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ASSESSMENT OF TECHNICAL CAPACITY AND PERFORMANCE OF LOCAL BUILDERS IN RESIDENTIAL BUILDING CONSTRUCTION SITES

Sandesh SIGDEL*

Oxford College of Engineering and Management, Gaindakot-2, Nawalpur, Nepal
Corresponding author`s e-mail: sandessigdel@gmail.com

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Abstract. This research aims to investigate the technical capability and performance of local builders on residential building construction sites in Gaindakot Municipality, Nepal. The construction industry plays a vital role in the growth of economies worldwide. The quality of construction heavily depends on the technical capacity and performance of builders involved in residential projects. This study aims to assess local builders' technical competence and performance operating on residential building construction sites. By examining the capabilities of local builders, this research contributes to enhancing the overall quality and efficiency of residential construction projects. The research employs a mixed-methods approach, combining quantitative and qualitative data collection techniques. A comprehensive survey is administered to local builders to evaluate their technical knowledge, skill sets, and utilisation of modern construction techniques. Concurrently, on-site observations and interviews are conducted to gain insights into the actual performance of builders during different construction phases. The findings of this study shed light on the strengths and weaknesses of local builders in residential construction. The on-site observations and interviews offer qualitative insights into the practical application of skills, compliance with safety protocols, and adherence to project timelines. The outcomes of this research are intended to guide policymakers, industry stakeholders, and training institutions in formulating strategies to enhance the technical capacity of local builders. Bridging the identified gaps can improve construction quality, reduce project delays, and increase customer satisfaction. Additionally, the study emphasizes the need for ongoing professional development programs to keep builders updated with the latest construction techniques and standards.

Keywords*: Technical capacity, performance, local builders, residential buildings.*

INTRODUCTION

Technical competence of local builders is the ability to use relevant skills and expertise in technical expertise and equipment competence to construct residential buildings to ensure project delivery according to specifications with the desired quality within the scheduled time and costs (Aje & Famakin, 2012). The performance of local builders is the primary means of success in any building construction project, as the builders make the design a reality. Better and improved

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performance of local builders leads to increased customer satisfaction, better reputation of builders and thus competitiveness in the market. While the performance of local builders has been the subject of much research, evidence suggests that there is still space for improvement (Egan, 1998).

There has been a fast increase of reinforced concrete (RC) framed buildings construction within Nepal's urban and semi-urban zones. Most of these buildings have been built on the exhortation of mid-level professionals and masons without any proficient basic plan input. These buildings are altogether vulnerable to earthquake shaking, which includes a sensible chance of happening in Nepal. The 1934 and 1988 earthquakes in Nepal, resulting not only to human deaths, but also destruction to both housing and schools, again drew attention to the need for changes and improvement in current building development and plan strategies. Additionally, the past earthquake of April 25, 2015, which was a strong earthquake of magnitude 7.8 hitting central and Western Nepal severely with the epicenter near the Barpak village of Gorkha district, was a lesson to construct earthquake resilient buildings to reduce the misfortune of property and lives of people. Numerous public and private buildings were harmed due to the strong earthquake, which also caused casualties and injuries (Adhikari & Ayala, 2019).

However, the locally accessible builders are least prepared and are not financially strong enough to bear the good quality construction equipment and materials within the private building development projects. The trend of moving labourers and builders from India appears to be unfortunate competition among the builders, which straightforwardly influences the quality of the construction work. There is the impact of the technical capacity on the execution of local builders in constructing residential buildings.

1. LITERATURE REVIEW

Local builders contribute to the economic and social development of the country by building and maintaining infrastructure in the same sectorial manner as builders with multi-million-rupee turnovers. Therefore, they are subject to the same regulatory framework, procurement procedures, and fluctuations in demand and government policy. To survive in a competitive market, they also have to deal with the same issues of contract management, marketing, access to finance, tender preparation and staff training. As noted, for smaller builders, the constraints and costs of the business environment are more serious. Local or small-scale builders usually work in their local geographical area. The benefits of using local builders are that they are familiar with the local area, they understand the local government structures, they are aware of the technologies and materials that are appropriate for the area; they generally employ local labour and are familiar with the way of doing business in the area. In addition, local builders and their performances are well known by local clients, including local government and public implementing agencies, therefore there is a need for reformation of giving permits for doing construction activities in local areas as a listed contractor. Local builders include micro-service providers who can carry out minor works.

