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The Impact of Project Manager Competence and Team Building on Project Success: The Mediating Role of Organizational Culture in Pakistan's Public Sector Construction Projects

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Abstract

These are typical and commonplace with public sector construction and arise from many and varied sources all too frequently – including delayed construction, construction cost overruns and uncertain results – all of which consume much of the country's development spend. This research will be continued in order to answer the questions asked about how PM competences and team building affect the project success, and how the role of organizational culture in project success is. The survey respondents were 263 individuals from public sector projects in Pakistan, and were measured on following scales: PM competence (fifty items), team building (fifty items), organization culture (fifty items) and project success (forty-eight items) all of which were measured on a five point likert scale. Partial least squares structural equation modelling was used to estimate the hypothesised mediation model, which was tested by resampling 5,000 times the data by bootstrap. The measurement model was good with the Cronbach's alpha ranged between 0.850 and 0.862, composite reliability ranged between 0.889 and 0.897, the average variance extracted (AVE) ranged between 0.537 and 0.592, the all the heterotrait monotrait correlation was below 0.85. 31.4 percent of the variance in organizational culture and 49.5 percent of the variance of project success were explained using the model. Project manager competence ($b=0.203$), team building ($b=0.258$) and organizational culture ($b=0.417$) were all directly positively related to success; the project manager competence and team building had positive effects on culture ($b=0.258, 0.203$, respectively). The indirect path (through culture) was considerable for competence (0.164) and team building (0.117); both of these relations were complementary partial mediation. This means that, for public bodies building up projects, the role of competent

managers and the construction of one's team is a direct benefit, not only due to the project, but due to the organisational culture that was formed by using the project.

Keywords: project manager competence; team building; organizational culture; project success; mediation; PLS-SEM; public sector construction; Pakistan

1. Introduction

The translating of public funds into public capability is achieved mainly by what a developing country constructs; this is creating public capability. Roads, water schemes, hospitals, schools, power stations and government buildings have development budgets as do public bodies, and what makes a difference on whether they are an asset or a waste is all through the work of those public bodies. This burden in Pakistan rests on other organizations like National Highway Authority (NHA), provincial communication & works departments (CWDs), water and power agencies and has grown in the past ten years due to the investment in corridors and the public construction portfolio (Maqbool, Sudong, Manzoor, & Rashid, 2017).

Delivery is poor. According to the research conducted in the construction industry of Pakistan, it is being observed that there is recurring issue of delay, escalation, scope and quality problems and it is mostly prevalent in a public project as compared to similar projects in the private domain (Abas, Khattak, Habib and Nadir, 2022; Imam & Zaheer, 2021; Maqbool et al., 2017). The circumstances of procurement, financing mechanisms, the acquisition of land or political intrigue are the well-known reasons. But a second line of research suggests that there are important keys of variation which are more linked to the project itself, namely: competence of the project manager, project team assembly and project team management, and organisational culture in which the project manager and team operate (Belassi & Tukel, 1996; Müller & Turner, 2010). Even if it was a bigger, similar challenge, in the same procurement regime, and same fiscal setting, the outcomes of the projects vary – it is not a question of procedure, it is a question of people and organisation.

There are three human factors that support this study: One being as to project managing. A series of research projects have connected what project managers know and do to what their projects deliver since Katz (1955) differentiated technical, human and conceptual skills and Boyatzis (1982) wrote about the underlying characteristics that lead to successful performance (Crawford, 2005; Geoghegan & Dulewicz, 2008; Müller & Turner, 2007 and 2010). In construction projects, coordination and time of decision making at each step of the project is important and therefore the amount of attention on planning, technical judgement, communication and conflict handling becomes an added burden on the projects (Ahadzie, Proverbs & Olomolaiye, 2008; Hyväri, 2006). The second one is team building. Multi-disciplinary teams are put together to complete construction projects for the public and have little or no experience working together and many departmental loyalties that are at odds. Literature on classic group development and high performing teams has proven that these elements – such as trust, clarity of role, communication and commitment – don't just occur in isolation; instead they have to be achieved and they will be reflected in the work product (Katzenbach & Smith, 1993; Tuckman, 1965). Team cooperation/performance are the outcome of the quality of teamwork in projects (Hoegl & Gemuenden, 2001; Salas, Sims, & Burke, 2005; Scott-Young & Samson, 2008).

The third one is on a higher level than the level of the project itself: the organisational culture. Culture can be considered a set of assumptions, values and norms that are shared by its

members, enabling to make sense of their organization (Schein, 2010), and it has been associated with overall organizational effectiveness (Cameron & Quinn, 2011; Denison & Mishra, 1995), and project effectiveness in particular (Belassi, Kondra, & Tukel, 2007; Yazici, 2009). In a public construction agency, it might be a rational answer, as formal rules are robust, and informal 'rules' govern how and when they are used, at times a good manager, a good staff, can make the potential become actual and good work or the opposite. It gives rise to a second thought: competence and team building can be successful in part by impacting the culture in which they're working. This potential mediation is what this paper explores as its heart.

There are a few bits of Pakistan's information about these questions. In mega construction projects, Maqbool et al. (2017) correlated emotional intelligence, competencies and leadership of project manager with the success of construction project, Imam and Zaheer (2021) established that the leadership states of team members is linked to the success of the project while Watanabe, Shafiq, Nawaz, Saleem and Nazeer (2024) found that the emotional intelligence of successful projects is associated with conditions in the organizational culture. What the local literature lacks is an integrative test which brings together the skills of the manager and team building and organisational culture into one model and then, the public sector question, 'Does culture serve as a conduit to the people centred effects on outcomes? An important distinction for policy. In the event of a direct pay off, it is important that human resources are being identified, recruited and trained based on their competency degree. However, if team building doesn't occur in the culture it instills, one time team building events will not be effective. If culture is altered, but the work context is not then cultural interventions with both will underdeliver.

Similarly, in this study, a new model has been developed and tested for validity (based on survey of 263 professionals of public sector construction projects in Pakistan) using the PLS-SEM. It does so, in three ways. To the best of our knowledge this study is the first study that investigates the effect of direct and indirect (through cultural mediated) effects of Project Manager competence and team building on projects success in public construction organizations of Pakistan. It provides a complete record of the diagnostics and criterion validity as well as SAMPLING ADEQUACY - COMMON METHOD BIAS - to make visible the extent to which evidence supports the Conclusions. It also provides some estimates of levers for agencies with limits, taken from these estimates, including some low-cost delivery capacity improvement options, that is of particular interest. The remainder of the paper involves literature review, generation of the hypotheses, description of the method, findings and finally the implications, limitations, and further research directions.

2. Literature Review and Hypothesis Development

2.1 Project success

The development program of successful projects was developed practically as a yard stick and expanded to multi-layered construction. First, the classic criterion was iron triangle of time, cost and quality (Atkinson, 1999), which is well-understood, but has been poorly completed since its conception. De Wit (1988) has pointed out the difference between project management success (as measured by the costs, duration and quality of the project's performance) and project success (as measured by the project's objectives). Pinto & Slevin (1988) included client satisfaction and use of what was actually produced as outputs in the criteria. Then, success on dimensions and

on time horizons—from project efficiency to customer impact and business results to preparing for the future—was decomposed into weights by project type similar to those proposed by Shenhar, Dvir, Levy and Maltz (2001). Cooke-Davies (2002) helpfully distinguishes between: What – Success criteria; How – Measure of success; What helped – Success factors. When put in a multi layered structure, aware as it was in later reviews, of stakeholders (Jugdev & Müller, 2005; Ika, 2009), it arises from a narrow delivery component.

