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FACTORS AFFECTING THE PERFORMANCE OF ROAD CONSTRUCTION PROJECTS, THE CASE OF BUTAJIRA TOWN ADMINISTRATION, ETHIOPIA

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ABSTRACT

This study aimed to identify factors affecting the performance of road construction projects in Butajira town in terms of the three basic performance dimensions; quality, time and cost. Primary data was collected via questionnaire from the total of 63 respondents. For the purpose of data analysis, a relative importance index was used to identify critical factors contributing to the performance problem. The finding of the study indicated that 68.3%, 38.3% and 35% of the respondents agree that there is a problem of quality, cost overrun and project delay in Butajira town road construction projects respectively. Based on the relative importance index result, among the factors that contribute for the construction projects performance problems; project managers unable to build efficient and effective project team, price escalation of construction material in the market, absence of regular meetings between authorities and other relevant stakeholders in solving the problems, and poor opportunities for managers and employees who have a good idea were not encouraged to “run with it.” were identified and ranked at first position from project managers’ competency related factors, construction resources management related factors, stakeholder management related factors, organizational culture related factors respectively. The researcher recommends continuous coordination and relationship between project participants’ through-out project life cycle in order to solve the up-coming project cost and time affecting problems, and develop project quality performance.

KEY WORDS Project performance, Project quality, Project cost overrun, Project delay.

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1. INTRODUCTION

Construction industry is a fundamental economic sector that permeates most of the other sectors as it transforms various resources into constructed physical economic and social infrastructure necessary for socio-economic development (Ogunde et al., 2017). Heggie and Vickers (2011) identified roads as essential to a country's economic and social development.

Infrastructure development is primary plan for any developing country, and Ethiopia being one of the developing nations will be anxious to implement the same. According to Ethiopian roads authority report (2008a) road is the dominant mode of transport of the country accounts for 90 to 95 percent of the motorized inter-urban freight and passenger movements. Recently there are many leading intra-town road projects that are being carried out by the Ethiopia Ministry of Urban Development and Construction. Butajira town is being one of the towns implementing leading cobblestone and asphalt road projects through ULGDP. Regardless of the industry substantial role in a country socio-economic development, the road construction sector is highly challenged by project cost and time overruns and poor quality. The success and failure of any construction projects depend on its performance, which is measured based on timely completion, within the budget planned, required quality standards and customer's satisfaction. Moreover, Projects must meet budget, schedule, safety, and quality goals to be regarded as a success (Jekale, 2004). In Ethiopia, the study conducted by Tadesse et al, (2016) indicated that construction projects' deviation from predetermined schedule ranges between 61 to 80% and the deviation from predetermined costs and quality ranges between 21 to 40%. This deviation is found to be high when we compare it with other African countries.

Even though many researches have been conducted on the Ethiopia road construction projects performance and challenges, most of them were tried to investigate the factors that affect construction project performance focused on single type of construction project (Wondwossen, 2013; Yohannes, 2017; Samuel, 2020), none of them has carried out study on the topic dealing with factors affecting performance of cobblestone and asphalt type of road construction projects. Hence, there is lack of sufficient empirical evidence to understand whether the critical factors of project performance vary across different types of road construction projects. Objectively by identifying the main factors affecting the performance of different type of road construction projects; this research contributes to the present literature by bridging the existing theoretical gap.

2. LITERATURE REVIEW

2.1. Concepts of Project and Construction Project

A project is a set of tasks that must be completed within a defined timeline to accomplish a specific set of goals (Malsam, 2023). Construction project is a type of project; its main goal is to make a building that can be used for different purposes such as infrastructure, residential or commercial use. A construction project in simple words is a process of constructing something for one purpose or another in a given time and budget. Construction projects: are usually capital intensive, complex; and require significant management skills, involvement and coordination of a wide range of experts in various field (Chartered Institute of Building, 2002).

2.2. The Theories of Performance and Construction Project Performance Measures

Developing performance is a step-by-step process, and level of performance describes location in the step. According to Elger (2007) effective performance improvement has three axioms: engagement in reflective practice, immersion in an enriching environment and a performer's mindset.

