Management Dynamics

Volume 19 | Number 2 Article 3

August 2020

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Recommended Citation

Gomero, Geleta Demera; Bhat, Mohd Abass; and Obssilencha, Kefyalew (2020) "Determinants of public construction works contract performance Application: An Empirical survey," *Management Dynamics*: Vol. 19: No. 2, Article 3.
DOI: https://doi.org/10.57198/2583-4932.1021
Available at: https://managementdynamics.researchcommons.org/journal/vol19/iss2/3

DETERMINANTS OF PUBLIC CONSTRUCTION WORKS CONTRACT PERFORMANCE APPLICATION: AN EMPIRICAL SURVEY

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ABSTRACT

The overall purpose of the study was to identify determinants of public works contract performance, in Benishangul Gumuz Region. The researchers used survey method for the study and data were collected from the target population by means of self-administrative questionnaire and sample was selected by using stratified sampling. Descriptive and inferential analysis was employed to analyze the determinants of public construction works contract performance. The consequence shows that all determinants like contractor performance, consultant performance, contract management, and risk management significantly and positively affects public works contract performance; on the other hand cost overrun significantly and negatively affects public works contract performance. Therefore, the researchers recommends that existing low level of public works contract performance should be improved in order to facilitate public service delivery and properly use of public money (wisely use of public resource). Moreover, contractors, consultants and clients should increase their performance. Therefore, owners, contractors, consultants and the concerned Government bodies who struggle to promote growth of public construction works contract should start at giving tremendous effort on this very prominent area. Following this public construction can be used as an engine for basic delivery of public service especially for the poor's and that improving public construction projects performance hence progress the welfare of the society at large.

Keywords: *Public construction, works contract, contract management, cost overrun, Performance*

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INTRODUCTION

Construction is a major sector for the development of infrastructure capital that is central to growth and improved quality of life; however governance failures can lead to the construction of the wrong infrastructure, poor quality construction and excessively high prices for work (Kenny, 2010).The construction industries are one of the dominant sectors and have significant effect on one countries economy. In these industry contractors, consultants, and owners are the prominent players. More importantly, the performance of contractors, consultants and owners have affected by factors like shortage of man power, planning and scheduling, contractors financial capacity, too many change orders from the owners, owners financial constraints and contractors use of unacceptable construction techniques (Sweis et al, 2014).

Moreover, the critical factors influencing the construction projects success are soundness and work force, planning and control, project quality and past performance (Ahmad et al., 2015). Overall performance of contract is influenced by contractors past performance on similar projects, commitment of employee, perceived importance of time for performance, relationship with sub-contractors and the number of design variation during construction (Proberbs et al, 2003).Despite the construction industry has a prominent role in country`s development but however, developing countries, faces problems like poor practice of project management tools, techniques, lack of adapting appropriate project management procedure and management challenges in the important aspects of construction management practice such as quality, safety, time, cost, risk, resource and contract management (Tadesse et al, 2016). During the Ethiopian GTP I (Growth and Transformation Plan one) period (2010/11-2014/2015),the construction industry on average grew at 28.7% per annum and the GDP contribution of the industry has been raised to 5.6% and approaches to the sub-Saharan Africa average 6% (World Bank, 2016).

However, many projects in Ethiopia experienced, cost overrun, it is difficult to complete projects in the allocated cost and time, due to factors like increase in the cost of construction materials, poor planning and coordination and change in initial design (Nega , 2008).From the challenges of construction contract management: managing cost, schedule (time) and qualities are the triple constraints inter depend on each other and make the problem sever (Abebe, 2003). In this background present study aspired to address the current critical problems of public construction projects like; low quality of the construction, low performance of public works contract, risk management problems, poor contract management practice, cost overruns, construction delay, and construction quality problems. Therefore, this study sought to fill this research gap by investigating these factors affecting Public Construction Works Contract Performance in public construction sector.