This is not the case in public buildings. A public project reports to a budget auditor for both scope and cost approval, a user for functionality – will the asset work, and monitoring organisations for value – an issue several years after the project is delivered. Failure to take all these audiences into account in any measure of success would therefore be a misrepresentation of the measures of success which are used in practice. The scale used in the current study has thus been considered as a multi dimension perceptual phenomenon (Akinfenwa, 1999; Pinto & Slevin, 1988; Shenhar et al., 2001) which includes the following dimensions: time deadline, budget, quality, customer satisfaction, goal attainment and longterm value

2.2 Critical success factors in construction

There is another thread, on how to get it done – not on what is deemed to be success. Pinto and Slevin (1987) have made a list of ten key issues including people and communication apart from the style of implementation. Belassi and Tukel (1996) categorised the long list into four groups: Project Manager, Team, Organisation and the External Environment and propose that the project outcome is based upon the interactions between the groups. The same holds true for the studies on construction, in which the cooperation of teams (and parent organisations) is routinely one of the few factors that need to be considered to ensure success (Gunduz & Yahya, 2018; Hyväri, 2006), and skills of project manager are one of the top factors influencing the success of capital projects throughout the project life cycle (Belout & Gauthier, 2004, as adapted by Abas et al., 2022 for Pakistan). The current design is correlated with the Belassi and Tukel grouping by the competence to manager group; as well as the team building to the team group and the organisational culture to the organization group (constant to public sector). Also influences the mediation logic: The mediation logic for the manager and team groups is stored in the organization group and all mediation to have an influence passes through this organization group.

2.3 Project manager competence

Good-bye Taxonomy, hello Evidence! El-Sabaa (2001) however found that it is the human skills that are more important than the technical ones, Odusami (2002) put a questionnaire to the construction participants and ranked communication, leadership and decision making as the most important of a PM's skills, and Turner and Müller (2005) took their data result from the broad survey to conclude that the manager's style and competence must also be taken into the list of additional project management success factors that were not highlighted by the others. Then, there were empirical studies by Müller and Turner (2007, 2010) that showed an interdependency of leadership competences (cemented by emotional competences and managerial competences) and success which in turn was project type dependent. Geoghegan and Dulewicz (2008) correlated some aspects of leadership (resource management, empowerment) to project success and Anantatmula (2010) presented a study which examined

the relationship between aspects of leadership (defined leadership roles and processes) and project performance.

These findings are put in perspective by construction research, in scenarios like the construction site in question. Ahadzie, et al (2008) have created a competency based measurement of construction project managers in developing countries; Hwang and Ng (2013) identified required competencies by the construction industry in building and project management; Fisher (2011) listed building and project management competencies attributed to successful construction project managers and the latest literature search revealed clear and well understood base of skills, knowledge, and competencies within the construction industry, which was correlated to successful construction project managers (Dziekonski, 2017; Ghorbani, 2023; Jokanović Đajić, Ciric Lalic, Vujičić, Stankov, & Petrovic, 2024; Ochoa Pacheco, Coello-Montecel, Tello, Lasio, & Armijos, 2023). However, Maqbool et al., 2017 assigned to Pakistan have reported that psychological attribute of emotional intelligence, competencies of project manager and project success were directly related in construction industry. According to this literature, competence is perceived as having multiple dimensions, namely, leadership, competence in the management of risk, competence in a domain of expertise, competence in decision making, competence in communication, competence in conflict management, competence in planning, etc, and competence is expected to have a direct impact on the outcome.

H1. *Project Management is a positive influences dimension towards a successful completion of Public Sector Construction Project in Pakistan*

2.4 Team building

Competence is an issue between the individual leader, team building is an issue between the people in the Group. Tuckman (1965) described the process groups experience on their way to becoming a team (forming, storming, norming and performing); Belbin (1981) identified the way the team is put together and how the team's composition leads to balance and how balance leads to the team outcomes; and Hackman (1987) noted that the effectiveness of this team is not up to chance, but to the way the task is designed, the composition of the team and the context. Hence Katzenbach and Smith 1993 found that it's all about behaviour: there is a new 'illuminating difference' between real teams and working groups. After reviewing the literature, Hoegl and Gemuenden (2001) identified a set of parameters that describes quality of team work in relation to project performance and team member satisfaction; Salas et al. (2005) in another 10 year literature review on the project process identified a small set of parameters that covers a large number of parameters in team work and Mathieu et al (2008) identified that both will predict team performance, the set of team processes and emergent phenomena (team trust).

There is also some indication that the construction is in the same direction. Factors that strongly predict the success of capital projects are: Team factors (Scott-Young & Samson, 2008), Team training and motivation enhances the working of construction labour in a developing country context (Tabassi & Bakar, 2009) and Shared leadership creates trust and cohesion correlated with the success in mega construction projects (Ali et al., 2021 and Imam & Zaheer, 2021). It is an assessment of the team building - in regard to trust, team work, clarification of roles, exchange of ideas, political and human efforts to improve the situation for the team, commitment to the goals and the first expected results.

H2. Team building has a positive effect on the success of public sector construction projects in Pakistan.

2.5 Organizational culture

Organisational culture is a complex phenomenon and can be understood as having a set of shared values, tacit assumptions and membership norms that inform the behaviour of those who make up the institution (Schein, 2010). Through two research programmes – Denison and Mishra (1995) related it to the characteristics of involvement, consistency, adaptability and mission, and Cameron and Quinn (2011) related it to clan, adhocracy, market and hierarchy orientations. Please note, projects setting is consistently found in every project. Gray (2001) identified the link between a climate that encourages doubt and participation and success, Kendra and Taplin (2004) determined that values need to be consistent between manager, team and organization for the project to succeed, Yazici (2009) related clan oriented cultures to project and business performance and Belassi et al. (2007) related culture to the outcomes of NPD. The research findings of construction community showed that project culture (goal alignment and trust elements) are important factors affecting project performance and satisfaction (Nguyen & Watanabe, 2017), construction project management practices have a positive effect on construction project outcomes, with construction project culture as a mediation variable (Chen, Yin, & Lyu, 2024 and Osman, Liu, & Wang, 2023).

Again, more heathen thought from the public agencies – the way a team works (whether they like teamwork, ideas, resource themselves, hold each other to account, whether they communicate, whether they respond well to change) should make a difference to the success or not of a project. In the context of this work, those six dimensions is a measure of culture.

H3. Organizational culture has a positive effect on the success of public sector construction projects in Pakistan.

2.6 People centered antecedents of culture

Culture isn't just about those doing it, it's also about what is the output of culture. Schein (2010) connects norms in a culture to what leaders pay attention to, their responses to critical events, allocation of resources and their selection of reward criterion. A good PM sets the example for accountability and openness through a good culture by planning openly, dealing with conflict in a good way and presenting information and facts. Same in the team – if the team believes in and treasures the ideas, if they feel the goals are theirs, they can collaborate and show it to the other members, to the organisation and support it as part of the team. With such a logic, the people centred factors must have an impact as far as environment culture is concerned.

