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# Understanding the soft side of software projects: An empirical study on the interactive effects of social skills and political skills on complexity – performance relationship

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**Abstract**

While prior research considers project complexity as a double-edged sword, researchers and practitioners still remain unclear whether project complexity serves as productive or counterproductive ingredient for project performance. Our research brings clarity on the dynamic nature of complexity-performance relationship by integrating social exchange theory with recent developments in project management research to develop and test a novel framework involving interactive roles of social skills and political skills in software-projects. Regardless of calls for further empirical studies, researchers have predominantly neglected the fundamental role of human efforts and human interaction in outlining performance particularly in complex projects. Drawing on a survey based sample of 242 project managers and use of variance based structural equation modeling, the findings illuminate theoretical and practical contributions in better understanding complexities in software-projects performance. In addition, prioritizing human-centric factors i.e. social skills and political skills in supporting complexity- performance relationship further enhances contributions of this research.


*Keywords:* Project complexity; Project performance; Social skills; Political skills; Structural equation Modeling; SMART PLS

## 1. Introduction

In an era of digitalized global economies, the emergence of software as a service (SAAS), big data analytics and cloud computing infrastructures have enabled more advanced capabilities for smarter decision making, effective collaborations and superior cost reductions in modern operations. This has created a radical shift in software projects' development, delivery and purchase (Kasemsap, 2017). The global spending on enterprise software's is projected to reach USD 424 Billion by 2019 (Statista, 2018). As the international software projects are becoming increasingly sophisticated and useful, hence this surge of complexities in deployment, integration and operation of project infrastructures requires capable project professionals with specialized skill set (Batistič and Kenda, 2018; Holmes, 2018; Lei et al., 2017). International software development projects like Enterprise Software Technologies (EST) including ERP systems are quite infamous for their high failure rates as only one-eighth of software development projects are delivered on time, remaining within budget and meeting all other project requirements (Neumeier et al., 2018; Engelbrecht et al., 2017; Badewi and Shehab, 2016). Software development projects can

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have confounding expectations as they fail even before being formally introduced to its stakeholders (Badewi and Shehab, 2016). The European Union (EU) alone has reported an estimated annual cost of $142 billion euros due to unsuccessful international software projects (Gingnell et al., 2014). Earlier, Hewlett-Packard experienced a loss of USD 160 million whereas Nike faced decline in sales by USD 100 Million due to software project failures (Orina and Luketero, 2018).

Software risk-based theory highlights various critical factors and extensive diversity requirements which further complicate the estimation of project performance and even to predict performance outcomes (Holmes, 2018; Sangaiah et al., 2017). An estimated 18% of all software development projects are either cancelled or aborted without delivering any benefits to the clients (López-Martín et al., 2017) and 19% of software development projects are outright failures (Coelho and Valente, 2017). High rate of project failures especially in software industry is a phenomena experienced by both developing and advanced nations (Ebad, 2016). Software development projects performance has attracted attention internationally due to its wide ranging impact on various industries and business processes including human resource management, supply chain management, operational planning and control, inventory management and also project management (Holmes, 2018; Pellerin et al., 2013).

Tremendous advancements have been made in managing projects effectively; however, there are still various underlying factors that create catastrophic conditions for large-scale and complex IT projects to fail spectacularly leaving behind undrawn lessons (Holmes, 2018; Coelho and Valente, 2017; Sangaiah et al., 2017). The notion of 'failing forward' hasn't been effectively applied in software-projects as the failure ratio continues to rise by monotonous mistakes and inability to salvage lasting value from underperforming or unsuccessful projects (Holmes, 2018; Coelho and Valente, 2017; Puche Regaliza et al., 2017). Zwikael and Meredith (2018) have underscored the inconsistencies in defining key project roles and their performance criteria, despite various project management theories and methods developed to enhance project's strategic value, enabling benefits and performance (Zwikael et al., 2018; Ul Musawir et al., 2017). In spite of all efforts and studies, international projects continue to suffer from low productivity and poor performance, costing organizations USD 97 Million for every USD 1 Billion invested in projects (PMI, 2017). Recent publishing trends highlight importance of more investigations into the human side applicable in project based environment to secure missed opportunities and build closer project connections (Keegan et al., 2018).

Despite the streams of research on complexity - performance relationship (Zhu and Mostafavi, 2017; Floricel et al., 2016), the project managers are being overwhelmingly exposed to the emergence of non- converging and non-deterministic project performance paradigm (Bjorvatn and Wald, 2018; Daniel and Daniel, 2018). There is limited empirical evidence that provides an integrated approach toward managing complexity in projects. This creates further difficulties for project managers in meeting performance goals with the continuously increasing complexity in modern projects (Kermanshachi et al., 2018). No matter how effectively project manager's estimate and schedule projects, optimize resources and plan for project risks; still the project success remains entirely dependent on the cooperation of project stakeholders each having their own hidden agendas, conflicting motivations or previously held unresolved conflicts (Vijay, 2018; Kerzner and Kerzner, 2017). Therefore, the politics surrounding projects need to be carefully studied in actionable steps to improve project performance. Realizing the limitations of project resources especially focusing on human potential with right skill set, the interplay of power and politics continues to rest at the core of project foundations, processes and interfaces (Kerzner and Kerzner, 2017). This has been rarely studied in-depth in the project management literature as a critical factor for project performance and success (Vijay, 2018).

Bolzan de Rezende et al. (2018) bibliometric analysis on project complexity highlights the importance of socio- political factors in complex projects that need to be managed through developed capabilities. Apart from technical skills, the software projects require social skills to be successful (Kerzner and Kerzner, 2017). The technical skills meet the requirements of processes and tools whereas social skills meet the needs for effective communication, team work competencies, adaptability and collaborative problem solving. The unfailing use of robust social capabilities to maintain project performance helps to avoid communication breakdowns, facilitate knowledge sharing, build relationships, reduces coordination cost, promotes trust and clarifies to align project expectations (Kerzner and Kerzner, 2017).

With the rapidly changing technologies, the project stakeholders must adapt to maintain balance between social and technical factors. Even the most carefully orchestrated projects fall apart without the people skills (Bryan, 2018; Holmes, 2018; Kerzner and Kerzner, 2017). The use of people skills in complex software projects have been rarely studied or empirically tested (Elizalde and Bayona, 2018; Hilary, 2018; Harry, 2016). There is lack of empirical evidence to ascertain the interactional effects of social skills and political skills in the project complexity - performance relationship particularly in the software industry. Based on our arguments above, we set the following research questions for this empirical study: To what extent software-projects performance is influenced by levels of its complexity? How does project manager's political and social skill actually enact the complexity - performance framework in software-projects?

## 2. Theoretical framework

This section provides discussion on the theoretical background of the variables being observed and tested. These constructs include project complexity (technical), project performance, social skills and political skills.

### *2.1. Project complexity*

Contemporary organizations in the highly uncertain, dynamic and globalized environment are undertaking projects with increased complexity due to more sophisticated project scope,

multi-organizational and international context and emerging new technologies (Nonino et al., 2018). Researchers and practitioners during the last decade have suggested different approaches to address complexity in projects. Some authors recommend a simplification philosophy using advanced skills and tools, pre-established schemes and even proactive approach to deal with project complexity. In alternative, others support more recognition and navigation of project complexity in order to develop distinctive technical and individual capabilities to successfully drive complexity factors (Nonino et al., 2018). Despite extensive studies on complexity in projects there is still no universal definition of project complexity (Zhu and Mostafavi, 2017).

