretical contributions to the existing literature on project governance and agile methodology and their relationship with project performance. First, there are only few studies that are mainly focused on the IT industry of a developing country such as Pakistan as its IT industry is still in its nurturing phase. The relationships such as impact of project governance on project and project performance and the effect if agile project methodology on project risk and project performance has been studied individually in the past literature. However, the mediation of information asymmetry on these relationships and the moderation of trust on information asymmetry and project risk have not been studied previously. Therefore, this study tested the two hypotheses (Hypothesis 7) and (hypothesis 8) for the first time. As this study was conducted purely from the Pakistani IT industry and provided cultural specific findings. Therefore, this study addresses the theoretical implication and contextual gap for the current study variables in the developing countries.

In light of the IT sector of Pakistan, the existing research goes to encompass the previous research. In the context of Pakistan, literature is limited and delivers less proof on the inclusiveness of the framework which describes the connection of the variables of the research. The purpose of this research is to offer a realistic model that raises questions for the academicians, researchers, and the practitioners to know if Project Governance, Agile project methodology enhances the performance of the project or not when mediated with information asymmetry, in Pakistan and other developing countries. The examination doesn't repeat any current model rather it is planned on by other researchers who have effectively produced promising proof in the field of IT regarding developing and underdeveloped countries.

This study delivers substantial insights into the IT sector of Pakistan and capacity to increase project performance as well as their capacity to formulate approaches to measure the performance of different projects, all while addressing project governance instruments, specifically resourcefulness and requirements risk. Hence, this study recommends the following practical implications for IT project managers in Pakistan and should be appropriate in other developing countries as well. First, project governance should be incorporated at all organizational levels to improve the project performance. As the project manager is mostly responsible for the effective execution of the project, he or she must have a good understanding of the governance framework and should apply this framework throughout the project lifecycle. As project managers and team leaders are responsible to make appropriate decisions and changes during the project lifecycle, there should be a balanced flow of information between the project managers and its team. Project managers are also more affluent in using control styles that deliver IT teams with self-sufficiency informative the proper methods for managing the IT process, especially when several adjustments must be made throughout a project. In essence, our findings point to the need for agility in project management approaches, suggesting that managers need to be knowledgeable in customary and more agile methods of development and control. It is paramount for IT teams to maintain a focus on outcomes throughout IT projects.

This study investigated the impact of project governance and agile methodology on levels of information asymmetry and how it can reduce project risk for better project performance. To conduct this study, the data was collected from both public and private sector IT industry of Pakistan. However, this study also has certain limitations. Firstly, the demographic data shows that

only 8.5% of the respondents are female working in IT industry of Pakistan. Almost half the population of Pakistan are women, which makes them the most decisive force in the national economy. Future studies can investigate the influence of low female participation in the IT industry on project governance and project performance. Secondly, this study was conducted in the context of IT industry of Pakistan only. Future studies can be carried out to other populations at various organizational levels for a more generalized result. Thirdly, to investigate the influence of project governance on information asymmetry and project risk, only the agency theory perspective was used. This can be further extended using other theories such as stewardship theory and stakeholder theory and relate the variables in the current model. Moreover, this study is of cross-sectional nature and further longitudinal studies are required. Self-report surveys may cause common method variance and inflation of relationship for current variables. Future research can investigate the moderation of dynamic environment on the relationship between agile project methodology and project success and can examine weather agile methodology works best in dynamic environment or in all the environments. Secondly, this study did not reflect the antecedent factors such as contract duration, complexity, and size of the project. The future researcher may consider such factors to add more detailed perceptions into this unique research area. Thirdly, the factors like “pay structure, social system, popularity, and growth of the software industry”, may affect the governance structures and their effect on project performance. Future researchers should consider including these essential factors as well.

References

Abrahamsson, P., Babar, M. A., & Kruchten, P. (2010). Agility and architecture: Can they coexist?. *IEEE Software*, *27*(2), 16-22.

Adam-Müller, A. F., & Panaretou, A. (2009). Risk management with options and futures under liquidity risk. *Journal of Futures Markets: Futures, Options, and Other Derivative Products*, *29*(4), 297-318.

Afzal, W., Roland, D., & Al-Squri, M. N. (2009). Information asymmetry and product valuation: An exploratory study. *Journal of Information Science*, *35*(2), 192-203.