H4. Project manager competence has a positive effect on organizational culture.

H5. Team building has a positive effect on organizational culture.

2.7 Organizational culture as a mediating mechanism

A mediator is a "variable that is a consequence of an antecedent variable, is an antecedent of the outcome variable in turn and that may or may not carry part or all of the causal influence of the antecedent variable" (Baron & Kenny, 1986, p. 1175). Currently, in the absence of an added distribution on a product of these coefficients,

the effect of the indirect path is estimated and then compared to a bootstrap confidence interval (Preacher & Hayes, 2008). Direct mediation occurs when both direct and indirect effects occur simultaneously and are significant to the outcome; direct mediation that is not significant is related to the outcome and indirect mediation that is not significant is related to the opposite of the outcome (called complementary partial mediation); direct and indirect mediation that are not significant, but either of both paths is towards the outcome is complementary partial mediation if one towards the outcome, the other away from the outcome is partial mediation; direct is not significant, indirect is significant and indirect towards the outcome is indirect-only mediation). In this context the behavioural chain is rather simple. Same way culture (H4 and H5) creates same type culture which bears the impact on the way the delivery is done (H3), part of each antecedent should have impact on the culture style. Positive local evidence can be gleaned from the work of Watanabe et al (2024) found out how the attributes of managers contribute to their success in the construction field and transmission aspects can be found in manager-related literature on leadership, teamwork etc. (Aga et al., 2016; Hamed, 2024; Han et al., 2024). The mediation hypothesis invokes a variety of additional potential questions: Are there intervening patterns with respect to each of the antecedents and how often does the culture route “activate”? The mediation hypotheses because they result in different reform implications are separated out.

H6. *Organizational culture mediates the relationship between project manager competence and project success.*

H7. *Organizational culture mediates the relationship between team building and project success.*

2.8 Conceptual framework

Note: All the hypotheses are summarised in Fig. 1. The three constructs are project manager competence, team building, organization culture and project success; the project manager competence and team building constructs located in the first and second row are exogenic constructs and the third row (organization culture) and the last row (project success) are meditational constructs. There are three shifts of ‘Path into Culture’ in Ontario teaching-secondary: Direct Path (H1, H2, H3), Path into Culture (H4, H5) and Indirect Path (H6, H7).



Figure 1. Conceptual framework of the study.

3. Method

3.1 Design

The study is positivist, deductive since the hypotheses are set up deductively based on theory and original facts with subsequent testing by the facts collected from the field. It's a cross sectional study of people all describing the world of public building projects in which they've had the most intimate experience. The following two options may require a word. Firstly, they're perceptual constructs, that includes our senses! In the public sector, the project audience is one where informed practitioner judgement has a long standing history as an indicator of project reality (Pinto & Slevin, 1988), competence, teamwork, culture and even success and there are very few archival cost records. Secondly, the outcome portrays the four constructs in the perspective of the individual, rather than of the project, thus providing a voice for the feelings of the persons in the public construction environment.

3.2 Participants and procedure

The target population will be the professionals; who are involved with the process of carrying out the construction activities in public sector in Pakistan especially Panel Headers-Project Managers/Engineers of any project, site supervisors, Planning and Monitoring Officers and other Technical Officers of Governmental Departments/Agencies/Auto authorized Authorities. A problem with this type of sampling was that there was no sampling frame for this kind of professional and so respondents were sampled via their professional networks, known to the researcher. This questionnaire was sent via an on-line shared form. Action was taken to ensure that responses were produced voluntarily and informed consent was gained on the first page, as well as asking participants for confidentiality and making sure they did not have to give 'good' or 'bad' answers. The platform submissions' data is anonymised when analysing, and the information that allows to trace an account identifier to the participants is erased. There were 263 response forms which were sent in for screening, all of these forms were analysed. With a maximum of three arrows going to each construct in the model (Hair, Hult, Ringle, & Sarstedt, 2022) and sufficient power for medium sized effects at the five per cent level (Cohen, 1988) this sample size easily surpasses the estimations for the chosen estimator.

3.3 Measures

Project manager competence was configured by seven items that included leadership, risk management, technical knowledge, decision making, communication, conflict resolution as well as planning; all these items were worded affirmatively and on a 5 point likert scale: Strongly disagree – 1; Disagree – 2; Not sure – 3; Agree – 4; Strongly agree – 5 (the instrument is listed in Appendix A). Implementation of the following six elements of Team Building was used: Team building elements that contribute to developing trust, co-operation, role clarity, freedom of idea sharing, coherence in stress and commitment to project goals (Hoegl & Gemuenden, 2001; Salas et al., 2005). The six items of Organizational Culture used were: Support for Teamwork, Encouragement of Innovation, Resourcing of Teams, Accountability, Transparency: Communication, and Constructive Response to Change (Cameron & Quinn, 2011; Denison & Mishra, 1995). The six aspects of project success (schedule, budget, quality, satisfaction of stakeholders, achievement of objectives and longer term value following) (Atkinson, 1999; Pinto & Slevin, 1988; Shenhar et al., 2001) were used. Some previously set parameters: demographic (gender, age, highest qualification and years in work experience etc.).

3.4 Data screening

The numbers are in order of the sequential screening done and recorded. The accounts' identifiers were then deleted - duplicate sources (based on accounts' identifier from the platform) were removed from the accounts and the number of responses equaled to 263. There were no missing cases, all constructs had 100% return for all retained records. There was one civil matter that needed to be determined. In contiguous columns, one project success item for accomplishing intended objectives was counted twice, as the result of a form building error. No one had different administrations and administrations were averaged and treated as one indicator avoiding double counting one component in the indicator; A robustness check that included only the 1st administration yielded no change in the results. Finally, checks were made for evidence of careless responding (response styles). No respondent was eliminated because the same answer was not given to all of the 25 questions nor could a respondent be found who was close to straight-lining at "zero". Thus, there are 25 indicators (7 competence, 6 team building, culture and success) and 263 full answers at the end of the analytical phase achieved.

3.5 Analytical strategy

The choice of PLS-SEM is for four reasons. Conversely, using mediator model, the fluid movement can be modeled, and the direct path can NOT be approximated by piecewise regressions nor can the indirect path. The number of blocks is estimated with a technique termed partial least squares (PLS), and as the sample size (263 wells) is below 30, Hair et al. (2022) is used. In this study the distribution of constructs is moderately skewed (skew: -1) hence, is not multivariate normal. This study aims to exact and clarify what is relevant to the method which is recommended Hair, Risher, Sarstedt, & Ringle, (2019) the target construct (project success). These two simultaneous equations belong to the owners of the structural model, the culture on competence as well as success on the three predictors (as indirect effect is shown by the product of paths).