Patanakul et al. (2016) considers project complexity is an essential factor that project managers need to keep in mind while selecting and implementing appropriate strategies and approaches for project management. High project complexity at times results in unsatisfied stakeholders, increased costs, additional expenditures and poor project performance and in many instances withdrawal of projects (Patanakul et al., 2016). However, it's not an easy task to define project complexity due to its vague nature (Klir, 1985; Sinha et al., 2001). According to one of the pioneers, project complexity is "*consisting of many varied interrelated parts and can be operationalized in terms of differentiation and interdependency*" (Baccarini, 1996). Others researchers further explained Baccarini's suggested definition of project complexity firstly in organizational complexity and secondly in technological complexity (Bosch-Rekveldt et al., 2011).

Williams (1999) theorized that generally the complexity of project may possibly be categorized as 'complexity of structure' (total number and interdependence of features) and uncertainty (ambiguity or vagueness in methods and goals). Geraldi and Adlbrecht (2007) categorized project complexity from the perspective of interaction, faith and fact. According to Bosch-Rekveldt et al. (2011) complexity of large engineering projects constitutes three structural elements: firstly, technical, secondly organizational, and thirdly environmental. Despite the fact that it was challenging to comprehend, anticipate and control or regulate complexity of projects (Vidal et al., 2011a, 2011b), various project heads, leaders and project managers need to be equipped and well-prepared to measure project complexity. According to PMI (2013), complexity, successes and failures of entire enterprise is determined by how they anticipate, comprehend and manage projects. Simon (1996) states that the complexity of the projects depends on how we describe it. Whitty and Maylor (2009) have established that the issue of explaining complexity remains unsettled in so much as literature review is considered; due to its subjective nature (Vidal et al., 2011a, 2011b).

Prior studies revealed that complexity factors cannot be used to categorize project complexity. Vidal et al. (2011a, 2011b) distributed the nature (i.e. facets) of complexity encountered by the organizations while working on a project into two broad categories of organizational and technological variables. Bosch-Rekveldt et al. (2011) described three characteristics of project complexity, specifically technological (relating to technicalities prevailing in a work environment), organizational (cultural, policies and procedures), and environmental.

The technological facet is an important feature of complexity of projects (Bosch-Rekveldt et al., 2011). The main technical aspects contributing to project complexity are: knowledge and familiarity with advance and new technologies (Baccarini, 1996; PMI, 2013), technology-based project innovation (Dewar and Hage, 1978; Geraldi and Adlbrecht, 2007; Tatikonda, 1999; Vidal and Marle, 2008), expertise and skills required to handle technical risks and requirements of quality (Bosch-Rekveldt et al., 2011), application of different project control approaches, processes and tools as well as techniques (Vidal and Marle, 2008), and diversity of responsibilities (Williams, 1999). Consequently, recognizing and understanding the dynamics of technical complexity will help stakeholders to tackle holistic technical complexity in projects (Bosch-Rekveldt et al., 2011).

### 2.2. Social skills

Labor market in recent decade is increasingly rewarding social skills as jobs require more extensive levels of social interactions that endorse group efficiency and reduce coordination costs. Reading and reacting to signals in an unconscious social setting process therefore requires greater need for social skills especially in complexity intensive jobs (Deming, 2017). Social skills denote a person's ability to understand, socially interact, control, read effectively to fulfill an objective or a specific goal (Baron and Markman, 2000; Hochwarter et al., 2006; Riggio and Reichard, 2008; Riggio et al., 2003; Witt and Ferris, 2003; Ferris et al., 2001; Fligstein, 2001; Notari et al., 2014; Riggio, 1986). Ferris et al. (2001) described social skills as the ability to pick-up underlying feelings, motives and behaviors of people in one's cultural circle and motivate or persuade them. Consequently, people with strong socialization skills have the ability to understand accurately other people's thoughts, adequately adjusting their behaviors to the situation and responding to other's responses commendably (Ferris et al., 2001), mainly in terms of persuading cooperation and collaboration being empathetic toward others' situation and explaining them the reasons to cooperate (Fligstein, 2001).

According to Rubin et al. (1995), an individual/employee demonstrates great level of social skills when he or she acts efficiently, effectively and meritoriously in a particular type of social situation (Rose-Krasnor, 1997). Effectively is demonstrated as the ability or talent to fulfill one's individual objectives and own needs while at the same time maintaining progressive and positive associations with others around you in explicit environments (Rose-Krasnor, 1997). This description defines two types of attitudes and behaviors that are relevant to or can relate to a situation in which people from different backgrounds come to work together, for example to complete a project. One dimension of the definition is: behaviors or attitudes that help people fulfill their goals i.e. leadership, confidence, creativity and imitativeness etc. Second dimension of the definition is: behaviors serving to build and retain good working associations with others i.e. compromising, social and willing to solve any issues or conflicts that arise.

### 2.3. Political skills

Political skills are deployed to establish new alliances through mediation of multiple unexpected spaces of negotiation (Newman, 2017). Lvina et al. (2018) explained political skill as an application of contextual understanding of others at workplace to influence their actions and advancing personal or organizational agenda. Gansen-Ammann et al. (2017) presented that political skill concept includes multiple dimensions, i.e. networking ability, interpersonal influence, social astuteness and apparent sincerity. Perceptiveness of social cues and the individual abilities provides politically skilled manager's resilient perspective of workplace dynamics. Employees or individuals carrying such abilities are capable of reading peoples mind, actions and situations quickly and respond considerately to prompt the preferred answer from individuals (Ferris et al., 2005a, 2005b). In a meta-analysis study, political skills demonstrated beneficial influence on work outcomes (Munyon et al., 2014). Various studies confirm the relevance of political skills in differing occupational demands and being impactful on social behaviors and performance (Gansen-Ammann et al., 2017).

Literature in research circles confirms political skills as one of the imperative forecaster of good performance, organization commitment, self-efficacy, career success, career satisfaction, and personal repute (Blickle et al., 2012; Chopin et al., 2012; Laird et al., 2013; Munyon et al., 2014; Meisler, 2014). Moreover, political skills have been confirmed as a moderator to overwork-pressure association (Perrewé et al., 2005), stress-outcome relationship (Meurs et al., 2010) and the psychological anxiety caused due to role conflict (Perrewé et al., 2004). As it is evident from the research literature (Chopin et al., 2012; Meurs et al., 2010; Munyon et al., 2014; Perrewé et al., 2005), political skills involves a comprehensive outline of societal capabilities and proficiencies with intellectual, negotiating, emotional and behavioral outlooks, which have both direct impact and influence on good and bad consequences, as well as moderating influence on independent-dependent associations (Ferris et al., 2007).

### 2.4. Project performance

Over the last decade, project performance has plateaued due to the staggering ratios of successful, challenged and failure projects (Sirisomboonsuk et al., 2018). Project performance is defined as accomplishment of pre-determined project goals (Lim & Mohamed, 1999). Project performance shows internal accomplishments and achievements of the organization (Garcia et al., 2008). Project quality, cost and time are eminent measures or indicators of project performance. From the customer's perspective, an ideal project is finished in minimum time, at least cost, and with the best quality (Arditi et al., 1997). In this research study, project performance has been defined to the extent that goals are accomplished and whether the project remained within scheduled budget with quality standards maintained. Project performance encompasses the three most important scopes of project constraints i.e. quality, cost (also referred to as budget) and time (also referred to as schedule) and can aptly reflect project success. Project performance also is representative of project success and being successful is all about staying ahead of competitors in all aspects while increasing proceeds (Cleland Cleland, 1991; Wirth, 1992). From the literature it is evident that in IT, construction and soldierly projects, project success aspects will foretell project outcomes i.e. project performance – quality, cost and time (Turner, 2002; Müller and Turner, 2005).