1.1. Technical capacity and performance of local builders in developing countries

Due to the considerable variation in construction demand, contractors are at greater risk of changes in their working environment. Small contractors often have trouble managing labour, materials, finance, and equipment. They cannot influence the business environment, including the industry's regulatory framework. Using large contractors is considered economically unviable for local-level small-scale construction works because applying heavy equipment increases the overall work cost. Local infrastructure works are more effectively carried out through local contractors managed and supervised by local authorities. Using locally based contractors is likely to be more labour-intensive, which is an advantage, as they have chosen to establish their operations and business where the infrastructure is located. Some other advantages include rapid and less costly mobilisation of services, engaging local labour, local procurement of materials and equipment, long-term working relationships with local clients, and having the reputation of protecting the interests of local communities (ILO, 2017).

Access to appropriate equipment is one of the first major challenges for emerging local contractors due to the limitation of capital assets. However, high-quality hand tools can be difficult to obtain in local markets, and many countries have limited capacity to produce quality hand tools. Since labour is the main means of production in good quality hand tools their designs play a significant role in workers' productivity. Investing in equipment, however, poses a major challenge for small-scale contractors that requires a key management decision, as the decision is based on their anticipation of future work prospects and financial capacity. The lack of access to training significantly affects the quality of work, costs, and sustainability, increasing maintenance needs. The construction industry is considered to have some of the most hazardous jobs with a high frequency of occupational accidents. Appropriate occupational safety and health (OSH) measures in specific local contexts, including the provision of safety gear and quality tools as well as access to water, food, sanitary and medical facilities, along with other managerial measures, including appropriate labour inspection and supervision, is very weak in the context of local contractors' construction activities in developing countries (ILO, 2009).

In developing countries, problems associated with contractors' performance are higher and compounded because of inadequate resources and organisations to address them. The construction industry is vibrant and the largest in developing countries, but it has also been challenged to improve its performance. As a result of the multiple complications in the construction industry show that the construction industry is project-based and mainly deals with the various interests of multiple stakeholders that result in various changes. These changes seriously affect the productivity aspects of the contractor's performance. Local contractors' performance is a critical issue to the success of any construction project, as it is a contractor who converts designs into practical reality. While the local contractor's performance has been the subject of much research, evidence suggests that there is much need for further improvement. Numerous studies have shown that local

contractors' performance in construction project execution was inferior. Until recently, their performance became so deficient that they could not be considered for the award of major notable construction projects in developing countries. Local contractors suffer from many problems and complex issues. Consequently, they faced the significant problems of the high cost of project delivery, bad financial performance, and inability to deliver value to customers on time. As a result, local contractors have been criticised extensively for poor performance and inefficient productivity (Zainal et al., 2019).

1.2. Effect of technical capacity on the performance of construction work

The construction sector is people-oriented and encompasses both skilled and unskilled labour. The availability of necessary construction skills affects the quality, cost, time, and safety as well as the stakeholders' satisfaction. Due to the low technical skills, it may lead to an increase in cost, project delay, quality reduction, an increase in the number of accidents on site, rework and low productivity of the workforce. The availability of necessary construction skills affects the project's success (Oke et al., 2018).

2. METHODOLOGY

The primary data sources were questionnaire surveys, checklists, field surveys, and inspection and evaluation of residential buildings constructed by local builders. Similarly, previous research, reports, documents, relevant websites and municipal data were secondary data sources to conclude research objectives.

2.1. Technical capacity evaluation methods

The technical capability of local builders is the ability of local builders to employ relevant skills and expertise in terms of technical knowledge and equipment capacity to project management to ensure project delivery to the desired quality specification within the budgeted cost and schedule. It generally relates to local builder's experience, plant and equipment capacity, the volume and quality of personnel, and their general ability. Experience gives insight into the local builder's potential by determining the ability of local builders to commit adequate resources to a building construction project (Aje & Famakin, 2012).