The innermeasurement model used the standard practice from a standard PLS software, Ringe, Wende, & Becker, (2015), and path weighting scheme was used to get estimation, with the Reflective Measurement Model (Model A) used. Based on the traditional criterion of 0.70 (Nunnally, 1978), the measurement model and the reliability was evaluated by using outer loadings, Cronbach's alpha, composite reliability, average variance extracted and the Fornell-Larcker criterion (1981) and the heterotrait monotrait ratio (Henseler, Ringle, & Sarstedt, 2015). Based on Kaiser (1974) and the advised procedure by the study (Podsakoff, MacKenzie, Lee & Podsakoff, 2003) the Kaiser Meyer Olkin measure (KMO) and measure of Common Method Variance (CMV) are used as measure of sampling adequacy. Assessment of the structural model has been made by looking at inner variance inflation factors, coefficients of determination, read against Chins' (1998) benchmark and cross validated (blindfolding) read against Cohen's (1988) benchmark. Coding of the mediation was based on suggestions from Zhao et al. (2010) results, that the indirect effects were deemed as a function of their bootstrapping CIs, with all hypothesis testing being conducted using 5000 resamples bootstraps.

4. Results

4.1 Respondent profile

A summary of the respondents is presented in Table 1 and profile of the respondents is presented in Figure 2. The male-female ratio is quite similar: 59.3 per cent males to 40.7 per cent females

– that is substantial for women as well, considering that the construction sector in general is men's thing. There is an age profile which is linked with “active age-highest” category (31-40: 34,2 percent) and “active age group” (20-30: 28,1 percent). The educational level distribution of the sample reveals that the educational level group good – bachelor (42.6 percent) and master (42.2 percent) is about equal and in minor numbers the MS or M. degree holders. Phil and a PhD. In terms of work experience, most of the respondents are in the 1-5 year band, 6-10 year band, and a significant minority of 16-years or more, meaning that the ratings are an amalgamation of the views of both the current delivery workers as well as more experienced ones. The constructs focus on a specific population group – the engineers, planners and project workers in the first level of the population who see the results and who exemplify a managerial competence, a team functioning and organization culture.

Table 1. Demographic profile of the respondents (n = 263)

Variable	Category	Frequency	Percent
Gender	Male	156	59.3
	Female	107	40.7
Age	20-30 years	74	28.1
	31-40 years	90	34.2
	41-50 years	69	26.2
	51 years and above	30	11.4
Qualification	Bachelor's degree	112	42.6
	Master's degree	111	42.2
	MS / M.Phil	28	10.6
	PhD	12	4.6
Work experience	1-5 years	110	41.8
	6-10 years	91	34.6
	11-15 years	43	16.3
	16 years and above	19	7.2

Note. Percentages are computed over the 263 complete responses analysed.

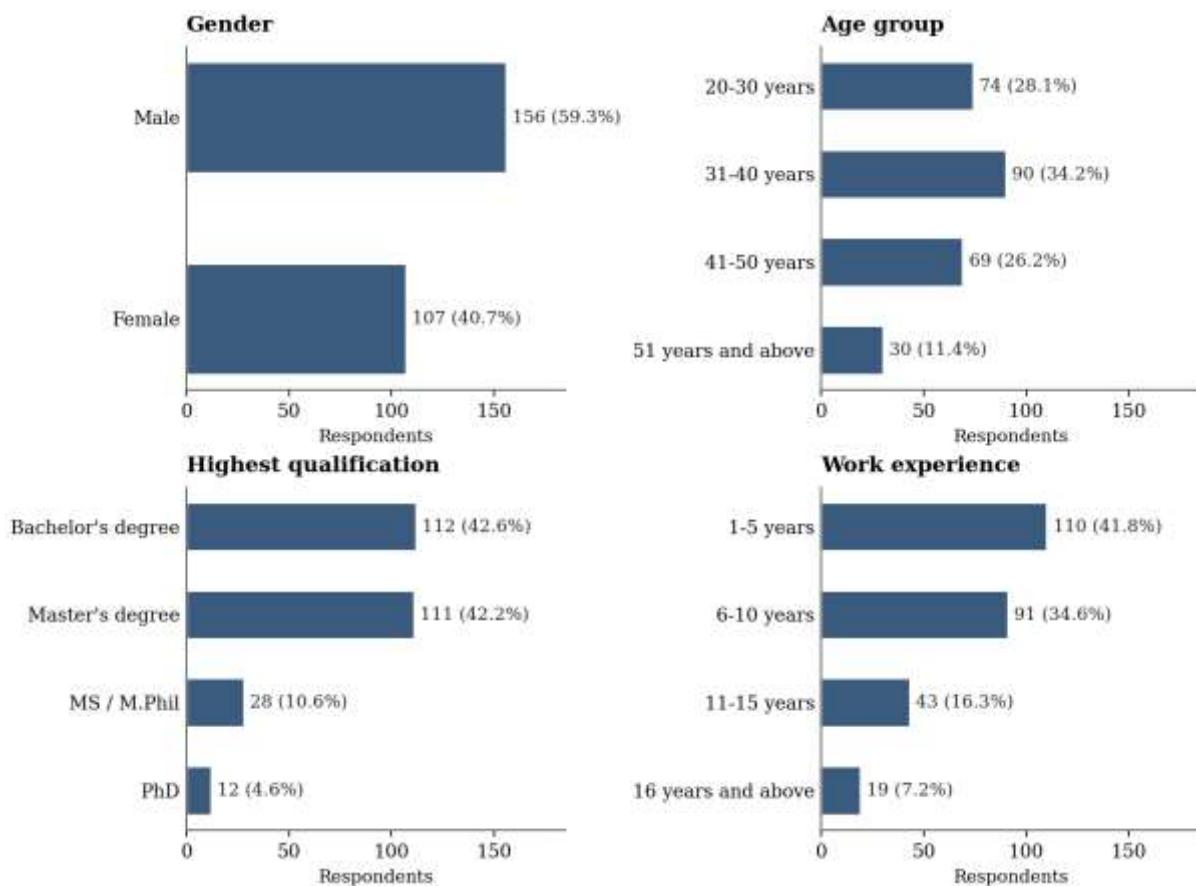


Figure 2. Demographic profile of the respondents (n = 263).

4.2 Descriptive statistics

Descriptive statistics of level-construct is shown in Table 2. This is because all 4 points are above the midpoint of the scale (which is 3) – i.e. all respondents rated their environments positively, although not at the top (3.619) – a point halfway through the midpoint. The standard deviations of the constructs are comparable and each is large enough to have relationships among them estimated. In all cases, there is not a very extreme skewness, which is negative, so it was slightly 'biased' towards the higher end of the scale (agreement side), and therefore the estimator used does not assume any normalisation. At the item level, the means vary between 3.56 and 3.90; and the standard deviations vary between 0.73 and 0.88. Not surprisingly, the least well rated items (and those who have worked in public construction projects will not be surprised by this) are those relating to transparent communication, a willingness to change, and trust in team; the highest rated of these are that clear roles, planning and scheduling, and cohesion under stressful circumstances are important.

Table 2. Descriptive statistics of the constructs (n = 263)

Construct	Mean	SD	Skewness	Kurtosis
Project manager competence (PMC)	3.715	0.579	-0.217	0.138
Team building (TB)	3.731	0.628	-0.556	0.618
Organizational culture (OC)	3.632	0.627	-0.203	-0.335
Project success (PS)	3.619	0.645	-0.221	-0.525

Note. Construct scores are the means of their items on the five point scale.