There are many potential measures of performance for evaluating the success of a construction project. All address performance in three key areas: scope, schedule and budget (Alvarado, Silverman & Wilson, 2005). Constriction performance can be evaluated though various dimensions of performance indicators such as time, quality, cost, client satisfaction, health, safety and overall business performance (Enshassi et al., 2009). They further argue that time, cost, and quality are the 3 predominant performance evaluation dimensions.

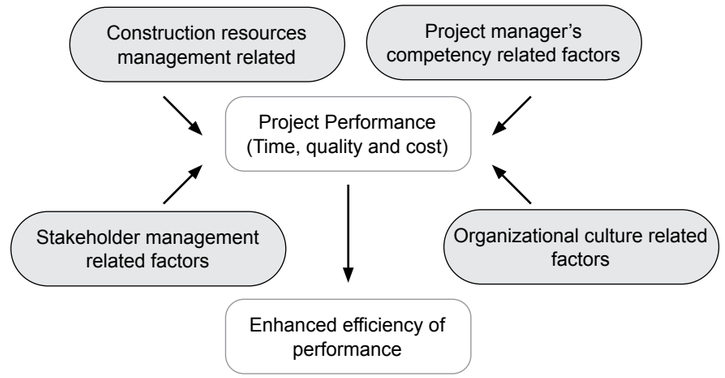
2.3. Related Studies in Some African Countries

According to a study conducted in Uganda , the major finding from this study include: weak procurement rules which lead to awarding road projects to incompetent contractors; contractor monitoring being handled by unqualified, incompetent and inexperienced professionals; lack of contractors and contract supervisors appraisal system; delay of contractors payments which affects timelines in services delivery; lack of a strong internal project monitoring and evaluation mechanism at the Uganda National Roads Agency (Byaruhanga et al., 2017).

Related studies conducted in Ethiopia were also reviewed, according to Mengistu et al., (2016) identified equipment shortage, poor site management, lack of labour surveillance, payment delay as the most critical factors that affect road construction projects. Michael (2020) studied employee's perceived factors affecting the performance of road projects administration by Addis Ababa city road authority: the case of Alem Bank-Betel road construction project. The major finding of the study indicated that the study variables i.e., project managers planning responsibility, availability of project funds, availability and adequacy project equipment's), advancement of project equipment's, empowerment orientation and team orientation has significantly affect the performance of road construction projects administered by Addis Ababa Construction and Road Authority.

Generally, based on the reviewed literatures figure 1 is developed to shows the conceptual framework of this study, which depicts that the factor affecting the performance of road construction projects in Butajira town. It also shows how the variables relate to each other. The dependent variable for the study is project performance (time, quality, and cost). The independent variables are project managers' competency related factors, construction resources management related factors, organizational culture, and stakeholder management related factors.

Figure 1: Conceptual Framework



Source: Own Construction Based On Reviewed Literatures, (2023)

3. RESEARCH METHODOLOGY

3.1. Research Design and Approach

Descriptive type of research design method was used with the assumption that it enables the researcher to achieve the study objective. In addition, the study employed quantitative and qualitative research approach to collect and analyze data.

3.2. Target Population of the Study

The data for this study comprises 5 cobblestone and 1 asphalt road construction projects which ware completed in 2022 G.C in Butajira town. The target population of the research was contractor, client, consultant and regulatory auditor employees who were directly involve in the implementation of the projects.

3.3. Sampling Procedures, Sample technique and Sample Size

To draw the sample for the study the researcher employed non-probability type of purposive sampling technique. In this regard, some literatures also reinforce the reason and advantages of purposive sampling, in such a way that "purposive sampling is a useful sampling method which allows a researcher to get information from a sample of the population that one thinks knows most about the subject matter" (Nicholas, 2010). Accordingly, 33 and 30 professionals who work on the study targeted cobblestone and asphalt road projects respectively were selected purposively based on their involvement on the projects implementation.

3.4. Method of Data Collection and Analysis

Both primary and secondary data was collected. Primary data were collected through structured questionnaire. In the questionnaire a five-point Likert Scale from (1) strongly disagree to (5) strongly agree was used. Secondary data were collected through the review of relevant documents and subsequently analyzed with statistical methods. The information from primary source was analyzed using Statistical Packages for Social Sciences (SPSS) Version 21 and analyzed using descriptive statistics. Furthermore, the most important factors affecting the performance of cobblestone and asphalt construction projects were ranked by using the relative importance index (RII). The relative importance index was computed by using the following formula (Cheung et al., 2004; Iyer and Jha, 2005)

Where; $RII = \sum W/(A)(N)$

RII= Relative Importance Index

W = Weight given to each factor by respondents ranging from 1 to 5

A = Highest weight, in our case 5.