Project performance can be examined and tested in terms of delivery of the product within the targeted time, cost, and quality (Agarwal and Rathod, 2006). Frequently project performance is defined by various growth indicators (a) cost growth, (b) schedule growth, and (c) quality of deliverables. Each of these performance indicators have been defined and explained, keeping in mind, the context of this study in the passages to come. Cost growth refers to the degree of percent variation in project budget from the target price or budgeted cost to project finish. According to Konchar and Sanvido (1998), cost growth could be either positive or either negative (Konchar and Sanvido, 1998). Schedule growth offers degree of percent variation in project period from agreed delivery time or target plan to project finish or close. Schedule growth might also be either positive or either negative (Konchar and Sanvido, 1998). Quality is defined as the extent to which the deliverable meets the set standards or benchmark threshold of the owner at the time when it is shipped over to the vendor (Konchar and Sanvido, 1998). In the literature it has been demonstrated a number of times that task nature acts as a moderator between practice being implemented and project performance (Low and Quek, 2006; Müller and Turner, 2007; O'Connor and Won, 2001a, 2001b; Oya and Walter, 1998; Pheng and Chuan, 2006).

## 3. Conceptual model and hypothesis

Fig. 1 shows diagrammatic representation of conceptual model. This study attempted to test the following model, to check the effect of project complexity (IV) on project performance (DV) and whether this relationship strengthens if moderated by social skills and political skills (MODs).

### 3.1. Project complexity & project performance

Zhu and Mostafavi (2017) had studied complexities and emergent properties in construction projects to better understand corresponding project performance. Various project complexity features including project scope, size, uncertainties, regulative, task diversity, technological novelty, interdependencies and frequency of changes have been researched to explain variations in project performance (Bolzan de Rezende et al., 2018). However, existing studies remain inconclusive to offer insights on how project complexities could be proactively managed to overcome shortcomings in project performance (Bjorvatn and Wald, 2018; Zhu and Mostafavi, 2017). Complexity continues to be one of the widely researched factors that hinders project performance (Bosch-Rekveldt et al., 2018a, 2018b) and complexity misunderstood or poorly managed can results in

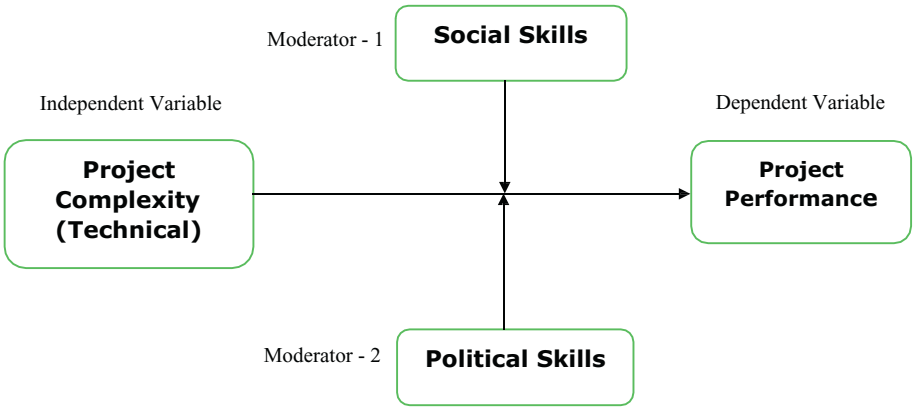


Fig. 1. Conceptual framework.

project failure or poor project performance (Kermanshachi et al., 2016).

As a result of rapid technological advancements and fast changing organizational environment, projects that organizations deal in are becoming increasingly complex (Bosch-Rekveldt et al., 2011). According to Browning (2014), a complex project comprises of multidimensional activities that are interrelated to one another in a number of different ways to accomplish a common goal or objective. Project management has consequently faced many obstacles because of the growing and rising intricacies of projects (Baccarini, 1996; Bosch-Rekveldt et al., 2011; Thomas and Mengel, 2008; Vidal and Marle, 2008; Williams, 1999). This increased project complexity persists as the main cause of complete or partial project failures (Bosch-Rekveldt et al., 2011). Thus understanding project complexity is critical (Baccarini, 1996). Without any exception, software development and implementation projects have become increasingly complex. It's a known fact that a number of reasons are a contributing factor to project complexity in software industry and managing this project complexity problem is a challenging task. There have been a number of research studies that attempted to explore and measure project complexity (Vidal et al., 2011a). Therefore, this can be hypothesized as follows: -.

**H1**. Project complexity has significant negative effect on project performance.

### *3.2. Moderating roles of social skills and political skills*

Project complexity does not relate to the size of the project but it is something bigger than that (Williams, 1999). Vidal et al. (2011a, 2011b) viewed complexity as characteristic of the system that results in making the system difficult to comprehend. Cicmil et al. (2009) defined complexity that demonstrates planning and controlling practices, delays in identification of project objectives and goals, and elements that influence quality, time and cost of the project. Sbragia (2000) is of the opinion that number of factors are involved in a project, the frequency of interaction between team members of project and difficulty to collaborate amid the functional areas regulate and determine the level of complexity in a project.

Azim et al. (2010) discussed complexity of projects in relation to both hard and soft skills and highlighted the importance of people's skills involved in projects. Judge and Zapata (2015) reported that predictive performance is activated by person's strong social skills. In a project based environment, the quality of collaborations and communications performance is highlighted by social skills (Notari et al., 2014). One of the main aspects of social skills is one having an ability to adjust their behavior according to the increasingly changing situations (Baron and Markman, 2000). This ability of social adaptability is also defined to be one of the components of political skills required to be successful in a corporate setting (Ferris et al., 2005a, 2005bTreadway et al., 2013). Fligstein and McAdam (2012) argued that social skills facilitate impression management, persuasiveness, boundary-spanning roles and to interact effectively to induce cooperation among multiple actors producing and contesting for results. In addition, social skill is an excellent ingredient for successful mobilization of the social capital.

Gansen-Ammann et al. (2017) stated that political skill is a key differentiator for managers that improves social networking and persuasive power for overproportional performance gains and achievement of goals by organizations and its individuals. Ferris et al. (2005a, 2005b) recognized having political skills and ability to utilize that skill for the betterment of the organization as one of the fundamental aspects. A large body of previous research shows that having political skills has proved to be very favorable to not only individual employees' success but also improved performance of projects and organizations as a whole (Ferris et al., 2008; Ferris et al., 2007; Treadway et al., 2013). This skill enables employees to comprehend and infer the behavior of their colleagues, gain their trust by appearing sincere and have a convincing and subtle working style (Brouer et al., 2011; Ferris et al., 2007). Subsequently, politically astute persons are more likely to cultivate and exercise social relations to boost their success and improve performance of the organizations (Ferris et al., 2008; Ferris et al., 2007). According to Massaro et al. (2016) gaining social skills stimulates effective and innovative resolution to problems which as a result improves organizations performance or in case of project improves project's performance. High level complex projects not only

oblige project teams to engage in inventive idea generation and solutions to problems but require them to coordinate with each other while performing project specific task (Unger-Aviram et al., 2013). At the same time, coping with multiple demands of project roles, ambiguous requirements and inconsistent assignments need to be met (Turner et al., 2008). Therefore, this can be hypothesized as follows:

**H2**. Social skills moderate project complexity and project performance relationship.

**H3**. Political skills moderate project complexity and project performance relationship.

## 4. Research gap

### *4.1. Theoretical gap*

The existing literature is ambivalent that shows inconsistencies among various studies that either support the positive effects of project complexity on project performance while recent studies have shown otherwise (Abdou et al. 2016; Luo et al., 2016). Daniel and Daniel (2018) maintained that unified theory is lacking to derive a universal definition of complexity; to better understand project uncertainties and to maximize performance in highly complex projects. Plethora of studies are available that investigated project performance and complexity of the projects (Eriksson et al., 2017; Floricel et al., 2016; Zhu and Mostafavi, 2017) but still limited research can be found that has investigated software-project performance in relation to project's technical complexity (Eriksson et al., 2017; Hsu et al., 2017).