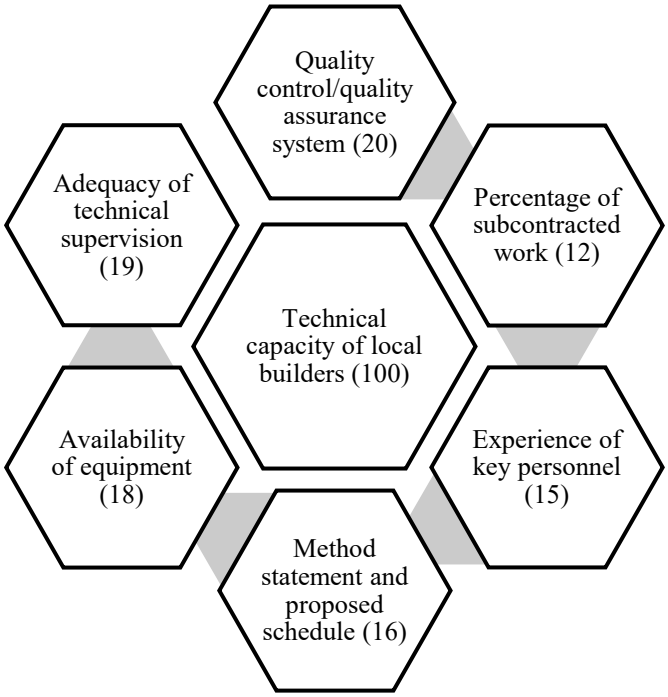


Fig. 1. Technical capacity evaluation methods.

2.2. Performance evaluation method

The competence of any local builders in terms of technical capability, experience and managerial ability reflects heavily on the performance of the building construction project. Here, this study has focused on 5 different indicators of performance evaluation of local builders at the site.

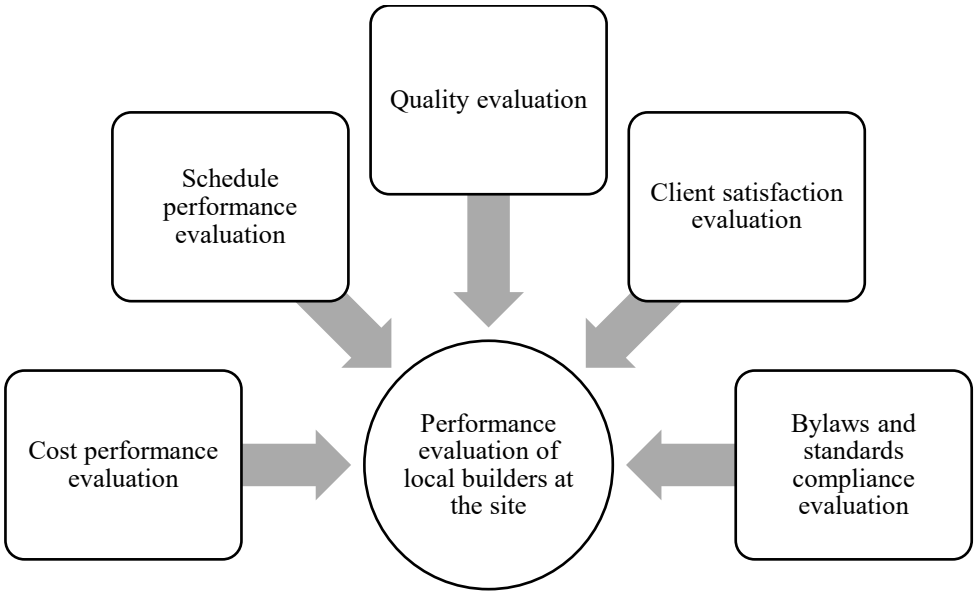


Fig. 2. Performance evaluation methods.

3. RESULTS AND DISCUSSION

To analyse the technical capacity of local builders, a field evaluation was conducted among the sites of 18 local builders. The evaluated scores of different parameters of the technical capacity of local builders were given based on the weightage score of technical capacity parameters. The results from the evaluation are tabulated in Table 1.