Ali, M. A. (2012). Survey on the state of agile practices implementation in Pakistan. *International Journal of Information and Communication Technology Research*, *2*(4).

Ambler, S. (2012). *Agile database techniques: Effective strategies for the agile software developer*. John Wiley & Sons.

Amzaleg, Y., Azar, O. H., Ben-Zion, U., & Rosenfeld, A. (2014). CEO control, corporate performance and pay-performance sensitivity. *Journal of Economic Behavior & Organization*, *106*, 166-174.

Andrews, K. M., & Delahaye, B. L. (2000). Influences of knowledge processes in organizational learning: The psychological filter. *Journal of Management Studies*, 37, 797–810

Badewi, A. (2016). The impact of project management (PM) and benefits management (BM) practices on project success: Towards developing a project benefits governance framework. *International Journal of Project Management*, *34*(4), 761-778.

Baiman, S. (1982). Agency research in management accounting: a survey. *Journal of Accounting literature*, *1*(1), 154-210.

Beck, K., Beedle, M., Van Bennekum, A., Cockburn, A., Cunningham, W., Fowler, M., ... & Kern, J. (2001). Manifesto for agile software development.

Bekker, M. C., & Steyn, H. (2008, July). The impact of project governance principles on project performance. In *PICMET'08-2008 Portland International Conference on Management of Engineering & Technology* (pp. 1324-1330). IEEE.

Benesty, J., Chen, J., Huang, Y., & Cohen, I. (2009). Pearson correlation coefficient. In *Noise reduction in speech processing* (pp. 1-4). Springer, Berlin, Heidelberg.

Berg J, Dickhaut J, McCabe K (1995) Trust, reciprocity and social history. Games and economic behaviour 10:122–142

Bergh, D. D., Ketchen Jr, D. J., Orlandi, I., Heugens, P. P., & Boyd, B. K. (2019). Information asymmetry in management research: Past accomplishments and future opportunities. *Journal of management*, *45*(1), 122-158.

Biesenthal, C., & Wilden, R. (2014). Multi-level project governance: Trends and opportunities. *International Journal of Project Management*, *32*(8), 1291-1308.

Boehm, B. W. (1991). Software risk management: principles and practices. *IEEE software*, *8*(1), 32-41.

Brannen, M. Y., & Salk, J. E. (2000). Partnering across borders: Negotiating organizational culture in a German-Japanese joint venture. *Human relations*, *53*(4), 451-487.

Butler, C. W., Vijayasarathy, L. R., & Roberts, N. (2019). Managing Software Development Projects for Success: Aligning Plan-and Agility-Based Approaches to Project Complexity and Project Dynamism. *Project Management Journal*, 8756972819848251.

Butler, J. (1991). Toward understanding and measuring conditions of trust: Evolution of the conditions of trust inventory. *Journal of Management*, 17, 643–663.

Buvik, M. P., & Tvedt, S. D. (2017). The influence of project commitment and team commitment on the relationship between trust and knowledge sharing in project teams. *Project Management Journal*, *48*(2), 5-21.

Cash, C. H., & Fox II, R. (1992). Elements of successful project management. *Journal of Systems Management*, *43*(9), 10.

Ceric, A. (2014). Strategies for minimizing information asymmetries in construction projects: project managers' perceptions. *Journal of business economics and management*, *15*(3), 424-440.

Ceric, A. 2010. The impact of asymmetric information on communication in construction projects, in Engineering Projects Organizations Conference: Working Paper Proceedings, 4–7 November, 2010, South Lake Tahoe, California.

Ceric, A. 2011. Minimizing communication risk in construction projects: a Delphi study of the key role of projects managers, in Engineering Projects Organizations Conference: Working Paper Proceedings, 9–11 August, 2011, Estes Park, Colorado.

Clots-Figueras, I., González, R. H., & Kujal, P. (2016). Trust and trustworthiness under information asymmetry and ambiguity. *Economics Letters*, *147*, 168-170.

Conforto, E. C., Amaral, D. C., da Silva, S. L., Di Felippo, A., & Kamikawachi, D. S. L. (2016). The agility construct on project management theory. *International Journal of Project Management*, *34*(4), 660-674.