Eriksson et al. (2017) in their paper explored the association of project complexity and time performance. This investigation was conducted on public projects, which suggested that future research can explore and examine the concept of project complexity in private sector and with different types of project practices. Zhu and Mostafavi (2017) investigated project performance and complexity (detail & dynamic) from the lens of project emergent properties (absorptive, adaptive and restorative capacities). It was a qualitative study and the future avenue shared for research in this paper was to perform quantitative assessment on complexity of projects and its effect on project performance.

Yun and Lee (2017) explored social skills as a moderator between job performance and R&D personnel's knowledge sharing. In the very same paper the researcher suggested to elucidate the role of social skills as a moderator on activities that are usually a group process e.g. R&D employees job performance and also project performance. Ferris et al. (2001) was of the opinion that social skills has a meaningfully impact on the quality of project outcomes when activities or task are performed as a group usually in case of projects. Zhang and Huo (2015) suggested in their research on performance of construction projects and interpersonal conflict; with the mediated and moderated role of negative emotions and political skills, that in future researches political skills should be measured based on the assessment of supervisor's report and that the level of project performance should be other than qualitative evaluation. In addition, the combination of social influence theory and project management theory has been least explored in aiding performance in project (Floricel et al., 2014). Exiting studies on project performance framework lack concentration as there is less empirical evidence to ascertain the nature of project complexity (technical) in affecting performance especially in software-projects involving social and political dynamics (Ferris et al., 2008; Massaro et al., 2016).

### *4.2. Contextual gap*

Bosch-Rekveldt et al. (2018a, 2018b) conducted cross-industry research on project complexities in order to analyze the complexity perspective of project practitioners in the industrial sectors of construction, information and communications technology (ICT), high tech product development and food processing. Lack of resources and skills availability were among the main reasons causing project complexities in those industries. The authors recommended further investigations into cross-sectoral learning to analyze the broader applications and significance of complexities in challenging projects. Turner et al. (2018) had investigated project complexities in the supply chain management discipline and recommended for future cross-fertilization studies to equally benefit researchers and practitioners. This would provide useful insights and developing contributions across academic disciplines while facing unique challenges in project complexities.

Semrau et al. (2017) investigated team political skills and team performance in service industry teams in Germany and suggested that replication of the study in other contexts can resolve the issue of generalizability. Bjorvatn and Wald (2018) in their study had merited for future studies in different geographical regions and societal contexts, industry-specific (e.g. private-sector) and project purpose-specific studies to include wide range of exogenous variables involving project complexity and project management performance. Based on extensive review of relevant literature, no such empirical study has been traced in context of software-project performance (and in particular the rapidly advancing South Asian software industry) that uncovers the project performance framework involving project complexity (technical) and the human skills set (i.e. social skills and political skills).

## 5. Methodology

### *5.1. Research participants and study type*

This research study is both exploratory and explanatory in nature as the authors had not only explored the variables in conceptual framework but also explained their cause and effect relationship (Nardi, 2018). Prominent studies have preferred cross-sectional setting for conducting their recent investigations on project performance (Ali et al., 2018; Heredia Rojas et al., 2018; Hsu et al., 2017; Um and Kim, 2018). As software houses are usually project-based (Heeks et al., 2001; Shepperd and Schofield, 1997), therefore our cross-sections included leading software houses in Pakistan. Individuals functioning as

project managers were considered to be most appropriate for collection of survey data in analyzing project performance (Um and Kim, 2018; Wang et al., 2018).

### 5.2. Sampling and data collection procedure & technique

As the population was unknown therefore non-probability convenience sampling was employed to validate and test the theoretical model. Convenience sampling approves samples based on easy accessibility of individuals who willingly agree to take part in a research study (Etikan et al., 2016; Teddlie and Yu, 2007). Although it has restrictions of unknown biases and outliers, convenience sampling is quicker to implement and is more practical (Etikan et al., 2016). Leading software houses in Pakistan were engaged in order to collect data with the help of survey questionnaires (Kerlinger and Lee, 2000). As previously stated, this study type is exploratory, and convenience sampling has been considered justifiable for such research types (Ferber, 1977). Whereas according to Meltzer et al. (2012), the basic purpose of survey is to generalize the results obtained from a sample after observing it and to test and examine the hypothesis compared to reality rather than describing the reality.

Primary data collection method was implemented for this research study. Survey questionnaires were administered by personal visits by the researcher as well as use of Google Forms, personal emails with attachments and direct links to questionnaire and also social media (LinkedIn) which seemed interesting and relevant to the current study sample. LinkedIn survey has also been employed in a Harvard University research involving new working environment and leadership study (Korzynski, 2013). Moreover, Leiner (2014) stated that internet based survey questionnaires provides scholars with on- demand access to individuals with diverse background and high motivation. Ogbeibu et al. (2018) maintained that assuring respondent-researcher anonymity helps prevent issues of common method bias.

### 5.3. Sample selection strategy

The sample size was determined using most powerful and latest techniques: G*Power 3.1.9.2 (Faul et al., 2007) and Hair et al. (2012). Total of 350 questionnaires were circulated, however only 250 survey responses were received; out of which 8 responses were redundant and were discarded. 242 useful responses were used in the research. According to Hoelter, (1983), 200 is the minimum sample size recommended for structural equation modeling technique.

### 5.4. Measures

After extensive review of the literature, adapted instruments were employed that asked respondents to rate every single item of the instrument on a scale of 1 (i.e. strongly disagree) to 5 (i.e. strongly agree). The entire questionnaire consisted of 25 items including information about respondent's experience, gender, age, project complexity (PC), social skills (SS), political skills (PS) and project performance (PP). All of the constructs are measured on a 5 – point Likert-scale. Details of variables including types, measurement sources, number of items, cronbach's alpha (CA) and composite reliability (CR) have been stated in Table 1.

#### 5.4.1. Project complexity

Scale that is adapted to measure "Project Complexity – Technical" was originally developed by He et al. (2015), it comprises of 4 items. Sample items include: - "Processes are technologically dependent". Independent variable includes factors such as different types of technologies used, technologically dependent processes of the project, very high risk of using difficult technology and compatibility or interaction of various technologies and the environment it prevails. Composite reliability is 0.80.

#### 5.4.2. Social skills

Scale that is adapted to measure "Social Skills" was originally developed by Ferris et al. (2001), it comprises of 6 items. Sample items include: - "I can easily adjust my behavior and become the type of person dictated by any situation". It includes factors such as coordination, service orientation, social perceptiveness, and persuasion. Composite reliability is 0.89.