REVIEW OF RELATED LITERATURE

Public works contracts are contracts for commercial interest concluded in writing between a contractor and a contracting authority, which have as their object: either the execution, or both the execution and design, of works related to one of the activities like building and civil engineering, installation and building completion work or the execution, by whatever means, of a work corresponding to the requirements specified by the contracting authority. A work is defined by the directive as the outcome of building or civil engineering works taken as a whole e.g. a hospital, theatre or bridge that is sufficient of itself to fulfill an economic and technical function, i.e. Fully equipped and completed" (World Bank, 1994).In Ethiopia, Many projects experience cost overrun and thereby exceed initial contract amount; the number of public building construction projects is increasing from time to time. However, it becomes difficult to complete projects in the allocated cost and time. Taking into account the scarce financial resources of the country, cost overrun is one of the major problems of

projects in Ethiopia and the most important causes of cost overrun were found to be inflation or increase in the cost of construction materials, poor planning and coordination, change orders due to enhancement required by clients, excess quantity during Construction (Nega, 2008).

Management Challenges of Construction Industry in Ethiopia

In Ethiopia, the level of construction project management practice in terms of adapting general project management procedures, project management functions, tools & techniques to be unsatisfactory. Particularly the level of practice in terms of safety, risk and time management was found to be very low. Regarding challenges, the identified problem areas are time, cost and risk management and these are become the most challenging issues for procurement contract administration professionals in managing in public organizations. The deviation from plan or predetermined requirements on these issues also reinforces these results. The amount of safety, risk and time management schedule slippage ranges between 61-80% and that of planed costs and other variables such as risk, quality, resources utilization and safety deviates in the range of 21-40% from predetermined requirements, planned or anticipated at the beginning (Tadesse et al, 2016).

Key Performance Indicators

Key performance indicators include the following influential elements; value, efficiency, speed, innovation, complexity and impact value. Defined as the ratio of scope over cost, this KPI is one that should be maximized. Value is a function of Project Stakeholder Management, namely meeting expectations and fostering engagement. Scope is treated as an output and cost is treated as an input, so the more utility per unit of cost the greater is the value for money efficiency. Defined as the ratio of cost over time, this KPI is also one that namely team performance and leadership. Cost in this case is treated as an output (value of work completed) and time as an input, so the more money spent per unit of time the more efficient is the delivery process speed. Defined as the ratio of scope over time, this KPI is another that should be maximized. Speed is a function of Project Procurement Management, namely outsourcing strategies and parallel supply chains. Scope is treated as an output and time as an input, so the more utility provided per unit of time the faster is the delivery process innovation. Defined as the ratio of risk over cost, this KPI should be maximized too. Innovation is a function of Project Communications Management, namely knowledge management and research-informed learning. Risk is treated as an output (innovation leads to development risks) and cost as an input, so a higher level of risk per unit of cost reflects the search for better ways of doing things. Complexity. Defined as the ratio of risk over time, this KPI is one that should be minimized. Complexity is a function of Project Quality Management, namely excessive quality assurance paperwork and engineering over design. Risk is treated as an output and time as an input, so a higher level of risk per unit of time is a sign of project difficulty that should be avoided impact. Defined as the ratio of risk over scope, this KPI is also one that should be minimized. Impact is a function of Project Environmental Management, namely adverse sustainability outcomes and unnecessary resource consumption. Risk is treated as an output and scope as an input, so a higher risk level per unit of utility reflects unwanted environmental disruption (Langston, 2013).

STATEMENT OF THE PROBLEM

A well structure construction industry is a substantial source of employment, a sound base for revenue collection, contributes significant portion of National GDP, provides utility distribution system, provision of infrastructure, supports government to provide public service at large and enhances national competitiveness (Okpala & Aniekluu, 1988). During the Ethiopian GTP I (Growth and