N = Total number of respondents.

4. RESULT AND DISCUSSION

In order to collect primary data, 63 questionnaires were distributed to the sampled respondents; out of the distributed questionnaires 60 were returned. Furthermore, based on the road construction project type out of 60 respondents, 31 were from cobble stone and 29 were from asphalt road construction projects. Based on this, the total response rate was 95.24%. In addition to this, primary data were collected from 1 head municipality and 5 community members by key informant interview.

Table 1: Demographic characteristics of the respondents

Item	Depiction	Cobblestone		Asphalt		Total	
		Freq.	Percent	Freq.	Percent	Freq.	Percent
Gender	Male	25	80.6	26	89.7	51	85.0
	Female	6	19.4	3	10.3	9	15.0
	Total	31	100.0	29	100.0	60	100.0
Age	20 –29 years	18	58.1	3	10.3	21	35.0
	30 –39 years	11	35.5	12	41.4	23	38.3
	40-49 years	2	6.5	9	31.0	11	18.3
	above 50 years	0	0	5	17.2	5	8.3
	Total	31	100.0	29	100.0	60	100.0
Educational achievement	Bellow Diploma	0	0	0	0	0	0
	Diploma	9	29.0	3	10.3	12	20.0
	Degree	22	71.0	19	65.5	41	68.3
	Masters	0	0	7	24.1	7	11.7
	PhD	0	0	0	0	0	0
	Total	31	100.0	29	100.0	60	100.0
Experience in Construction projects	Less than 5	25	80.6	5	17.2	30	50.0
	5 - 9 years	6	19.4	10	34.5	16	26.7
	10 - 14 years	0	0	6	20.7	6	10.0
	15- 19	0	0	6	20.7	6	10.0
	Above 20	0	0	2	6.9	2	3.3
	Total	**31**	**100.0**	**29**	**100.0**	**60**	**100.0**

Source*: Own Survey Data, 2023*

4.1. Performance of Road Construction Projects from Primary Source

As indicated in the table 2, 61.9% and 75.9% of the respondents agree that there is quality problem in cobblestone and asphalt road construction projects respectively. 35.5% and 41.1% of the respondents agree that there is a problem of cost overrun in cobblestone and asphalt road construction projects respectively, whereas only 29% and 41% of the respondents agree that there is a problem of project delay in cobblestone and asphalt projects respectively. The problem of project time delay is not at severe stage in Butajira road construction compared to quality problem and cost overrun.

Table 2: Respondents Perception on Road Construction Projects Performance Status

Project Performance indicators	Road type	Scale SD	D	N	A	SA	No.	Mean	Std. Dev.
There is quality problem	Cobble	0	1	11	13	6	31	3.77	0.80
	Asphalt	0	1	6	14	8	29	4	0.80
There is Problem of project delay	Cobble	0	7	15	9	0	31	3.06	0.72
	Asphalt	1	2	14	12	0	29	3.27	0.75
There is Problem of cost overrun	Cobble	0	5	15	9	2	31	3.25	0.81
	Asphalt	0	4	13	9	3	29	3.38	0.86

Source: *Own Survey Data, 2023*

4.2. Performance analysis of road construction projects from secondary sources

Reviewed documents, compiled and presented in the table 3 confirm that time and cost were overrun in both asphalt and cobblestone road construction projects in the town. The asphalt road construction project has planned to complete within 730 days but it is completed in 910 days which runs 25% beyond its estimated completion date. Likewise, the cost overrun is 6,000,000 Et.birr which accounts up to 9 %. Similarly, as depicted in the table the cobblestone projects have an average time delay of 53 days ranging from a minimum 30 days (project 5) to a maximum 70 days (project 1). Also, the data reveals the planned budget of all cobblestone projects were overrun, which range from a minimum amount of 196,839 Et.birr (project 5) to the maximum amount of 318,736 Et.birr (project 1). Generally, based on the secondary data sources, the target asphalt and cobblestone road construction projects implemented by Butajira town municipality have had poor time and cost performance.