#### 5.4.3. Political skills

Scale that is adapted to measure "Political Skills" was originally developed by Ferris et al. (2005a, 2005b), it comprises of 8 items. Sample items include: - "When communicating with my colleagues, I try to be genuine in what I say and do". Political skills include factors such as social shrewdness, networking and interacting capacity, and obvious sincerity. Composite reliability is 0.92.

#### 5.4.4. Project performance

Scale that is adapted to measure "Project Performance" was originally developed by Anton de Wit (1988), and has been used in a number of researchers afterwards (Kissi et al., 2013; Yang et al., 2014; Reich et al., 2014). The instrument adapted comprises of 7 items. Sample items include: - "Project is completed within budget". Factors that are involved in project performance include budget, schedule, quality, users and stakeholder's satisfaction and meeting project goals. Composite reliability is 0.88.

Table 1
Measurement instruments.

| Variables | Types of variable | Source | Items | CA | CR |
|---|---|---|---|---|---|
| Project Complexity | Independent | He et al., 2015 | 4 | 0.69 | 0.80 |
| Social Skills | Moderator | Ferris et al. (2001) | 6 | 0.87 | 0.89 |
| Political Skills | Moderator | Ferris et al. (2005a, 2005b) | 8 | 0.89 | 0.92 |
| Project Performance | Dependent | Anton de Wit (1988), Kissi et al., (2013), Yang et al., (2014) and Reich et al. (2014) | 7 | 0.83 | 0.88 |

### 5.5. Data analysis tool

PLS SEM has gained tremendous popularity across different disciplines including social sciences and business research (Henseler, 2017). Numerous studies based on PLS SEM method have been published in eminent SSCI journals recently (Banihashemi et al., 2017; Lee and Hallak, 2018; Hult et al., 2018). SMART-PLS 3.2.7 latest software version has been used to analyze the captured data, as PLS SEM has been preferred over covariance-based SEM due to its greater statistical power in parameter estimations and maximizing explained variance (Tajvidi et al., 2018; Hair et al., 2011). PLS SEM and CB SEM are more complementary rather than competitive siblings (Sarstedt et al., 2014; Rigdon, 2014). However, PLS SEM is originally known for its superior prediction purposes over CB-SEM (Hair, 2017) even though the estimate differences among both techniques are quite low (Hair et al., 2011).

PLS-SEM operates much like a multiple regression analysis and is deemed appropriate for simultaneous estimations of causalrelationships among one or more independent and dependent variables. This characteristic makes PLS-SEM particularly valuable for exploratory research purposes (Henseler, 2017). PLS-SEM combines path coefficients, multi linear regression and CFA (confirmatory factor analysis) which is a second-generation multivariant investigation technique. With the help of structural model examination, it explains the variance in dependent variable (Hair, 2017; Hair et al., 2010). Partial least squares structural equation modeling (PLS-SEM) works proficiently with complex models involving moderations, small sized samples and less sensitive to multivariate normal data (Vlajčić et al., 2018; Hair, 2017). Reflective measurement model was adopted in this research study, where measures represent latent variables and the direction of the connection is from the construct or latent variable to the measure (Diamantopoulos and Winklhofer, 2001). The statistical analysis performed in the study includes test like:

(1) Measurement model – testing of reliability analysis and validity analysis and (2) Structural model analysis – examining the path coefficients between observed coefficients. This examination has been performed with the help of bootstrapping procedure with 1000 subsamples, R-square, t-statistics and Cohen's effect size (f2) (Hair, 2017; Chin, 1998; Cohen, 1988).

## 6. Results

### 6.1. Measurement model

Measurement model is an examination and evaluation for reliability (composite reliability, Cronbach alpha and indicator reliability) and validity (convergent and discriminant validity) (Hair et al., 2014). For the estimation of variable's or constructs internal consistency, composite reliability is used, whereas for indicators (i.e. items) reliability, outer loadings are used. The expected strength of the relationships between the constructs or concepts can be interpreted implicitly only if the construct's reliability and validity has been established or met (Peter and Churchill, 1986). Thus, ensuring that measurement model in research apprehends what it is intended to quantify (Campbell and Fiske, 1959).

#### 6.1.1. Reliability analysis

According to Hulland (1999), factor loading value of 0.70 is preferable but if the research being conducted is explanatory than in that case value of 0.40 or higher is acceptable. For construct's internal consistency, value of composite reliability (CR) should be 0.70 or higher, but 0.60 or higher is acceptable in case of explanatory research (Bagozzi and Yi, 1988). After removing indicators with low loadings (< 0.50), construct reliability has been established. Reliability result details are stated in Table 2.

#### 6.1.2. Validity analysis

*6.1.2.1. Convergent validity.* Convergent validity refers to the extent or degree that the items being used to quantify the concept are in agreement. According to Cheung et al., (2015) testing convergent validity helps us detect any unrelated measurement items in the construct being: measured in Smart PLS, average variance extracted (AVE) estimate the convergent validity (Ramayah et al., 2011; Hair et al., 2013). Bagozzi and Yi (1988) suggested that threshold for Average variance extracted (AVE) should be 0.50 or higher. Table 2 below summarizes the results on convergent validity.

*6.1.2.2. Discriminant validity.* Discriminant validity confirms that a concept being measured is empirically distinctive or unique and demonstrates that the phenomenon being observed is not captured by other measures in SEM (structural equation model) (Hair et al., 2010). Campbell and Fiske (1959) states that in order for discriminant validity to establish correlation between measures that are supposed to differ from one other should not be too high. If discriminant validity is not confirmed; which means that the variables or concepts have an impact or effect on the fluctuation of more than the variable being observed which they relate to hypothetically; than as a result, researcher would not be able to confirm the results of hypothesized structural paths that whether they are factual or are a consequence of statistical and analytical inconsistencies (Farrell, 2010). In this context, in today's research studies discriminant validity examination has become one of the most important and common practice in structural equation modeling (SEM) investigation (Shah and Goldstein, 2006; Shook et al., 2004). Table 3 shows results of discriminant validity obtained via Fornell-Larcker criteria. Discriminant validity is assessed in terms of three approaches:

(1) Fornell-Larcker criteria.
(2) Heterotrait-heteromethod ratio (HTMT) criteria.
(3) Cross loadings

Table 2
Convergent validity.

| Variables | Cronbach Alpha | Composite Reliability (CR) | AVE |
|---|---|---|---|
| Project Complexity | 0.685 | 0.797 | 0.502 |
| Social Skills | 0.865 | 0.896 | 0.590 |
| Political Skills | 0.891 | 0.916 | 0.646 |
| Project Performance | 0.829 | 0.875 | 0.540 |

Table 3
Discriminant validity – fornell - larcker criterion.

| Variables | PC | PP | PS | SS | AVE |
|---|---|---|---|---|---|
| Project Complexity | **0.708** | | | | 0.502 |
| Project Performance | –0.181 | **0.735** | | | 0.540 |
| Political Skills | –0.027 | 0.668 | **0.804** | | 0.646 |
| Social Skills | –0.075 | 0.520 | 0.759 | **0.768** | 0.590 |

*6.1.2.2.1. Heterotrait - Monotrait Ratio (HTMT).* The HTMT criterion clearly leaves behind classic approaches to discriminant validity assessment such as Fornell-Larcker criterion and partial cross-loadings. This approach achieves high sensitivity and sensitivity rates through all conditions. Heterotrait-heteromethod is the evaluation of correlation of indicators across concepts measuring different phenomenon (Henseler et al., 2015). If the HTMT (heterotrait-heteromethod) value of indicators that belong to two different constructs is smaller than one; then this means that the two constructs differ from one another (Henseler et al., 2015). HTMT is compared to a threshold and value higher than the threshold means that discriminant validity did not establish.