Transformation Plan one) period (2010/11-2014/2015),the construction industry on average grew at 28.7% per annum and the GDP contribution of the industry has been raised to 5.6% and approaches to the sub-Saharan Africa average 6% (World Bank, 2016). Despite the construction industry has a prominent role in countries development management practice is very low. This can be expressed in lack of capacity of adapting general project management procedures, project management functions, tools & techniques. In addition, the practice of safety, risk and time management was found to be very low in turn these cause the deviation from plan or predetermined requirements. Thus the amount of schedule slippage ranges between 61-80%, and Cost and time over, risk, quality, resources utilization and safety deviates in the range of 21-40% from predetermined requirements, planned or anticipated at the beginning (Tadesse et al, 2016). However, In Ethiopia many projects experienced cost overrun and it is difficult to complete projects in the allocated cost and time, due to factors like increase in the cost of construction materials, poor planning and coordination and change in initial design (Nega , 2008). In Ethiopia construction industry lacks meeting domestic and international quality standards and also experienced by low performance (MoWUD, 2006). From the challenges of construction contract management: managing cost, schedule (time) and qualities are the triple constraints inter depend on each other and make the problem sever (Abebe, 2003). In line with this, the present study proposed aspire to solve the current critical problems of public construction projects like; low quality of the construction, low performance of public works contract, risk management problems, poor contract management practice, cost overruns, construction delay, and construction quality problems. Therefore, this study sought to fill this research gap by investigating these factors affecting Public Construction Works Contract Performance in public construction sector and to investigation will attempt answering the following research questions.

OBJECTIVE OF THE STUDY

- To determine overall factors affecting public construction works contract performance.
- To determine the influence of contractors performance, consultant performance, contract management, risk management on public construction works contract performance.
- To establish the influence of the changes in cost overrun on public construction works contract performance.
- To assess the effect of quality problems on public construction works contract Performance.
- To assess the effect of delay on the Performance of public works contract.

RESEARCH METHODOLOGY

Quantitative research approach was used for this specifically survey. This present design is an appropriate for collection of data on more than one case and at a single point in time in order to collect a body of quantitative or quantifiable data in connection with two or more variables, which are then examined to detect patterns of association (Bryman, 2012). The researcher collected data from respondents on their opinions and experiences on the factors affecting public construction works contract performance in benishangul gumuz region specifically assosa zone and target population for under study were clients, contractors and consultants who are currently the stakeholder of public construction projects in Benishangul Gumuz region Assosa Zone. The present sample size 30% of the total target population is acceptable (Mugenda, 2003) sample size of 157 respondents who are currently working as Government employees, as Contractors, and as Consultants working in their respective organizations at different management levels was included in the sample. Respondents were selected based on specific relevance to the study not their overall representativeness

to the population. All of the respondents are the stakeholders of the public construction who directly or indirectly involved in the construction activity and have relationship with public construction works contract performance in the zone. The sample size was be chosen based on some logical process before sample is taken from the universe, the sample size of present study was determined by using the formula designed by (Kothari, 2004)

$$n = (Z\alpha/2)\ 2.N.\ [p\ (1\text{-}p)]\ /\ (N\text{-}1)\ e2 + (Z\alpha/2)\ 2\ [p\ (1\text{-}p)]$$

$$n = 254.506/0.66+0.9604 = 254.506/1.6204 = 157$$

$$n = 157$$

Where;

$N = 265$

$p = 0.5$

$e = 0.05$

$Z\alpha/2 = 1.96$

n=sample size

The sampling technique used were probability sampling method specifically stratified random sampling method were used for the reason that the population is normally distributed and heterogeneous so, the purpose of using stratified random sampling method is to make the study population homogeneous within each stratum. i.e. Owners, contractors, consultants and total population is 265 Owners (145), contractors (80) and consultants (40). Relatively proportionally (n/N) where n is sample size and N is total population, 157/265 = 59%. The respondents were selected based on the proportion. i.e.59% of owner's i.e. 86 respondents, 59% of the contractors i.e.47 respondents and 59% percent of the consultants i.e. 24 respondents. Totally 157 respondents selected for survey investigation and these 157 respondents were delivered questionnaire by using simple random sampling technique or using lottery system. The questionnaire constituted two parts; the first part aims at getting the personal information of respondents and it included questions regarding gender, occupation and educational status. The second and main section of the questionnaire was designed to collect data about the overall information related to factors affecting public construction works contract performance. Data from questionnaire was coded and entered into the computer using Statistical Package for social science (SPSS Version 21) for analysis. It gives means, standard deviations, correlations and frequency distribution of each independent and dependent variable. Public construction works contract performance was regressed against the five independent variables using the multiple linear regression model and correlation analysis were under taken.

RESEARCH MODEL FOR UNDERSTUDY

Multiple Regression Model:-

$$PCWCP = \beta 0 + \beta 1CoP + \beta 2cm + \beta 3rm + \beta 4co + \beta 5cp + \epsilon i$$

Where:

PWCP = Public construction works contract performance.