Table 1. Technical capacity evaluation scores of local builders at the site

Local builder ID	Quality control/quality assurance system (20)	Adequacy of technical supervision (19)	Availability of equipment (18)	Method statement and proposed schedule (16)	Experience of key personnel (15)	Percentage of subcontracted work (12)	Total score
1	6	4	9	4	15	8	46
2	4	7	10	4	6	8	39
3	6	3	8.5	4	12	7	40.5
4	4	4	10	6	15	8.5	47.5
5	4	3	9.5	4	9	7.5	37
6	4	8	10	4	9.6	9.5	45.1
7	6	7	9.5	6	6	7	41.5
8	8	4	11	2	9	7	41
9	4	0	12.5	4	3.6	9	33.1
10	6	3	10.5	2	13.2	9.5	44.2
11	6	4	10.25	4	12	8.5	44.75
12	6	4	8.5	2	8.4	8	36.9
13	6	11	9.5	4	15	8	53.5
14	6	4	9.5	4	6	7.5	37
15	6	4	12.5	4	9	9	44.5
16	8	7	10	4	3	7	39
17	6	7	11.5	2	15	9	50.5
18	6	4	10	4	6	7	37
Mean score of technical capacity							42.11

From Table 1, it can be interpreted that the mean score of the technical capacity obtained by the local builders is 42.11. The highest score obtained by local builders during the evaluation of technical capacity at the site was 53.5. Whereas 33.1 is the lowest score obtained by a local builder during the technical capacity evaluation at the site. The obtained result indicated that the technical capacity of local builders in residential building construction projects was found to be very weak. Therefore, most effective effort is needed to boost local builders' technical capacity for better project performance.

3.1. Performance scores from field evaluation

To analyse the performance of local builders, field evaluation was conducted among every five sites of 18 local builders. The evaluated scores of different performance parameters of local builders were analysed on 5 different parameters.

Cost performance was evaluated using the cost Performance index (CPI). The CPI indicates the ability of the local builders to control costs and compares the budget for those tasks that have been accomplished with the actual cost of accomplishing the tasks.

Table 2. Cost performance index (CPI) of local builders

Local builder's Id	CPI	Remarks
1	0.948	Over contract budget
2	0.957	Over contract budget
3	0.938	Over contract budget
4	0.958	Over contract budget
5	0.95	Over contract budget
6	0.914	Over contract budget
7	0.906	Over contract budget
8	0.95	Over contract budget
9	0.921	Over contract budget
10	0.98	Over contract budget
11	1.01	Under the contract budget
12	1.007	Under the contract budget
13	1.007	Under the contract budget
14	0.902	Over contract budget
15	0.918	Over contract budget
16	0.937	Over contract budget
17	0.975	Over contract budget
18	0.954	Over contract budget

Schedule performance evaluation was done using the schedule performance index (SPI) on the time basis per the contract agreement. The SPI was calculated using the time scale. As the SPI measures the schedule performance, it will be more relevant to use the time scale to calculate it instead of the cost scale.

Table 3. Schedule performance index of local builders (SPI(*t*))

Local builder's Id	SPI(*t*)	Remarks
1	0.93	Behind contract schedule
2	0.952	Behind contract schedule
3	0.837	Behind contract schedule
4	0.906	Behind contract schedule

5	0.885	Behind contract schedule
6	0.872	Behind contract schedule
7	0.81	Behind contract schedule
8	0.954	Behind contract schedule
9	0.837	Behind contract schedule
10	0.894	Behind contract schedule
11	0.971	Behind contract schedule
12	0.882	Behind contract schedule
13	0.872	Behind contract schedule
14	0.791	Behind contract schedule
15	0.885	Behind contract schedule
16	0.841	Behind contract schedule
17	0.912	Behind contract schedule
18	0.879	Behind contract schedule

3.2. Comparison of time and cost performance of local builders in residential building construction sites

When the CPI exceeds zero, it signifies that the project is under budget, which is favourable for profitability because the actual cost of work performed is below the budgeted cost. Conversely, a CPI less than zero suggests that the project is over the budget, indicating potential profit losses or weak performance of local builders (Carstens et al., 2013).

For the SPI, a value exceeding zero indicates that the project is ahead of the contract schedule, which is beneficial for local builders' performance. In contrast, an SPI (*t*) less than zero suggests that the project falls behind the contract schedule, signalling weaker performance (Carstens et al., 2013).