- HTMT.85 (Clark and Watson, 1995; Kline, 2011),
- HTMT.90 (Gold et al., 2001; Teo et al., 2008) and
- HTMT inference - assessed by using bootstrapping routine.

Bootstrapping procedure provides with the confidence intervals where upper confidence should be below 1 (Valaei et al., 2016). If HTMT value is ≥1 this means that the null hypothesis has been accepted, which indicates lack of discriminant validity (Henseler et al., 2015). Table 4 shows HTMT results.

### 6.2. Structural equation model

After the establishment of measurement model adequacy, the bootstrapping routine procedure has been applied for evaluation of structural model and hypothesis testing. Structural model is assessed by determining the relationship between path coefficients among the variables or constructs under study (Hair et al., 2017). The variance described ($R^2$) of the endogenous constructs and the level of significance of all path estimates create the goodness of the theoretical model (Chin, 2010). According to Henseler (2017), researchers while using PLS path modeling should first examine the direct effects of hypothesized path model and then perform additional analysis involving moderating and mediating effects. The results depict R-square value for endogenous construct to be satisfactory (0.473) as it is falling in the acceptable range (Henseler, 2017; Hair et al., 2011; and Chin, 1998). Analysis of structural model relations reveal that project complexity has negative relationship (–0.163) with project performance, this has further been verified by checking its significance level i.e. *p*-value (0.040) with the help of bootstrapping routine. All the hypothesis testing results are illustrated in Table 5 and Table 6 below.

Table 4
Discriminant validity – Heterotrait - Monotrait Ratio (HTMT).

| Variables | PC | PP | PS | SS |
|---|---|---|---|---|
| Project Complexity | | | | |
| Project Performance | 0.275 | | | |
| Political Skills | 0.170 | 0.751 | | |
| Social Skills | 0.217 | 0.559 | 0.835 | |

Table 5
Model summary.

| Constructs | R | $_R2$ | Adj. $R^2$ | St. Error |
|---|---|---|---|---|
| | 0.6878 | 0.473 | 0.466 | 0.050 |

Predictors: Project complexity (technical), social skills and political skills.

As per the results provided in the above table, 0.473 value of $R^2$ depicts that 47.3% fluctuations or variance in endogenous (dependent) construct i.e. project performance is explained by exogenous (independent) construct i.e. project complexity, social skills and political skills. Hence this can be concluded that the model being tested has a moderate level of predictive quality and accuracy (Hair et al., 2011; Henseler et al., 2009; Chin, 1998). Graphical representation of the model results are shown in Fig. 2.

#### 6.2.1. Moderation analysis

Partial least squares – structural equation modeling technique suggested by Rigdon et al. (2010) was used to check moderation effect of political skills and social skills on the relationship of project complexity and project performance. From the below table results - Table 6, our first hypothesis has been supported i.e. project complexity – technical has significant negative link with project performance (β = –0.163, $t$ = 2.054, $p$ = .04).

In our second hypothesis it was hypothesized that social skills moderate the relationship between project complexity-technical and project performance making it stronger or improving it. Results in Table 6, support this hypothesis (β = 0.239, $t$ = 5.323, $p$ = .000). Also if we look at the effect size ($f^2$ value = 0.107), means that omitting or dropping this construct will have less than small effect or no effect. The value of R-square (0.520) has improved and the total effect results in acceptance of our second hypothesis.

According to Lee and Yun (2017) and Ferris et al. (2001), social skills as a moderator helps to improve overall performance, this relationship has been confirmed in present study. The only difference in this research study with social skills as a moderator and in prior research is that, the social skills were observed for managers and management personnel, whereas in our research investigation social skills have been evaluated with respect to project managers.

Another reason that could be the cause of less strong moderation in our second hypothesis is; political skills appeared to have a significant and very strong impact on the relationship of project complexity and project performance, and it would be save to say that people having political skills do not possess social skills at all. Any individual working in a project team or any other team can have either one of these skills.

i.e. political or social skills. Graphical representation of the model results are shown in Fig. 3.

Table 6
Moderation analysis.

| Hypothesis | Relationships | Beta | St. Error | T-values | Decision | P | $f^2$ |
|---|---|---|---|---|---|---|---|
| H1 | PC - > PP | –0.163 | 0.083 | 2.054 | Supported * | 0.040 | |
| H2 | PC x SS - > PP | 0.239 | 0.045 | 5.323 | Supported ** | 0.000 | 0.107 |
| H3 | PC x PS - > PP | 0.373 | 0.053 | 7.002 | Supported *** | 0.000 | 0.214 |

$P < .1$.
* $P < .05$.
** $P < .01$.
*** $P < .001$.

The third hypothesis theorized that political skills moderate the relationship between project complexity- technical and project performance making it stronger or improving it, and the results in Table 6, this has been supported ($\beta = 0.373$, $t = 7.002$, $p = .000$). Also the effect size($f^2$ value = 0.214), shows that omitting or dropping this construct will have medium to high effect. The R-square value has also improved.

Azim et al. (2010) proved in his qualitative study that project complexity can be countered for, by not just hard skills but soft skills as well. This supports our third hypothesis that having political skills helps face project complexity resulting thereby in improved project performance or project success. Graphical representation of the model results is shown in Fig. 4.

### 6.2.2. Blindfolding procedure

PLS SEM approach judges the quality of the structural model by measures of its predictive capabilities (Hult et al., 2018; Henseler et al., 2014). Therefore, this study used blindfolding procedure that provides calculated Stone-Geisser's $Q^2$ value i.e. 'an evaluation criterion' to confirm the predictive power of the cross-validated PLS path model (Hair et al., 2017; Ringle et al., 2012). The predictive power of the PLS path model is confirmed if the $Q^2$ value is greater than zero for latent endogenous variables (Hair et al., 2017). The $Q^2$ value for the endogenous variable project performance is 0.355 that confirm the quality of the study model through its predictive capabilities (Table 7).

## 6.3. Discussion and conclusions

Based on the references from literature and the empirical findings of a questionnaire based investigation, this study fills a research gap and adds to the body of knowledge by a theoretical model which brings innovative perceptions and insights on the relations between project complexity - technical and software- projects performance in the light of moderating