Table 3: Reviewed Document Finding on Projects Time and Cost Performance

Road Construction Project Type And Identification		Total Area /M2	Project Period/Days			Project Budget/Et.Birr		
			Planned	Actual	Project Time Delay	Planned	Actual	Project Cost Overrun
Asphalt project	**Project 1**	54720	730	910	180	68,000,000	74,000,000	6,000,000
Cobblestone projects	**Project 1**	3832	220	290	70	1,278,867	1,597,603	318,736
	Project 2	3030	200	265	65	1,111,719	1,386,013	274,294
	Project 3	3234	220	280	60	1,103,644	1,377,287	273,643
	Project 4	2379	180	220	40	1,103,216	1,378,837	275,621
	Project 5	1944	180	210	30	650,615	847,454	196,839

Source: Own Relevant Document Review, 2023

4.2.1. FACTORS AFFECTING THE PERFORMANCE OF ROAD CONSTRUCTION PROJECTS

In this study the major factors that affect road construction projects were categorized under 4 major categories namely; project manager's competency related factors, construction resources management related factors, stakeholder management related factors, and organizational culture related factors. The Relative Importance Index (RII) was used to determine the ranking of different factors based on their category that affect project performance.

4.2.2. RANK OF PROJECT MANAGERS' COMPETENCY RELATED FACTORS

Table 4 indicated that among the project managers' competency related factors those influence the project performance of cobblestone construction, the respondents ranked Project managers lacked demonstrate knowledge of regulations, codes, standards, and contractual issues" in the first position with a RII value of 0.72, followed by project managers were unable to build efficient and effective project team with a RII value of 0.71. Likewise, respondents ranked both project managers were unable to build efficient and effective project team and project managers were have poor exposure to all stages of the process/project life cycle from concept and feasibility analysis through closing in the first position with a RII value of 0.70, followed by project managers lacked problem-solving skills and techniques with a RII value of 0.68 which affects the performance of asphalt road construction projects.

Table 4: Respondents Perception on Project Manager's Competency

Project Managers' Competency Related Factors	Project Type	Scale					RII	Rank
		SD	D	N	A	SA		
Project managers were lacked relevant academic background	Cobble	1	10	15	5	0	0.55	7
	Asphalt	1	10	12	6	0	0.56	6
Project managers were lacked adequate work experience	Cobble	1	5	16	9	0	0.61	6
	Asphalt	4	11	11	3	0	0.49	7
Project managers lacked demonstrate knowledge of regulations, codes, standards, and contractual issues	Cobble	0	2	11	15	3	0.72	1
	Asphalt	0	5	11	10	3	0.67	4
Project managers were have poor exposure to all stages of the process/project life cycle from concept and feasibility analysis through closing	Cobble	1	2	14	14	0	0.66	4
	Asphalt	1	2	11	12	3	0.70	1
Project managers were unable to build efficient and effective project team	Cobble	0	4	10	13	4	0.71	2
	Asphalt	0	2	12	13	2	0.70	1
Project managers did not work with integrity, ethically and within professional standards	Cobble	0	4	13	14	0	0.66	4
	Asphalt	0	5	13	10	1	0.65	5
Project managers lacked problem-solving skills and techniques	Cobble	0	4	13	11	3	0.68	3
	Asphalt	1	5	8	11	4	0.68	3

Source: Own Survey Data, 2023

4.2.3. RANK OF CONSTRUCTION RESOURCES MANAGEMENT RELATED FACTORS

As shown in Table 5, the respondents ranked there was price escalation of construction material in the market in the first position with a RII value of 0.87, followed by there were changes in material types and specifications during construction with a RII value of 0.83 which affects the performance of cobble stone road construction projects.

Similarly, the respondents ranked there was price escalation of construction material in the market at first position with a RII value of 0.84, followed by there was inadequacy of modern equipment and allocation of equipment with a RII value of 0.81 which affects the performance of asphalt road construction projects.