4.3 Measurement model

The measure (or outer loadings) model is presented in Table 3 and the outermost loadings are illustrated in Figure 3 (using a 50% or greater outer loading to the measure to the construct as a benchmark). Loadings range from 0.674 to 0.816. However, 7 indicators fail to pass the threshold (lowest score is TB-5 at 0.674 which is acceptable for guidelines Hair et al. (2022); however, for those indicators in each of the 4 constructs, if more than 1 indicator fails to meet the threshold, then all indicators were retained, which results in 18 of 25 indicators passing the threshold.

The internal consistency of both estimates (with an accepted lower-bound of .6 and an even more relevant upper-bound of .95 [Hair et al., 2022; Nunnally, 1978] for reasons that should be obvious) is good, ranging from .850 (chronbachs alpha) to .862 (composite reliability). The level of average variance extracted (AVE) for each construct is also greater than 0.50 for each construct (0.537 to 0.592 with all constructs significant), indicating that the variance of each indicator is greater than 50% of the variance of each construct, which means that they have achieved convergent validity.

Table 3. Measurement model: outer loadings, reliability and convergent validity

Construct	Item	Loading	α	CR	AVE
Project manager competence	PMC-1	0.766	0.856	0.890	0.537
	PMC-2	0.705			
	PMC-3	0.704			
	PMC-4	0.709			
	PMC-5	0.786			
	PMC-6	0.758			
	PMC-7	0.694			
Team building	TB-1	0.703	0.850	0.889	0.572
	TB-2	0.780			
	TB-3	0.803			

Construct	Item	Loading	α	CR	AVE
Organizational culture	TB-4	0.780	0.855	0.892	0.581
	TB-5	0.674			
	TB-6	0.789			
	OC-1	0.797			
	OC-2	0.816			
	OC-3	0.693			
	OC-4	0.813			
	OC-5	0.755			
	OC-6	0.688			
Project success	PS-1	0.786	0.862	0.897	0.592
	PS-2	0.807			
	PS-3	0.764			
	PS-4	0.775			
	PS-5	0.754			
	PS-6	0.729			

Note. α = Cronbach's alpha; CR = composite reliability; AVE = average variance extracted. Benchmarks: α and CR above 0.70; AVE above 0.50 (Hair et al., 2022; Nunnally, 1978).

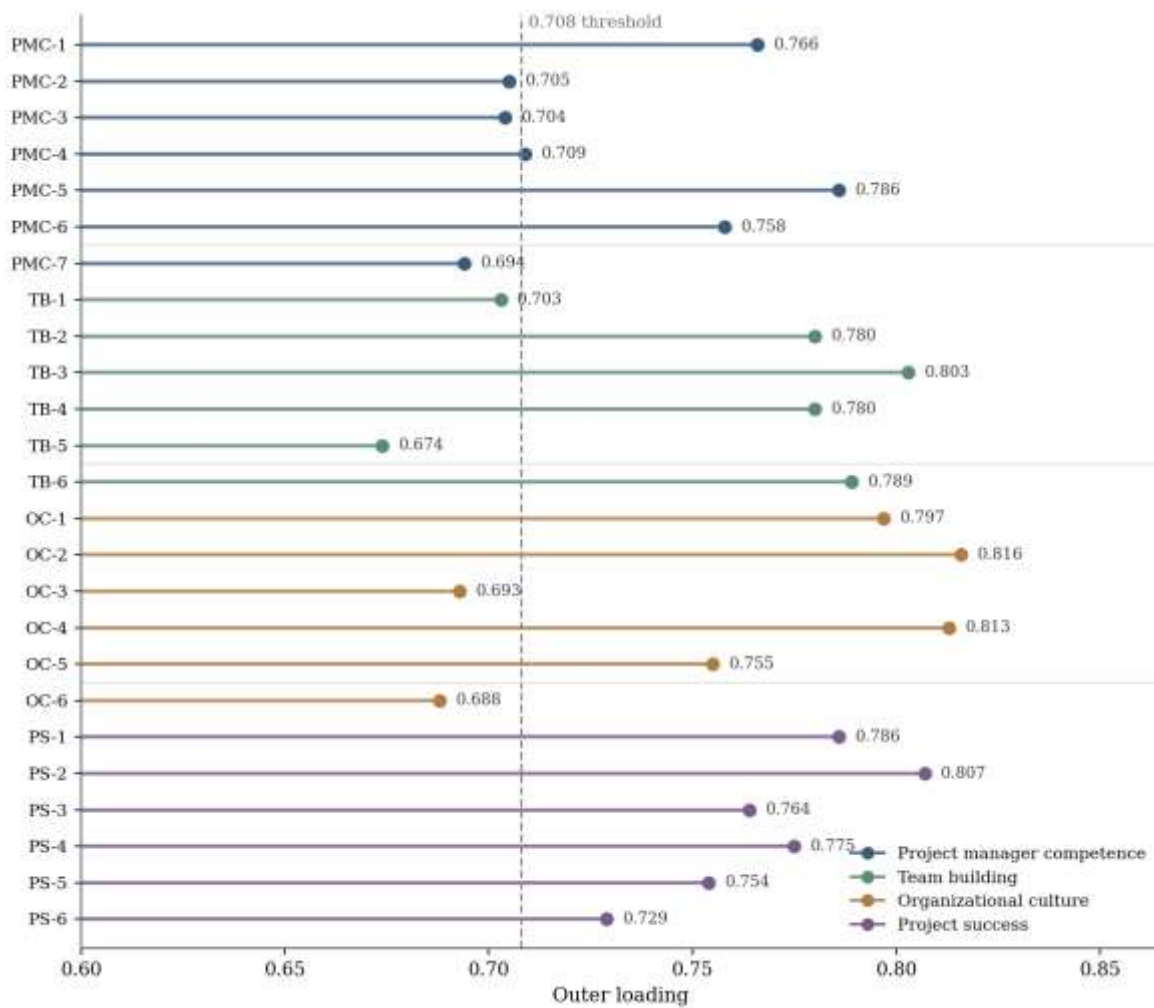


Figure 3. Outer loadings of the 25 indicators against the 0.708 threshold.

Discriminant validity holds on both criteria. Under the Fornell and Larcker (1981) test in Table 4, the square root of each construct’s average variance extracted exceeds its correlations with the other constructs. The heterotrait monotrait ratios in Table 5 provide the stricter test (Henseler et al., 2015), and they range from 0.423 to 0.728, all below the conservative 0.85 threshold, with no bootstrap confidence interval approaching one. The constructs are related, as one would expect among features of well run organisations, and even the largest ratio, between culture and success, leaves them clearly separable. Cross loadings tell the same story at the indicator level: every indicator loads highest on its own construct.

Table 4. Discriminant validity: Fornell and Larcker criterion

Construct	PMC	TB	OC	PS
PMC	0.733			
TB	0.365	0.757		
OC	0.496	0.424	0.762	
PS	0.504	0.509	0.627	0.769

Note. Bold diagonal entries are the square roots of the AVE; off diagonal entries are latent variable correlations.