Conforto, E. C., Salum, F., Amaral, D. C., da Silva, S. L., & de Almeida, L. F. M. (2014). Can Agile Project Management be Adopted by Industries Other than Software Development? *Project Management Journal*, 45(3), 21–34. doi:10.1002/pmj.21410

Connelly, B. L., Certo, S. T., Ireland, R. D., & Reutzel, C. R. (2011). Signalling theory: A review and assessment. *Journal of management*, *37*(1), 39-67.

Connelly, C. E., Zweig, D., Webster, J., & Trougakos, J. P. (2012). Knowledge hiding in organizations. *Journal of Organizational Behavior*, 88, 64–88

Costa, A. C., & Anderson, N. (2011). Measuring trust in teams: Development and validation of a multifaceted measure of formative and reflective indicators of team trust. *European Journal of Work and Organizational Psychology*, *20*(1), 119-154.

Cox, R. F., Issa, R. R., & Ahrens, D. (2003). Management's perception of key performance indicators for construction. *Journal of construction engineering and management*, *129*(2), 142-151.

Crawford, L., Cooke-Davies, T., Hobbs, B., Labuschagne, L., Remington, K., & Chen, P. (2008). Governance and support in the sponsoring of projects and programs. *Project Management Journal*, *39*(1_suppl), S43-S55.

Cummings, L. L., & Bromiley, P. (1996). The Organizational Trust Inventory (OTI): Development and validation. In R. M. Kramer, & T. R. Tyler (Eds.), trust in organizations: *Frontiers of theory and research.* (pp. 302–330). Thousand Oaks, CA: Sage

Currall, S. C., & Judge, T. H. (1995). Measuring trust between organizational boundary role persons. *Organizational Behavior and Human Decision Process*, 64, 151–170.

Dalcher, D. (2012). Project management for the creation of organizational value. *Project Management Journal*, 43(3), 79-79

Das, T. K., & Teng, B. S. (2004). The risk-based view of trust: A conceptual framework. *Journal of Business and Psychology*, *19*(1), 85-116.

Dasgupta, P. (1988). Trust as a commodity. In D. Gambetta (Ed.), *Trust making and breaking cooperative relations*. (pp. 49–72). New York: Basil Blackwell.

export.gov. (2019). Pakistan - Computer Software. Retrieved from https://www.export.gov/article?id=Pakistan-Computer-Software

Farris, G., Senner, E., & Butterfield, D. (1973). Trust, culture and organizational behaviour. *Industrial Relations*, 13, 123–140.

Fein, M. R. (2012). Tunnel Vision: "Invisible" Highways and Boston's "Big Dig" in the Age of Privatization. *Journal of Planning History*, *11*(1), 47-69.

Forsythe, P., Sankaran, S., & Biesenthal, C. (2015). How far can BIM reduce information asymmetry in the Australian construction context?. *Project Management Journal*, *46*(3), 75-87.

Gilb, K. (2007). Evolutionary Project Management & Product Development. Self-published online, 25.

Grabowski, M., & Roberts, K. H. (1999). Risk mitigation in virtual organizations. *Organization Science*, *10*(6), 704-721.

Guinan, P. J., Cooprider, J. G., & Faraj, S. (1998). Enabling software development team performance during requirements definition: A behavioral versus technical approach. *Information systems research*, *9*(2), 101-125.

Guo, F., Chang-Richards, Y., Wilkinson, S., & Li, T. C. (2014). Effects of project governance structures on the management of risks in major infrastructure projects: A comparative analysis. *International Journal of Project Management*, *32*(5), 815-826.

Haq, S. U., Gu, D., Liang, C., & Abdullah, I. (2019). Project governance mechanisms and the performance of software development projects: Moderating role of requirements risk. *International Journal of Project Management*, *37*(4), 533-548.

Haq, S. U., Liang, C., Gu, D. X., & Ma, Y. (2016, May). Understanding the Determinantsof Project Performance: Empirical Evidencesfrom Software Houses of Pakistan. In *WHICEB* (p. 8).

Hayes, A. (2013). *Introduction to mediation, moderation, and conditional process analysis. New York*: Guilford Press.

Hayes, A. (2015). An index and test of linear moderated mediation. *Multivariate Behavioral Research*, 50, 1-22.

Hayes, R. H. (2002). Challenges posed to operations management by the "new economy". *Production and Operations Management*, *11*(1), 21-32.