COP = Contractor performance.

CM= Contract management.

RM = Risk management

CO =Cost overrun.

CP = Consultant performance

*B*0=is a constant which is the value of dependent variable when all the independent variables are zero; β1- β5are the regression coefficients or change induced by COP, CM, RM, CO & CP on PCWCP. It determines how much each (i.e. COP, CM, RM, CO &CP) contributes to PCWCP.

ei = is the error of prediction.

Hence the resultant regression model is:

$$Y(PCWCP) = \beta 0 + \beta 1COP + \beta 2PCMC + \beta 3CO + \beta 4RM + \beta 5CP + ei$$

DATA ANALYSIS AND INTERPRETATION

The questionnaires were distributed to 157 randomly selected respondents and 147 were completed and returned, giving a response rate of 93.6% and result were consistent with the study by Kogi, (2013). The collection procedures involved personal administration, follow up after dissemination of questionnaires through mobile phone calls for validation of date when they would be equipped for collection and personal collection whenever possible. The response rate was found to be sufficiently satisfactory for analysis and for analysis of the study findings. The unreturned questionnaire 10(6.4%) could be credited to delay on the part of the respondent completing and hence being unable to return back.

Table1: Rating contractor performance levels

No.	Contractor performance Levels	N	Mean	Std. Deviation
1	Doing the right job ar the right time	147	2.80	.965
2	Contractors ability to identify problems	147	2.80	.965
3	Ability to improve internal employee	147	2.57	.868
4	Contractors ability to communicate with the other parties	147	2.47	.946
5	Contractors experience	147	2.41	.920
6	Contractor's cash flow	147	2.41	.897
7	Use of high quality supplies	147	2.38	.839
8	Contractors financial capacity	147	2.35	.873
9	Extent (involvement) of Subcontracting	147	2.34	.887
10	Site management	147	2.31	.738

Source: primary data

The respondents ranked doing the right job at the right time as the highest with a mean of 2.80 and a standard deviation of 0 .965 and Contractors ability to identify problems with a mean of 2.80 and a standard deviation of 0.965 also as the highest. The respondents ranked Ability to improve internal employee in second place with a mean of 2.57 and standard deviation of 0.868 and Contactors ability to communicate with the other parties in third place with a mean of 2.47 and standard deviation of .946. Contractor experience was ranked fourth with a mean of 2.41 and standard deviation of 0.920. Contractor's cash flow ranked fifth with mean 2.41 standard deviation 0.897.

Use of high quality supplies ranked sixth with mean of 2.38 standard deviation of 0.839. Contractors financial capacity ranked seventh with mean of 2.35 standard deviation of 0.873, extent (involvement) of Subcontracting ranked eighth with mean of 2.34 standard deviation of 0.887 and Site management ranked the lowest with mean of 2.31 standard deviation of 0 .738.

Table2: Major Factors Affecting Public Construction Works Contract Performance

No.	Major factors	N	Mean	Std. Deviation
1	Contractor Perfoemance	147	4.33	1.119
2	Risk Management	147	3.33	.975
3	Cost Overrum	147	4.62	.863
4	Contract Management	147	4.15	1.257
5	Consultant Performance	147	3.52	.822
6	Quality Problem of Public Construction	147	2.76	.568
7	Delay in Public Works Contract	147	.93	.264

Source: primary data

The respondents ranked Cost Overrun as the most influential factor with a mean of 4.62 and a standard deviation of .863 and Contractor Performance with a mean of 4.33 and a standard deviation of 1.119 also as the second most influential factor. The respondents ranked Contract Management the third most influential factor with a mean of 4.15 and standard deviation of 1.257. So these are the major influential factors affecting Public Construction Works Contract Performance in Benishngul Gumuz Region of Assosa Zone.