Table 5: Respondents Perception on Construction Resources Management Related Factors

Construction Resources Management Related Factors	Road Type	Scale					RII	Rank
		SD	D	N	A	SA		
There was unavailability of Man power (Skilled and labor) on local market	Cobble	5	5	12	9	0	0.56	7
	Asphalt	0	5	12	12	0	0.65	7
There was inadequacy of modern equipment and allocation of equipment	Cobble	0	0	8	13	10	0.81	3
	Asphalt	0	0	6	15	8	0.81	2
There was unavailability of better-quality material	Cobble	3	2	10	14	2	0.66	6
	Asphalt	2	2	13	10	2	0.66	6
There were changes in material types and specifications during construction.	Cobble	0	0	6	14	11	0.83	2
	Asphalt	0	1	11	15	2	0.72	5
There was delay in Payments	Cobble	0	3	7	16	5	0.75	5
	Asphalt	0	0	9	15	5	0.77	3
There was inefficient Project budget utilization	Cobble	0	1	7	15	8	0.79	4
	Asphalt	0	5	6	12	6	0.73	4
There was price escalation of construction material in the market	Cobble	0	0	1	18	12	0.87	1
	Asphalt	0	0	3	17	9	0.84	1

Source: Own Survey Data, 2023

4.2.4. RANK OF STAKEHOLDER MANAGEMENT RELATED FACTORS

As shown in Table 6, the respondents ranked Participation of stakeholders in quality related decisions was poor in the first position with a RII value of 0.85, followed by there were no regular meetings between authorities, and other relevant stakeholders in solving the problems with a RII value of 0.83 were identified as performance affecting factor of cobble stone road construction projects.

Regarding the asphalt construction project, the respondents ranked there were no regular meetings between authorities, and other relevant stakeholders in solving the problems at first position with a RII value of 0.89, followed by participation of stakeholders in quality related decisions was poor and there was Poor Stakeholders' engagement with a RII value of 0.83.

Table 6: Respondents Perception on Stakeholder Management Related Factors

Stakeholder Management Related Factors	Road Type	Scale					RII	Rank
		SD	D	N	A	SA		
There was ineffective planning of Project stakeholder management	Cobble	0	0	10	15	6	0.77	4
	Asphalt	0	0	7	13	9	0.81	4
There was Poor Stakeholders' engagement	Cobble	0	1	5	17	8	0.81	3
	Asphalt	0	0	4	16	9	0.83	2
There was no good relationship and communication with stakeholders	Cobble	0	7	12	10	2	0.65	5
	Asphalt	0	6	11	10	2	0.65	6
Stakeholders have had no a clear understanding on the projects and it affects their role on the project's success	Cobble	2	2	16	9	2	0.65	5
	Asphalt	1	2	15	9	2	0.66	5
Participation of stakeholders in quality related decisions was poor	Cobble	0	0	3	18	10	0.85	1
	Asphalt	0	0	4	16	9	0.83	2
There were no regular meetings between relevant stakeholders in solving the problems.	Cobble	0	0	5	17	9	0.83	2
	Asphalt	0	0	1	14	14	0.89	1
Stakeholders had no opportunity to air their views (voices) on the project's goal, impact and any other relevant project decision processes.	Cobble	2	10	14	5	0	0.54	7
	Asphalt	2	10	12	5	0	0.54	7

Source: Own Survey Data, 2023

4.2.5. RANK OF ORGANIZATIONAL CULTURE RELATED FACTORS

As shown in Table 7, the respondents ranked there were poor opportunities for managers and employees who have a good idea were not encouraged to "run with it." and failures were not treated as "learning experiences." and employees have had no considerable autonomy in choosing the means by which the goals were attained and bonuses were based on achievement of these outcomes in the first position with a RII value of 0.70, followed by there was poor conflicts management, when disputes or conflicts occurred with a RII value of 0.65 which affects the performance of cobble stone road construction projects.

As well, the respondents ranked there were poor opportunities for managers and employees who have a good idea were not encouraged to "run with it." and failures were not treated as "learning experiences." at first position with a RII value of 0.69, followed by Job activities were not designed around work teams, and team members were discouraged to interact with people across functions and authority levels with a RII value of 0.63 as performance affecting factors of asphalt road construction project.