Hooper, D., Coughlan, J., & Mullen, M. (2008). Structural equation modelling: Guidelines for determining model fit. *Electronic Journal of Business Research Methods*, 6(1):53– 60.

http://info.

Inkpen, A. C., & Currall, S. C. (1997). International joint venture trust: An empirical examination. In P. W. Beamish & J. P. Killing (Eds.), *Cooperative strategies*: Vol. 1. North American perspectives (pp. 308–334). San Francisco: New Lexington Press.

Innocenti, L., Pilati, M., & Peluso, A. M. (2011). Trust as moderator in the relationship between HRM practices and employee attitudes. *Human Resource Management Journal*, *21*(3), 303-317.

Jäger, C. (2008). *The principal-agent-theory within the context of economic sciences*. Norderstadt, Herstellung und Verlag, Books on Demand GmbH.

Jøsang, A., & Presti, S. L. (2004, March). Analysing the relationship between risk and trust. In *International conference on trust management* (pp. 135-145). Springer, Berlin, Heidelberg.

Jøsang, A., & Presti, S. L. (2004, March). Analysing the relationship between risk and trust. In *International conference on trust management* (pp. 135-145). Springer, Berlin, Heidelberg.

Joslin, R., & Müller, R. (2016). The relationship between project governance and project success. *International journal of project management*, *34*(4), 613-626.

Joslin, R., & Müller, R. (2016c). The relationship between project governance and project success. *International journal of project management*, *34*(4), 613-626.

Kataja, A., & Tuunanen, T. (2006, June). Information systems development methods and reducing information asymmetry: a way to decrease project escalation in outsourcing. In *European Conference on Information Systems (ECIS)* (Vol. 126).

Keil, M., J. Mann, et al. (2000). "Why software projects escalate: An empirical analysis and test of four theoretical models." MIS Quarterly 24(4): 631-664.

Keil, M., Smith, H. J., Pawlowski, S., & Jin, L. (2004). 'Why didn't somebody tell me?' climate, information asymmetry, and bad news about troubled projects. *ACM SIGMIS Database: the DATABASE for Advances in Information Systems*, *35*(2), 65-84.

Kelley, H.H., & Thibaut, J.W. (1978). Interpersonal relations: A theory of interdependence. New York: Wiley-Interscience.

Khalil, C., & Khalil, S. (2016). A governance framework for adopting agile methodologies. *International Journal of e-Education, e-Business, e-Management and e-Learning*, *6*(2), 111.

Kim, S., & Chung, Y.S. (2003). Critical success factors for IS outsourcing implementation from an organizational relationship perspective. *Journal of Computer Information Systems*, 43(4), 81-90.

Kimmel, M. J., Pruitt, D. G., Magenau, J. M., Konar-Goldband, E., & Carnevale, P. J. D. (1980). Effects of trust, aspiration, and gender on negotiation tactics. Journal of Personality and Social Psychology, 38(1), 9-22.

King, W. R., & Marks Jr, P. V. (2008). Motivating knowledge sharing through a knowledge management system. *Omega*, *36*(1), 131-146.

Klimoski R.J., & Karol B.L. (1976). The impact of trust on creative problem solving groups. *Journal of Applied Psychology*, 61(5), 72-74.

Kollock, P. (1994). The emergence of exchange structures: An experimental study of uncertainty, commitment, and trust. *American Journal of Sociology*, 100, 313-45.

Krishnan, R., Martin, X., & Noorderhaven, N. G. (2006). When does trust matter to alliance performance*? Academy of Management Journal*, 49, 894 –917.

Lappi, T., Karvonen, T., Lwakatare, L. E., Aaltonen, K., & Kuvaja, P. (2018). Toward an Improved Understanding of Agile Project Governance: A Systematic Literature Review. *Project Management Journal*, *49*(6), 39-63.

Lewis, J. D., & Weigert, A. (1985). Trust as a social reality. *Social Forces*, 63, 967–985.

MacKenzie, S. B., Podsakoff, P. M., & Jarvis, C. B. (2005). The problem of measurement model misspecification in behavioral and organizational research and some recommended solutions. *Journal of Applied Psychology*, 90, 710–730

Mahaney, R. C., & Lederer, A. L. (2011). An agency theory explanation of project success. *Journal of Computer Information Systems*, *51*(4), 102-113.

Maher, M., & Andersson, T. (2000). Corporate governance: effects on firm performance and economic growth. *Available at SSRN 218490*.