Table 5. Discriminant validity: heterotrait monotrait ratios with 95% bootstrap confidence intervals

Construct pair	HTMT	CI 2.5%	CI 97.5%
PMC and TB	0.423	0.300	0.541
PMC and OC	0.575	0.470	0.672
PMC and PS	0.581	0.480	0.672
TB and OC	0.493	0.378	0.598
TB and PS	0.591	0.494	0.677
OC and PS	0.728	0.643	0.802

Note. Percentile intervals from 5,000 bootstrap resamples. All ratios fall below the conservative 0.85 threshold and no interval approaches one.

Two further diagnostics support the analysis. The Kaiser Meyer Olkin measure of sampling adequacy is 0.925, an excellent value on the usual scale (Kaiser, 1974), and Bartlett’s test of sphericity is significant ($\chi^2 = 2895.86, df = 300, p < .001$), confirming enough common variance among the items to model. Because all data come from one source and one instrument, common method variance deserves attention. Harman’s single factor accounts for 35.1 percent of the variance, well under the 50 percent warning level, and the design carried the usual procedural remedies: assured confidentiality, a reminder that there were no right or wrong answers, and the separation of predictor and outcome items into distinct blocks (Podsakoff et al., 2003). Harman’s test is admittedly a blunt instrument, and part of any general factor may simply reflect the genuine tendency of good management, good teams, supportive cultures and good outcomes to occur together in well run agencies. Either way, the modest first factor and the clean discriminant results jointly suggest that method variance is not driving the findings reported below.

4.4 Structural model quality

The reading of the structural model can be done after measures have been provided. All predictors have information regarding the construct they are measuring: the range of the inner VIF is 1.15–1.46, below the ubiquitous VIF cut-off limit of 5 and therefore no collinearity issues. The explanatory/predictive power is shown in Table 6. Based on those data the model explained 31.4 per cent (adjust R square: 30.9 per cent) of the variance in organizational culture and 49.5 per cent (adjust R square: 48.9 per cent) of the variance in project success. On Chin's scale (1998), these ratings can be considered as moderate for culture, and border on the substantial for success – as high as they can be given the relatively limited number of antecedents for this perceptual model. Now as is clear from the cross validated redundancies of 0.189 for culture and 0.296 for success for blindfolding with the omission distance of seven returns the model is not only a good predictor but one is already expecting a good predictor: that is what it is supposed to do.

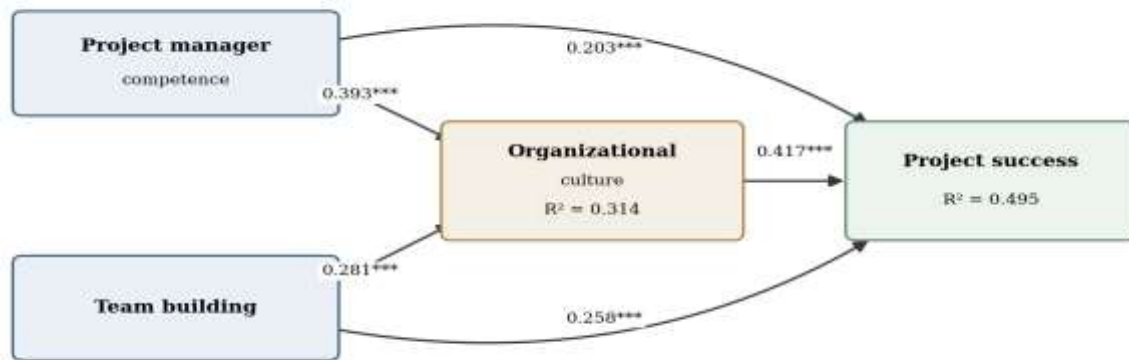
Table 6. The endogenous constructs is it explain/predict to what extent?

Construct	R ²	Adjusted R ²	Q ²
Organizational culture	0.314	0.309	0.189
Project success	0.495	0.489	0.296

Note. An omission distance of 7 is used in blindfolding to give the cross validated redundancies as Q² values > 0, which indicate predictive relevance (Chin, 1998; Geisser, 1974; Stone, 1974).

4.5 Hypothesis tests

There are five direct paths and bootstraps to those paths are reported in Table 7 along with the sizes of the effects; the estimated model is shown in Figure 4. All 5 are supported. Results: The results indicate that competent project manager is a positive predictor of team building and team culture, and a positive predictor of project success ($\beta = 0.203$, $t = 3.853$, $p < .001$), thus supporting H1. Also, opposite to H2, there is something about the direct effect of team building ($\beta = 0.258$; $t = 5.615$; $p < .001$) that previous research suggested team building effects should only be indirect and through mediating variables. From the results, it shows that there is high direct influence on Organizational Culture ($\beta = 0.417$, $t = 8.604$, $p < .001$) so that H3 is accepted. Team building ($\beta = 0.281$, $t = 5.571$, $p < .001$) and teammates' competence ($\beta = 0.393$, $t = 7.903$, $p < .001$) have a great influence on culture, as described by Hapk (2010) where the influence of leaders and collective behaviour on the norms is considerable, which supports H4 and H5. The ordering in terms of effect sizes is the same: culture affects success ($f^2 = 0.236$) is regarded as a medium size effect and competence affects culture ($f^2 = 0.195$) is also regarded as a medium size effect, while the other effects will hardly be considered worth bothering with (Cohen, 1988).



Standardised path coefficients; *** p < .001 (bootstrap with 5,000 resamples, n = 263)

Figure 4. Path coefficients from results of the structural models (standardized for n = 263).

Table 7. The direct paths' bootstrap results are shown below:

H	Path	β	SE	t	p	CI 2.5%	CI 97.5%	f ²	Decision
H1	PMC → PS	0.203	0.053	3.853	< .001	0.102	0.308	0.059	Supported
H2	TB → PS	0.258	0.046	5.615	< .001	0.168	0.347	0.104	Supported
H3	OC → PS	0.417	0.048	8.604	< .001	0.318	0.507	0.236	Supported
H4	PMC → OC	0.393	0.050	7.903	< .001	0.297	0.491	0.195	Supported
H5	TB → OC	0.281	0.050	5.571	< .001	0.184	0.381	0.100	Supported

Note. Standardised coefficients and 5000-bootstrap re-sample percentile based confidence intervals. Cohen (1988) compares the magnitudes of f² when they are equal to 0.02, 0.15 and 0.35 for small, medium and large effects respectively. (1) PMC = project manager competence, (2) TB = team building, (3) OC = organisational culture and (4) PS = project success.

4.6 Mediation analysis

Table 8 present the indirect, direct and total effects and Figure 5 plots these effects and also the 95% bootstrap confidence interval. With regard to step 1, mediation, the confidence interval of the indirect link between competence and success – via culture is (0.112, 0.222) not including 0, which supports H6 as there is also a direct link between competence and success. There is an indirect path from team building to culture (0.117 (0.072 – 0.167) with 0 not included, and the direct path is significant as well, thus supporting H7 as complementary partial mediation. But if both are considered – the total effects of the two antecedents – the results are almost equal – 0.367 for competence, and 0.375 for team building, which also suggests that the two people centred ones are of equal importance. The figure for culture is different - 44.7 per cent out of the total effect on competence is through this route and 31.2 per cent of the total effect of team building. In both of these, there is something – not what’s being built, but passing through what is being built – with the organisation context, that helps in the success.