Table 3: Test of significance of the correlation coefficient

		COP	CM	CO	CP	PWCP
COP	PC	1	.059	1.000**	-.004	.194*
	Sig.		0481	.000	.960	.019
	N	147	147	147	147	147
CM	PC	.059	1	.059	-.335**	.393**
	Sig.	.481		.481	.000	.000
	N	147	147	147	147	147
CO	PC	1.000**	.059	1	-.004	-.194*
	Sig.	.000	.481		.960	.019
	N	147	147	147	147	147
CP	PC	-0.004	-.335**	-.004	1	.201*
	Sig.	.960	.000	.960		.015
	N	147	147	147	147	147
PWCP	PC	.194*	.393**	.194*	.201*	1
	Sig.	.019	.000	.019	.015	
	N	147	147	147	147	147

Source: primary data

From the above correlation matrix, each variable is perfectly correlated with itself. Public Construction Works Contract Performance is positively and significantly related to contractor performance with pearseancorrelation of 0.194, P-value 0.019. There is positive correlation between Public Construction Works Contract Performance & contract management with pearsean correlation 0.393 & 0.00 significant level. Public Construction Works Contract Performance & cost overrun have negative correlation with pearseancorrelation -0.194 & p-value 0.019. Public Construction Works Contract Performance & consultant performance have positive correlation with pearsean correlation coefficient of 0.015 & p-value of 0.019.

Thus the relationship between public works contract and contractor performance, contract management and consultant performance was positively correlated at the significance level of p-value less than 0.05 and Public Construction Works Contract Performance is negatively correlated with cost overrun at the significant level of 5%.

Coefficient of determination (R Square)

Coefficient of determination (R square) predicted the portion of the dependent variable which was explained by the independent variables.

Table 5: Coefficient of determination

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.860*	.740	.716	.195

Source: primary data

Predictors: (Constant), consultant performance, risk management, contractor performance, cost overrun, public, contract management Reports the portion of total variation in the dependent variable Public Construction Works Contract Performance (PCWCP) Explained by the all independent variables taken together. So from the multiple regression SPSS out put the value of R squared is 0.740 which mean 74% of the variation in the dependent variable Public Construction Works Contract Performance is explained by the variation in contractor performance, risk management, contract management, cost overrun and consultant performance.

The remaining 26% of the variation in Public Construction Works Contract Performance is due to factors which are not included in the model. Thus further study should be conducted to identify the other factors affecting Public Construction Works Contract Performance.

Test of regression coefficients or model

Multiple regression models is often applied in research works to test the theoretical model. P-value indicates the strength of relationship between the outcome variable and the predictor variable. When the P-value approaches to zero it indicates there is strong relationship and when the p-value approaches to 0.05 the relationship becomes weaker and the higher the absolute value of unstandardized regression coefficient (Beta) indicates the strongest relationship between the outcome variable and the predictor variable. The unstandardized scale of Beta coefficient is ranges from -1 to 1 (Gujarati, 2004).

Table 6: Regression coefficient: Public Construction Works Contract Performance

No.	Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Bete		
1	(Constant)	-.162	.200		-.811	.419
2	Contractor Performance	.257	.049	.357	5.217	.000
3	Risk management	.168	.030.345	5.570	.000	
4	Contract management	.291	.038	.541	7.749	.000
5	Cost overrun	-.164	.064	-.198	-2.568	.011
6	Consultant performance	.226	.034	.445	6.663	.000

Source: primary data

After concluding the adequacy of the model the next step would be to test for the significance of each of the coefficients in the model.

Hypotheses:

Ho: $\beta j = 0$(no linear relationship between the dependent variable & the independent variables)

Ho: βj 0 (linear relationship does exist between dependent & independent variables)

The p-value for each coefficient is less than 0.05($\boldsymbol{\alpha}$) therefore the decision is rejecting the null hypothesis(Ho) and conclude that there is enough evidence that contractor performance, risk management, contract management, cost overrun, and consultant performance affect Public Construction Works Contract Performance at 5% significance level. From the multiple regression SPSS out put the signs of the estimated regression coefficients shows the direction of influence. Contractor performance, risk management, contract management and consultant performance significantly and positively affects Public Construction Works Contract Performance, while cost overrun significantly and negatively affects Public Construction Works Contract Performance.

The estimated coefficient of contractor performance is0.257.holding other independent variables constant, a one percent increase in contractor performance results in a 25.7% increase in Public Construction Works Contract Performance. The estimated coefficient of risk management is 0.168.holding other independent variables constant, a one percent increase in risk management results in a 16.8% increase in Public Construction Works Contract Performance. The estimated coefficient of contract management is 0.291.holding other independent variables constant, a one percent increase in contract management results in a 29.1% increase in Public Construction Works Contract Performance.