McEvily, B., Perrone, V., & Zaheer, A. (2003). Trust as an organizing principle. *Organization Science*, 14, 91–103.

Miller, G. J. (2013). Agile problems, challenges, & failures. Project Management Institute.

Moe, N. B., & Šmite, D. (2008). Understanding a lack of trust in Global Software Teams: a multiple-case study. *Software Process: Improvement and Practice*, *13*(3), 217-231.

Muller, R. (2009). Project governance. Surrey, England: Gower Publishing Limited.

Müller, R., & Jugdev, K. (2012). Critical success factors in projects: Pinto, Slevin, and Prescott-the elucidation of project success. *International Journal of Managing Projects in Business*, *5*(4), 757-775.

Musawir, A., Abd-Karim, S. B., & Mohd-Danuri, M. S. (2020). Project governance and its role in enabling organizational strategy implementation: A systematic literature review. *International Journal of Project Management*, *38*(1), 1-16.

Naeem, S., Khanzada, B., Mubashir, T., & Sohail, H. (2018). Impact of Project Planning on Project Success with Mediating Role of Risk Management and Moderating Role of Organizational Culture. *International Journal of Business and Social Science*, *9*(1), 88-98.

Nagel, R. N., & Dove, R. (1991). *21st century manufacturing enterprise strategy: An industry-led view*. Diane Publishing.

Nerur, S., Mahapatra, R., & Mangalaraj, G. (2005). Challenges of migrating to agile methodologies. *Communications of the ACM*, *48*(5), 72-78.

Nidumolu, S. R. (1996). A comparison of the structural contingency and risk-based perspectives on coordination in software-development projects. *Journal of Management Information Systems*, *13*(2), 77-113.

Ozyilmaz, A., Erdogan, B., & Karaeminogullari, A. (2018). Trust in organization as a moderator of the relationship between self-efficacy and workplace outcomes: A social cognitive theory-based examination. *Journal of Occupational and Organizational Psychology*, *91*(1), 181-204.

Project Management Institute. (2016). Governance of Portfolios, Programs, and Projects. Project Management Institute.

PSEB. (2019). Pakistan Software Export Board Programs. Retrieved from https://www.pseb.org.pk/

Rai, A., & Al-Hindi, H. (2000). The effects of development process modeling and task uncertainty on development quality performance. *Information & Management*, *37*(6), 335-346.

Ramesh, B., Mohan, K., & Cao, L. (2012). Ambidexterity in agile distributed development: an empirical investigation. *Information systems research*, *23*(2), 323-339.

Rasnacis, A., & Berzisa, S. (2017). Method for adaptation and implementation of agile project management methodology. *Procedia Computer Science*, *104*, 43-50.