Table 8. Project impacts: indirect, direct and total impacts on success

Effect	β	CI 2.5%	CI 97.5%	VAF
PMC → OC → PS (indirect)	0.164	0.112	0.222	44.7%
PMC → PS (direct)	0.203	0.102	0.308	
PMC → PS (total)	0.367	0.268	0.461	
TB → OC → PS (indirect)	0.117	0.072	0.167	31.2%
TB → PS (direct)	0.258	0.168	0.347	

Effect	β	CI 2.5%	CI 97.5%	VAF
TB → PS (total)	0.375	0.287	0.465	

Note. These are denominated: indirect effects over the total effect (or value added by the indirect effect (VAF)). Percentile confidence intervals to the 0.05 significance level were found.

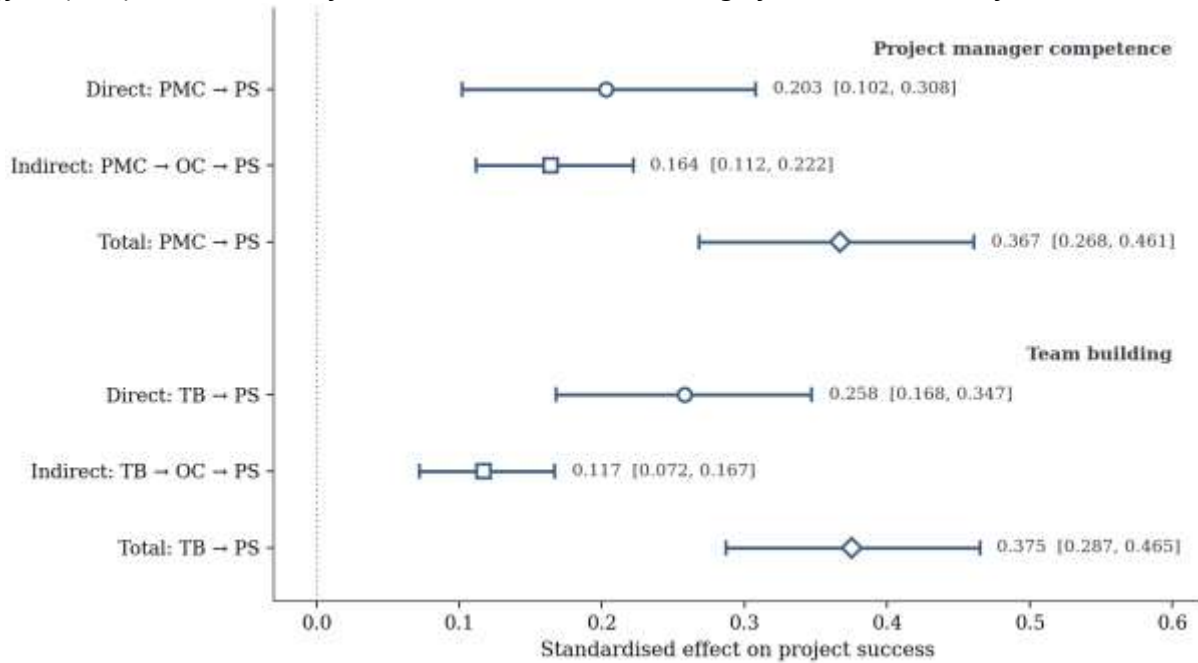


Figure 5. The 95% bootstrap confidence intervals are direct, indirect and total effects on project success.

4.7 Robustness checks

Two probes are used to explore evidence to investigate conclusions. The average of the two editions of the same duplicated success item, in fact, was not used in the re-estimation of the model (and, as indicated above, the two editions would have to be the same for each respondent anyway), thus this has no impact on the estimates. In addition, the estimates were not done in forms that were hastily completed because of the lack of straight line responders in screening. The bottom table of the table collection shown as Table 9 is an summary of the choices of hypothesis.

Table 9. Puts findings of a test into words and asks questions regarding the test. Explain in brief about hypothesis testing.

H	Hypothesis	Result
H1	Project manager competence improves project success	Supported
H2	Team building improves project success	Supported
H3	Organizational culture improves project success	Supported
H4	Project manager competence strengthens organizational culture	Supported

H	Hypothesis	Result
H5	Team building strengthens organizational culture	Supported
H6	Organizational culture mediates the competence to success relationship	Supported
H7	Organizational culture mediates the team building to success relationship	Supported

Note. The mediation in H6 and H7 is complementary partial mediation, in that the same sign for both the indirect and direct effects are significant (Zhao et al., 2010).

5. Discussion

5.1 Findings in context

The picture that results is coherent (ordered/tidy/neat). This agrees with results of previous studies on competence research done in Pakistan in the last two decades including Maqbool et al., (2017); Müller & Turner (2007, 2010); Geoghegan & Dulewicz (2008) who showed that competent project managers make positive contributions towards chances of success from the onset of the project. Direct coefficient ofapprx. If, however, it is a competency where the role of the manager is to help communicate between designers, contractors, departments and financiers, and where dealing with approvals driven processes (Ahadzie et al., 2008, Hwang & Ng, 2013), it seems likely that the competency will be reflected in more effective planning, better communications and faster recovery from impacts of such risk-becoming-true.

The most important ESFF that influence most directly is the Culture of organization. It aligns with project research on cultural orientation with its performance aspects (Belassi et al., 2007 and Yazici, 2009) and construction studies that take into account cultural goal alignment, trust and supportive norm in the projects (Nguyen & Watanabe, 2017 and Van Thuan & Hai, 2024). So there should be some "magnus" effect publically, but: Where there is consistency and depth on the structure of the process, the actual practice will vary as a function of the use of the process: are issues eked out early or late in the process; is the promised team there or something else; is there measurement of learning or blame? It is those norms that are measured in terms of the culture items.

The evidence in the antecedent paths is made up of field evidence which would normally be given on a theoretical basis to a claim. Actions (modelled, rewarded and tolerated by the leaders) and the collective behaviour explain less than a third of the variance (0.393 and 0.281, respectively) according to Schein (2010). Culture – that is to say – is not a ‘given’ to agencies. Firstly, it consists of people appointed into the agency and the team design that are inspired by the agency – two staples of management!

Results of the mediations are not intended to supplant the primary narration, but to be added to it. The importance of both indirect paths radicle - the effect is at the level of the project - better competence, better teamwork and at organisation level - the effect is on the culture which is how it has an impact on the project. Interestingly, no team building path was seen leading to here, but (Aga et al., 2016) found that the whole effect of transformational leadership on success was found, and (Watanabe et al., 2024) found that culture was the moderator or transmitter of the manager's attributes here, in this same industry. It could be a proximal process of work

(Hoegl & Gemuenden, 2001; and Salas et al., 2005), as well as overlap each other in terms of a culture of teamwork (set of norms). Last quantitative detail is that the near equals total effect of the 2 antecedents – manager = 0.367, team = 0.375 – means that agencies are not really forced to choose between investing in manager or investing in teams as different combinations of the 2 in varying proportions produced similar total effects.