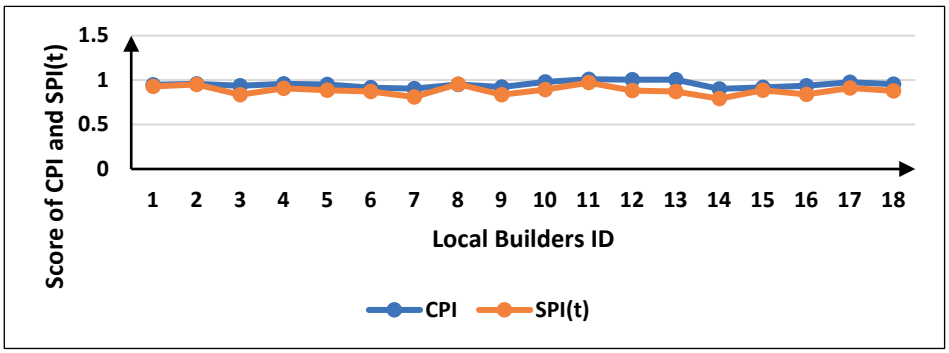


Fig. 3. Comparison between CPI and SPI (*t*).

From Fig. 3, the CPI value range of local builders is greater than the SPI(*t*) value range. It can be interpreted that the cost performance of local builders is better than schedule performance as per the contract. The timely completion of residential building construction as per the contract was not found in the site survey. This result

indicates that local builders' performance on schedule is lower than cost performance.

3.3. Quality performance (measured in terms of defects identified at the site)

In this study, a quality evaluation was conducted using a 10-point scale based on the defects observed in residential buildings constructed by local builders, ranging from "totally defective" to "defect-free".

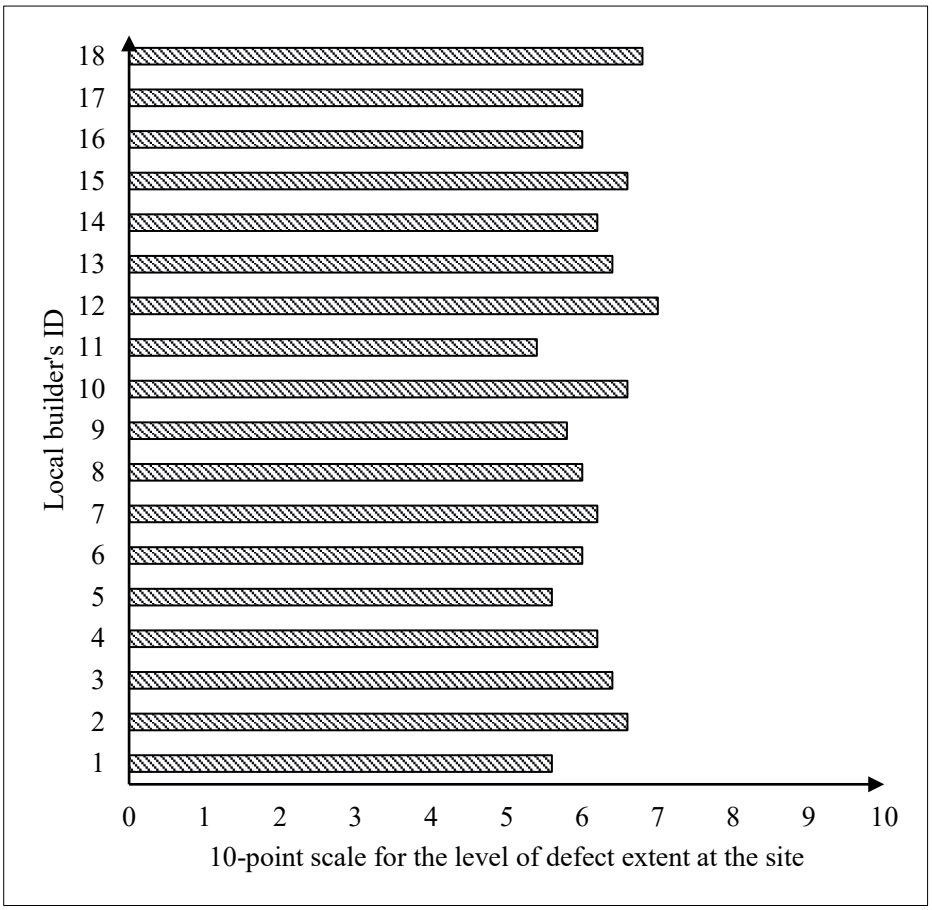


Fig. 4. Quality performance (measured in terms of defects identified at the site).