The estimated coefficient of cost overrun is -0.164. Holding other independent variables constant, a one percent increase in cost results in a 16.4% decrease in Public Construction Works Contract Performance. The estimated coefficient of consultant performance is 0.226. Holding other independent variables constant, a one percent increase in consultant performance results in a 22.6% increase in Public Construction Works Contract Performance. From the regression equation established, taking all factors (.contractor performance, risk management, contract management, and cost overrun & consultant performance) constant at zero, the public works contract in B/G Asossa zone would be - 0.162.

The theoretical regression model which is developed by the researcher:

$Y(PWCP) = \beta 0 + (\beta 1)\, COP + (\beta 2)\, RM + (\beta 3)\, CM + (\beta 4)\, CO + (\beta 5)\, CP$

Where $\beta 0$is the regression intercept; $\beta 1$-$\beta z5$ are the regression coefficients while Y(PWCP) is the dependent variable Public Construction Works Contract Performance (PWCP), COP is contractor performance independent variable, RM is risk management independent variable, CM is contract management independent variable CO is cost overrun independent variable.

And CP is consultant performance independent variable.

$Y(PWCP) = -0.164(\beta 0) + 0.257(COP) + 0.168(RM) + 0.291(CM) - 0.164(CO) + 0.0.226(CP) + ei$

The unstandardized b-values (beta coefficient) tell us about the relationship between the outcome and each predictor. Positive beta coefficient implies that there is positive linear relationship between the outcome variable & the predictors; on the other hand negative unstandardized beta value implies the negative linear relationship between the out com variable and the predictor one. For these data except cost overrun all predictors have positive b-values indicating positive relationships. As it indicated in the regression coefficients there is a positive relationship between the predictors (contractor Performance, risk management, contract management, and consultant performance) and Public Construction Works Contract Performance. and negative relationship between cost overrun and outcome (Public Construction Works Contract Performance). thus as contractor performance, risk management, contract management & consultant performance increase the Public Construction Works Contract Performance also increases. On the other hand as the cost overrun increases the public works contact performance decreases.

CONCLUSION

Construction industry is considered as an important sector in the world as it develops and achieves the goals of society. The performance of the construction industry is affected by clients, contractors, consultants, stakeholders, regulators, national economies and others. However, from the present study findings reveals the key factors affecting public construction works contract performance were contractor performance, consultant performance, contract management, risk management, quality problem and delay. From contractor performance related factors like doing the right job at the right time and contractor's ability to identify problems were the major factors, need attention during the implication; from the consultant performance related factors like lack of sufficient work experience by the consultants and absence of consultant's site staff were the influential problems in consultant performance. Similarly from factors related to contract management like lack of Coordination effectiveness and project monitoring and control problems were the significant factors which affects contact management seriously. Likewise, risk management factors are project target slippage and escalation of price (increase in the price of construction materials) were the influential factors. From factors related to cost overrun: Initial design change and inflation (increase in cost of construction materials) were the major factors contributing for the cost overrun.

Corresponding to this correlation and multiple regression analysis the following results were found; Public Construction Works Contract Performance had positive correlation with contractor performance, consultant performance, contract management & risk management at 5% significance level. On the other hand Public Construction Works Contract Performance had negative correlation with cost overrun at 5% significance level. Subsequent the estimated regression coefficients predicts that contract management as the most influential factor affecting the Public Construction Works Contract Performance with the regression coefficient of 0.291 this implies holding other variables

constant a one percent increase in contract management leads a 22.9% increase in Public Construction Works Contract Performance. Furthermore, Quality problems were most importantly caused by lack of well-trained man power, inadequate monitoring and control. This problems at the end resulted in public money wasted, low quality service delivery and increase maintenance cost. Problems related to delay cause delay were financial difficulties of contractors, lack of infrastructure, delay in supplying construction materials and rent seeking behaviors. These significant factors impacted in poor service delivery, society dissatisfaction on government service provision.

Recommendations for future research

It is recommended to develop performance measurement framework and modeling system in order to measure performance of construction organizations and projects. In addition, it is recommended to study and evaluate the most important factors as a case study of construction projects.

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