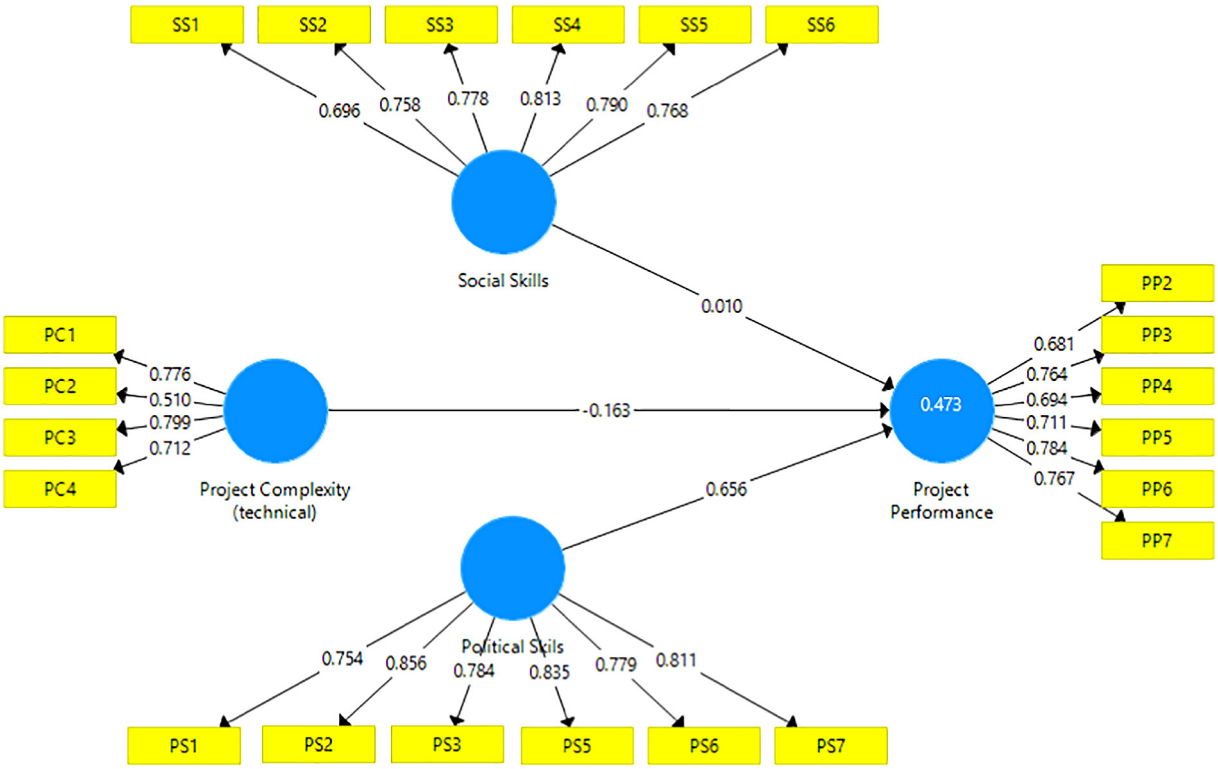


Fig. 2. Model showing structural model results (path analysis).

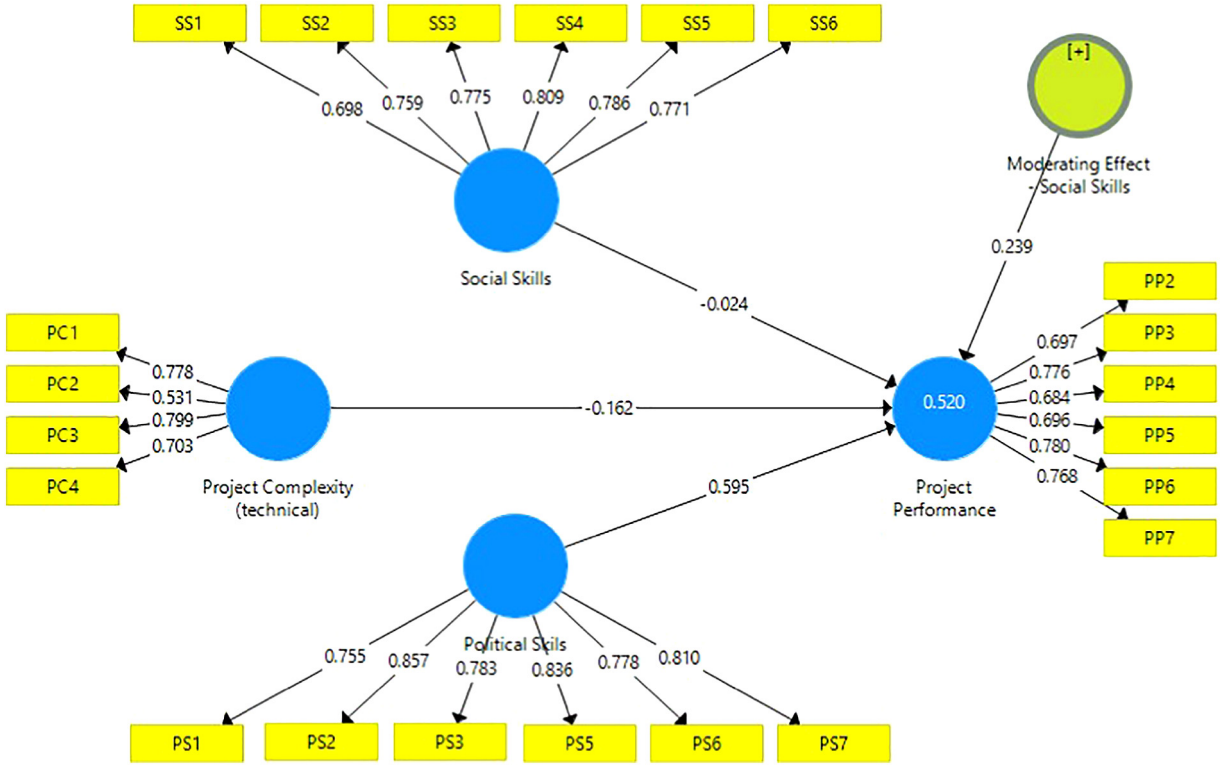


Fig. 3. Model showing moderating effect of social skills on the relationship between project complexity and project performance.

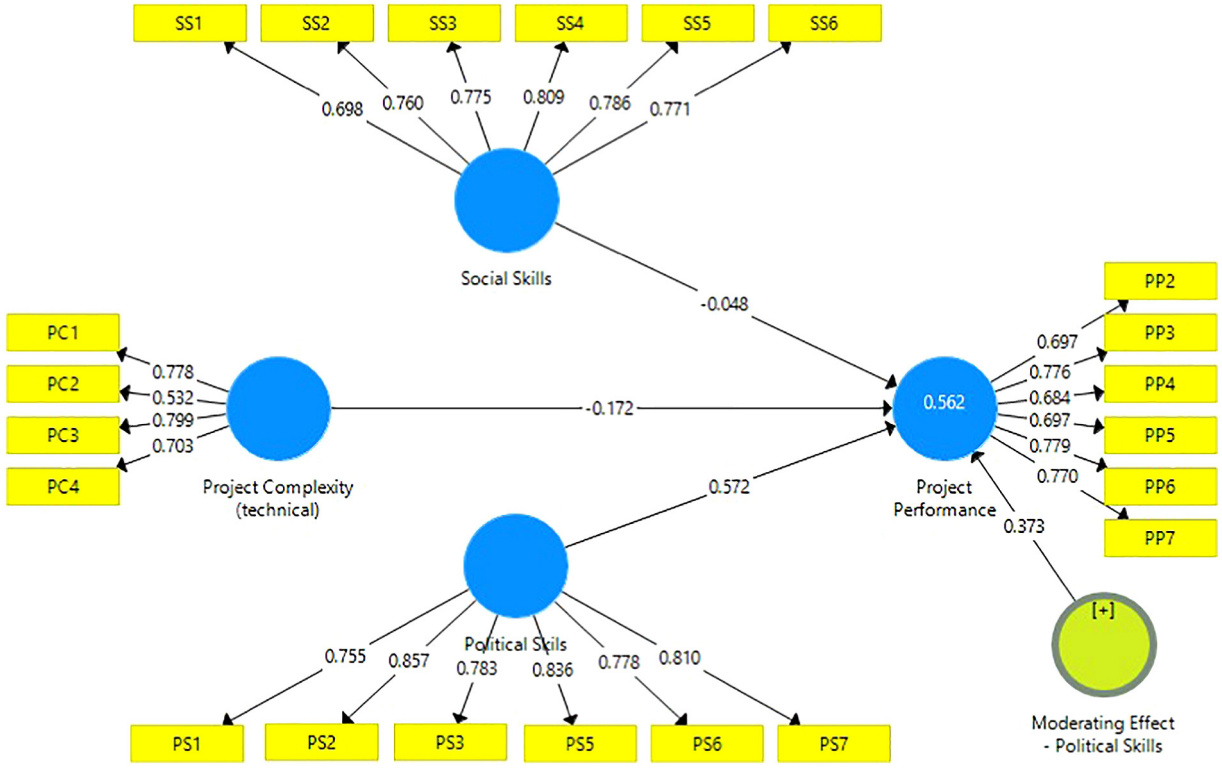


Fig. 4. Model showing moderating effect of political skills on the relationship between project complexity & project performance.