Raz, T., Shenhar, A. J., & Dvir, D. (2002). Risk management, project success, and technological uncertainty. *R&D Management*, *32*(2), 101-109.
Ross, A. (1994). Trust as a moderator of the effect of performance evaluation style on job-related tension: A research note. *Accounting, Organizations and Society*, *19*(7), 629-635.
Ross, S. (1973). "The economic theory of agency: The principal's problem." American Economic Review 63: 134-139.
Rotter, J. B. (1967). A new scale for the measurement of interpersonal trust. *Journal of Personality*, 35, 651–665.
Royce, W. (1970). Managing the development of large software systems: concepts and techniques. Proceedings of IEEE WESTCON. Los Angeles, USA.
Sankaran, S., Remington, K., & Turner, C. R. (2008). Relationship between project governance and Project performance: A multiple case study of shutdown maintenance projects in a maritime environment. In *PMI Global Congress Asia Pacific Project Management Conference*. Project Management Institute.
Schmidt R., Lyytinen K., Keil M., Cule P. (2001) Identifying Software Project Risks: An International Delphi Study, *Journal of Management Information Systems*, 17/4/2001, 5-36.
Sha, K. (2011). Vertical governance of construction projects: An information cost perspective. *Construction Management and Economics*, 29(11), 1137–1147
Sheffield, J., & Lemétayer, J. (2013). Factors associated with the software development agility of successful projects. *International Journal of Project Management*, *31*(3), 459-472.
Shenhar, A. J. (2001). One size does not fit all projects: Exploring classical contingency domains. *Management science*, *47*(3), 394-414.
SIDDIQ, S. (2017). *Implementation Issues of Agile Methodologies in Pakistan Software Industry* (Doctoral dissertation).
Sirisomboonsuk, P., Gu, V. C., Cao, R. Q., & Burns, J. R. (2018). Relationships between project governance and information technology governance and their impact on project performance. *International journal of project management*, *36*(2), 287-300.
Sitkin, S. B., & Pablo, A. L. (1992). Reconceptualizing the determinants of risk behaviour. *Academy of Management Review*, 17, 9–38
Smith, J. B., & Barclay, W. B. (1997). The effects of organizational differences and trust on the effectiveness of selling partner relationships. *Journal of Marketing*, 61, 3–21
Snow, A. P., Keil, M., & Wallace, L. (2007). The effects of optimistic and pessimistic biasing on software project status reporting. *Information & management*, *44*(2), 130-141.
Standish, G. (2014). The CHAOS report. Retrieved from https://www.projectsmart.co.uk/white-papers/chaos-report.pdf
State of Agile Survey, 2014. VersionOne Inc. nineth ed. (Source:
Strode, D. E., Huff, S. L., & Tretiakov, A. (2009, January). The impact of organizational culture on agile method use. In *2009 42nd Hawaii International Conference on System Sciences* (pp. 1-9). IEEE.
Talby, D., & Dubinsky, Y. (2009, May). Governance of an agile software project. In *2009 ICSE Workshop on Software Development Governance* (pp. 40-45). IEEE.
Tam, C., da Costa Moura, E. J., Oliveira, T., & Varajão, J. (2020). The factors influencing the success of on-going agile software development projects. *International Journal of Project Management*, *38*(3), 165-176.

Tan, B. C., Smith, H. J., Keil, M., & Montealegre, R. (2003). Reporting bad news about software projects: Impact of organizational climate and information asymmetry in an individualistic and a collectivistic culture. *IEEE Transactions on Engineering Management*, *50*(1), 64-77.

Too, E. G., & Weaver, P. (2014). The management of project management: A conceptual framework for project governance. *International Journal of Project Management*, *32*(8), 1382-1394.

Triplett, S. M., & Loh, J. M. (2018). The moderating role of trust in the relationship between work locus of control and psychological safety in organisational work teams. *Australian Journal of Psychology*, *70*(1), 76-84.

Turner, J. R., & Downey, A. B. (1993). The handbook of project-based. *Management, McGraw-Hill, Boston*.

Turner, J. R., & Keegan, A. (1999). The versatile project-based organization: Governance and operational control. *European Management Journal*, 17(3), 296–309.

Turner, J. R., & Keegan, A. (2001). Mechanisms of governance in the project-based organization:: Roles of the broker and steward. *European management journal*, *19*(3), 254-267.

Turner, J. R., & Müller, R. (2004). Communication and co-operation on projects between the project owner as principal and the project manager as agent. *European management journal*, *22*(3), 327-336.

Turner, R. J., Huemann, M., Anbari, F. T., & Bredillet, C. N. (2010). *Perspectives on projects*. Routledge.

Turskis, Z., Zavadskas, E. K., & Peldschus, F. (2009). Multi-criteria optimization system for decision-making in construction design and management. *Engineering economics*, *61*(1).

versionone.com/state-of-agile-development-survey-ninth.html

Wachnik, B. (2014). Reducing information asymmetry in IT projects. *Informatyka Ekonomiczna*, (31), 212-222.

Wachnik, B. (2015). Information asymmetry in four IT projects: the client's perspective a multiple case study. *Information Systems in Management*, *4*.

Wachnik, B. (2016). Agile Methodology as a tool for reducing information asymmetry in the implementation of it projects completed on the basis of the outsourcing strategy. *Information Systems in Management*, *5*.

Wallace, L., Keil, M., & Rai, A. (2004). How software project risk affects project performance: An investigation of the dimensions of risk and an exploratory model. *Decision sciences*, *35*(2), 289-321.

Wallace, L., Keil, M., & Rai, A. (2004). How software project risk affects project performance: An investigation of the dimensions of risk and an exploratory model. *Decision sciences*, *35*(2), 289-321.

Wang, D., Fang, S., & Li, K. (2019). Dynamic changes of governance mechanisms in mega construction projects in China. *Engineering, Construction and Architectural Management*.