5.2 Theoretical implications

There are three implications in terms of theory. First, it quantifies the interaction that Belassi and Tukel (1996) put in the framework; the group of the manager has a measurable impact in the organisation group (here 44.7 per cent), and the group of the organisation group has an impact on the group of the manager (here 31.2 per cent). It is no surprise to conclude then that focussing on culture as a means (and not an end) will not only make architecture “culturally sexy”, but the “shape of architecture for success” will change. Second, the results continuously support the Moderation evidence given by the same industry 'Watanabe et al., (2024)'; However, it is also identified that the evidence of mediation from the same industry also ignores the fact that implications of culture have multiple causal factors, of which one will lead to an underfitted model. Third, they support Schein's (2010) perspective on culture formation in a public sector where culture is barely researched and enhance the competence and teamwork tradition (Müller & Turner, 2010; Scott-Young & Samson, 2008) with some empirical insights in this under-researched sector.

5.3 Practical implications

The estimates are estimates of how the public construction agencies have reformed their program. Project managers' appointment and development is the first lever. For competencies, there are two payments: one at the time of delivery and another through the competent manager model which is proven to generate a competitive advantage. So those who can forward-plan, communicate well and have demonstrated their capacity for operating in a battle environment, as well as who have proper qualifications (structured development and certification for serving managers) and who have been post-seasoned of proven competency to be a scarce delivery asset, will bring that 0.367 return on investment.

Second lever is to adopt the attitude of team building as culture building. Almost one in three team building's impact goes through the organizational environment, so that the occasional team event falls short, the impact is only on the project not the norms. Processes for producing products and articulations of roles and matrices, open exchange of ideas, trust and shared responsibility for team products must be developed and must be embedded in the project "life cycle" processes (in role charters, team mobilisation sessions, follow-ups etc.) as 'what did the team learn?' rather than 'who was to blame?'. Norms that are created in this way are continuous and persistent – beyond the life of the project that created them.

The most cost-efficient of the three levers is realized with the direct investment in culture with the third lever. There is direct agency in many hands to use the six dimensions measured – as an agenda they can work on and each of these dimensions will inform accountability as a learning experience: support teams to work together; practice ideas from the bottom-centre; provide the teams with everything they have and need to get the job done; make accountability a learning experience; take communication seriously – open & sincere; and embrace change openly and positively. Then go to the direct coefficient – the effect is largest on culture and no capital is

required for any of these actions – a very important point during fiscal consolidation. The third, less rambunctious, is to data – and as you will have noted more thorough checking and recording will have to be done on the ground – and so too will be the case for the agencies who hope to be able to run their missions on the data.

5.4 Limitations and future research

Understand the outcome/results within the constraints of the design. It is important to recognize that this causal ordering – from people to culture to outcomes – is theoretical, and so other causal ordering elicited by the data (e.g. reversed or reciprocal ordering) are not ruled out. The common method variance would be minimized if not completely eliminated by employing at the same time, the same instrument and the same respondents during the study (as Harman's Factor indicated). The heterotrait monotrait correlations (HRCs) indicate that there is correlation between the constructs, as the HRC value for the largest construct is quite high (0.728). If so, the purposeful sampling and limited scope (unlimited to the public construction sector of Pakistan) should be mentioned and caution asked for when generalizing the results to this population.

All of them are limitation that is a way to go ahead. Multi source designs could be used that would permit the rating of various constructs by the manager, team members and team supervisor to avoid the single informer bias. Longitudinal panels of that same would be able to measure evolution of culture and could directly examine the temporal ordering. But how to relate back back perception to archival data regarding cost, time and scope would relate back to successful results, which would be known by the auditors. Comparative samples (public and private, and country to country) would clear up the separation of the structural from the local coefficients. A competing values framework (Cameron & Quinn, 2011) profile of culture may give an idea as to the role of the orientations. Two ideas are particularly worth highlighting: multilevel, sampling a number of respondents in each project, to distinguish what they perceive from what the project reality in the organisation is, and embedded mixed methods work – a few agencies – which would make the statistical mediation observed here into an organisational process visible and manageable to the reformers.

6. Conclusion

The present study aimed to find answers to the following propositions: Is there any effect of two people centred factors on successful completion of public sector construction projects of Pakistan? Is a culture of organisation beneficial in this respect? The explanation of the data of a mediating model identified using the mediation PLS-SEM indicates that the variable competence of the project manager directly affects the chances of success in project management, similarly, the variable team building has a direct effect on the chances of success in project management; competence of the project manager directly affects the chances of culture, the variable building of the team directly affects the chances of culture, and the mediated model transfers a significant portion of the variance in the competence of the project manager (44.7 percent) and in the team building (31.2 percent). The answer to the first question is thus as follows: People do things through projects and also people do projects through culture. Construction in real life situations for public bodies. Choosing and developing effective managers, choosing and developing real teams and using the organisation settings (Team work, Accountability, Resourcing, Communication and Openness to change) as a delivery system in itself are all critical. All of these levers do not require any fund raising since they help leverage the capacities the agencies already

have – that's what makes them valuable, particularly within an environment of constrained development budgets, but public activity demands.

Declarations

Author note. This article is derived from the first author's MS Project Management thesis at Mohammad Ali Jinnah University, Karachi, completed under the supervision of the second author.

Funding. This research received no external funding.

Conflicts of interest. The authors declare no conflicts of interest.

Ethics. Participation was voluntary and anonymous; informed consent was obtained from all respondents, and no personally identifying information was retained in the analytical dataset.

Data availability. The data that support the findings of this study are available from the corresponding author on reasonable request.

Appendix A. Measurement instrument

Each statement was rated on a five point scale from one for strongly disagree to five for strongly agree.

Project manager competence (PMC)

PMC-1. The project manager demonstrates strong leadership skills.

PMC-2. The project manager effectively manages project risks.

PMC-3. The project manager has adequate technical knowledge relevant to the project.

PMC-4. The project manager makes timely and informed decisions.

PMC-5. The project manager communicates project goals clearly to the team.

PMC-6. The project manager effectively resolves conflicts within the project team.

PMC-7. The project manager possesses strong planning and scheduling skills.

Team building (TB)

TB-1. Project team members trust each other.

TB-2. Team members collaborate effectively to achieve project objectives.

TB-3. Roles and responsibilities within the team are clearly defined.

TB-4. Team members are encouraged to share ideas and feedback openly.

TB-5. The team works cohesively even under pressure.

TB-6. Team members are committed to achieving project success.

Organizational culture (OC)

OC-1. The organization supports teamwork and collaboration.

OC-2. The organization encourages innovation and continuous improvement.

OC-3. Management supports project teams with adequate resources.

OC-4. The organizational culture promotes accountability and responsibility.

OC-5. There is open and transparent communication within the organization.

OC-6. The organization responds positively to change during project execution.

Project success (PS)

PS-1. The project was completed within the scheduled time.

PS-2. The project was completed within the approved budget.

PS-3. The project met its defined quality standards.

PS-4. Project stakeholders are satisfied with the project outcomes.

PS-5. The project achieved its intended objectives.

PS-6. The project delivered long-term value to the organization.

Note. Owing to a form building error, item PS-5 appeared twice in the administered questionnaire; the two administrations were identical for every respondent and were averaged into a single indicator, as documented in Section 3.4.

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