Table 7
Blindfolding procedure calculations.

| | SSO | SSE | $Q^2$ (=1-SSE/SSO) |
|---|---|---|---|
| Political Skills | 1452.000 | 743.353 | 0.488 |
| Project Complexity (technical) | 968.000 | 762.610 | 0.212 |
| Project Performance | 1452.000 | 936.658 | 0.355 |
| Social Skills | 1452.000 | 851.986 | 0.413 |

role of social and political skills combined – which has never been validated and empirically tested before.

Previously Müller and Turner, 2006 empirically tested a model where both hard (project types – culture, complexities, strategic impact) and soft (leadership style) aspects of project success were studied along with project success being a dependent variable. This research study is one of few studies to combine and investigate behavioral and technical aspects in one model and examine their impact on one of the emerging topics like project performance. The objective of this study has immensely been achieved and that was to test and validate the moderating effect of soft personality traits like political and social skills between technical and complex concepts like project complexity – technical and software-project's performance.

The results of this research work are a proof that in order for the organizations to succeed and improve their project performance, project team members employed on projects should have these behavioral traits along with the technical knowledge. Because without coordination, emotional intelligence, social astuteness, genuineness, truthfulness and integrity one cannot succeed, be it a project based organization or an individual. The results of this research study are in line with contingency theory, which according to Zhu and Mostafavi, (2017) is a new perception for evaluating and understanding project performance. The fundamental concept of contingency theory is that it helps project manager's better plan and accomplish projects of different complexities or conditions according to the situation, compared to "one-size-fits-all" approach (Zhu and Mostafavi, 2017). Contingency theory has been acknowledged as a promising methodology in the literature (Levitt et al., 1999; Müller, Geraldi and Turner, 2012, Hanisch and Wald, 2014).

The results of the research introduced a new perspective to look at the project performance or reason of project failures i.e. behavioral attributes of project managers. This has been supported by the results that technical complexities faced by the employees and teams resulting thereby in project failures or poor project performance; can be overcome if the participants in the project or project team members have relevant personality traits (political and social skills). Project-based organizations should pay close attention to the behavioral attributes of the employees while finalizing project teams. Proper combination of such skills (both technical & behavioral) in a team can not only improve project performance but also help organizations face less failure and develop a healthy working environment. Another way to explain this is through Trait-Activation Theory (TAT) (Tett and Burnett, 2003). Trait activation theory is defined as a process in which employees show their traits when they come across or are confronted with trait related conditions (Tett and Burnett, 2003). Consequently, project or organization performance then becomes function of work traits and personality. These work related traits activate those personality traits in an individual if a match is found between the situation at hand and employee's personality.

### 6.4. Theoretical implications

This research work added to the body of knowledge in a number of ways. Firstly, this study has pioneered in introducing and empirically testing a novel framework of project complexity and performance relationship using interactive effects of social skills and political skills in the software industry. This entails study's vivid usefulness from the practitioner's perspective, allowing project managers to better understand the linkages among complexities, socials skills, political skills and project performance.

Eriksson et al. (2017) suggested in their paper to investigate project performance in relation to project's technical complexity. Our findings revealed a significantly negative relationship between project complexity and software projects performance. This was consistent with recent studies that demonstrated comparable results (Bosch-Rekveldt et al., 2018a, 2018b; Kermanshachi et al., 2018; Floricel et al., 2016). It is not just the technical factors in a project that impacts project performance but there are some behavioral attributes that practitioners need to have in order to cope with project difficulties and then add to project outcomes. Lee and Yun (2017) explored social skills as a moderator between job performance and R&D personnel's knowledge sharing and shared future avenue of exploring social skills as a moderator with activities that are performed in the group i.e. R&D employees job performance and project performance. This research is the one of few initial studies to empirically test and validate the moderating role of social skills and political skills in a project based context in the software industry. These findings reaffirm the views of Gansen-Ammann et al. (2017), Notari et al. (2014) and Treadway et al. (2013).

### 6.5. Managerial implications

The managerial implications for this study include a new perspective to look at the software-projects performance or reason of project failures i.e. behavioral attributes of project managers. Managers should give prioritized attention to the behavioral features of employees while finalizing project teams. To understand the fact poor project performances due to complex nature of projects can be overcome if employees hired have both or at least one skill i.e. political or social (Zuo et al., 2018). Project leaders may also gain advantage of their embedded socio-political skills in leadership roles within broad social networks. Socio-politically skilled project professionals would accurately comprehend the members and project's needs, and then can use their influence to help others to achieve project results. The study also establishes greater understanding and recognition of how project managers could include social and political skills to manage complexities in sophisticated projects

(Deming, 2017; Gansen-Ammann et al., 2017). Unfortunately, the focus of training funds for project professionals is largely driven by developmental need for technical capabilities, rather enhancing social and political skills. These are essentially required to improve project communication, build supportive relationships, implement strategies, effective and efficient resource allocations and even help stakeholders in understanding project technical features alignment with complex projects goals. Knowledge-intensive industries such as software industry require continuous investments in human capital to effectively enhance project capabilities and even sustain competitive advantage. Project leaders also need to recognize the mobility factor of human resource with greater emphasis on workforce planning, recruitment and onboarding based on project complexity demands and the need for socio-political skills. Lastly on-facility trainings, workshops and seminars can prove to be helpful to employee's development.

### *6.6. Limitations and future avenues*

Despite this study's theoretical and practical contributions, there are certain limitations that need to be considered. The data used in this research is taken from leading software houses in Pakistan, which falls in the South Asian developing nation's context as compared to the developed nations. Therefore, it would be an interesting knowledge addition to research if future studies could validate the results and findings of this study in other cultural and business context through cross-sector learning. Further, this study considered only the technical dimension of project complexity, however in order to capture a more holistic view the other dimensions i.e. organization, institutional and market complexity (Floricel et al., 2016) should also be employed in determining software-project performance in forthcoming researches. Also due to time constraints, this study employed cross-sectional and self- reporting survey design which raises problems of reverse causality and personal bias. Moreover, the unit of analysis has been taken as individuals (i.e. project managers).

Future research could employ longitudinal and multi-level approach (Cheng et al., 2006; Ullah Khan, 2014) to study the same model with dyads as unit of analysis, where multi-dimensional project complexity questionnaire could be filled by project teams whereas political and social skills questionnaires could be filled by project managers or project heads. Lastly, future investigations may employ other methodological approaches such as consistent PLS i.e. PLSc-SEM or CB-SEM to highlight emerging recommendations based on divergent positions and to advance understanding on beneficial features of other SEM techniques.

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