Table 7: Respondents Perception on Organizational Culture Related Factors

Organizational Culture Related Factors	Road Type	Scale					RII	Rank
		SD	D	N	A	SA		
The employees of the contract parties have had no positive attitude in the work	Cobble	2	8	14	6	1	57.4	7
	Asphalt	6	11	10	2	0	0.46	7
The organizational culture adopted by the contract parties did not supports strategic objectives	Cobble	3	6	9	11	2	0.62	4
	Asphalt	1	5	13	8	2	0.63	2
There was no clear understanding of the objectives and values of the project within project participants	Cobble	1	8	15	4	3	0.60	6
	Asphalt	3	10	12	3	1	0.52	6
There was poor conflicts management, when disputes or conflicts occurred	Cobble	1	5	15	5	5	0.65	3
	Asphalt	1	5	13	8	2	0.63	2
Employees have had no considerable autonomy in choosing the means by which the goals were attained and bonuses were based on achievement of these outcomes.	Cobble	0	4	11	12	4	0.70	1
	Asphalt	3	5	8	10	3	0.63	2
Job activities were not designed around work teams, and team members were discouraged to interact with people across functions and authority levels.	Cobble	1	6	14	9	1	0.62	4
	Asphalt	0	6	13	9	1	0.63	2
There were poor opportunities for managers and employees who have a good idea were not encouraged to "run with it." and failures were not treated as "learning experiences."	Cobble	0	4	11	12	4	0.70	1
	Asphalt	0	4	11	11	3	0.69	1

Source: Own Survey Data, 2023

5. DISCUSSION

The result of the study in regard with the road construction performance problem is in line with the finding of Akawak (2020) and Michael (2020), who indicate that there is a problem of cost overrun, project delay, and project quality problems in their study done on Bishoftu cobble stone construction projects and Alem Bank-Betel road construction project in Addis Ababa respectively. Regarding projects performance affecting factors the study finding is in line with Oynaka (2017) and Samuel (2020), in which their finding reviled that the fluctuation in raw material price, inadequacy of modern equipment and allocation are the major factors affecting the performance of road construction projects. The study outcome in relation with the stakeholder related project performance affecting factors are in line with finding of Michael (2020) in which he argued that poor project success may necessarily be due to the lack of communication between road projects parties.

The major findings of the study are summarized as follow;

Among the three key-project performance indicators, quality substandard was the main problem for both asphalt and cobblestone road construction projects, followed by project cost overrun and time delay. The projects performances affecting factors were varied across the two road construction types, and where discussed and ranked under four different categories. Among the project managers' competency related factors; the cobblestone road construction projects were most affected by project managers lacked demonstrate knowledge of regulations, codes, standards, and contractual issues in contrast, the asphalt road construction project was challenged by project managers inability to build efficient and effective project team. Under construction resources management related factors both cobblestone and asphalt road construction projects were primarily faced price escalation of construction material in the market. The first challenge factor related to stakeholder management for the cobblestone projects was poor participation of stakeholders in quality related decisions. In contrast, the asphalt project was mainly challenged by the absence of regular meetings between authorities, and other relevant stakeholders in solving the problems. Finally, regarding organizational culture related factors, the highest challenge in cobblestone projects was that employees had little autonomy in choosing the means to achieve project goals. For asphalt projects, the key issue was the lack of opportunities for managers and employees with good ideas to pursue them, as well as the fact that failures were not treated as learning experiences.

6. CONCLUSION AND RECOMMENDATION

The finding of the study generally indicated that there exists the problem of project performance in terms of quality, schedule, and cost in both types of road construction (cobble stone and asphalt road) in Butajira town. From the study finding the top ranked critical factors under each category that were perceived to cause high performance problem in construction projects are; from project manager's competency related factors: Project managers were unable to build efficient and effective project team, from construction resources management related factors: There was price escalation of construction material in the market, from stakeholder management related factors: there were no regular meetings between authorities, and other relevant stakeholders in solving the problems, from organizational culture related factors: there were poor opportunities for Managers and employees who have a good idea were not encouraged to "run with it.", Finally, the study results show that there is a performance affecting factors difference between cobblestone and asphalt road construction projects.

The researcher recommends continuous coordination and relationship between project participants' through-out project life cycle in order to solve the up-coming project cost and time affecting problems, and develop project quality performance.

In order to overcome top critical construction resources management related factors those highly contribute for the performance problem of construction projects, the concerned bodies should work on in stocking adequate constriction material and need to work with reliable suppliers so that to provide constriction material on time.

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