From Fig. 4, the level of defect extent identified at the site was in the range of defects with impact on the client. The work performed by the local builders was found to be defective to some extent. The quality performance of local builders measured in terms of defects identified at the site was weak. The crack formation in walls, seepage in buildings, damping, drainage problems, defects in cantilever projections, defects in parapet walls, etc., were the major defects identified at the sites of local builders.

3.4. Client satisfaction (responses of house owners at the site)

Client satisfaction evaluation was conducted using a 10-point scale based on responses from house owners ranging from "totally dissatisfied" to "totally delighted".

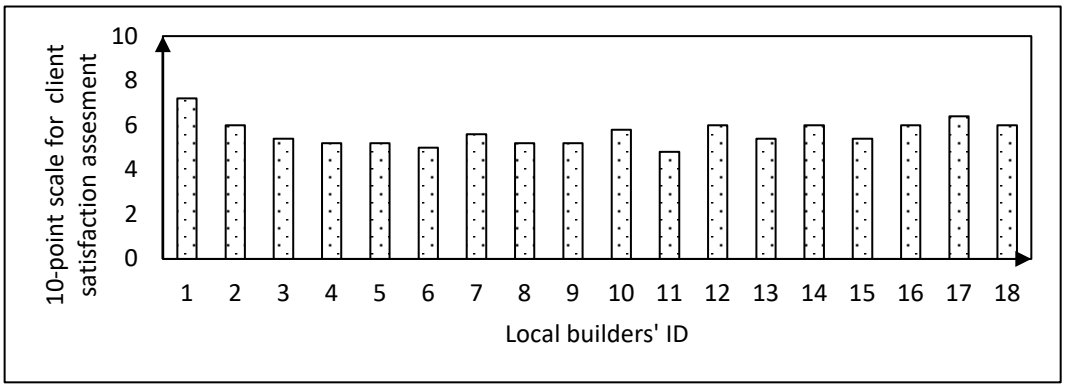


Fig. 5. Client satisfaction score.

The client satisfaction scores for each local builder are shown in Fig. 5. Most local builders achieved satisfactory performance, with satisfaction levels falling in the "neither delighted nor dissatisfied" range.

3.5. Bylaws compliance

A bylaws and standards compliance evaluation was conducted on seven different indicators: building setback, window setback, septic tank setback, construction as per drawings, plinth level permit, superstructure permit, and completion certificate, respectively.

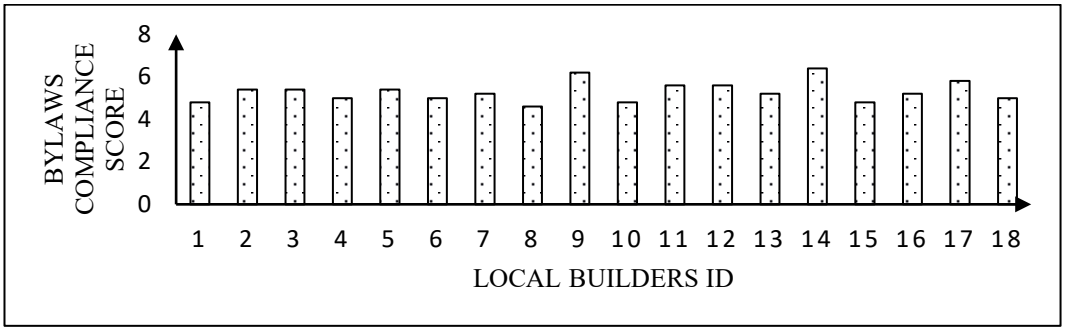


Fig. 6. Bylaws and standards compliance score.

For the performance evaluation on bylaws compliance of completed residential building projects, seven different parameters were used to evaluate the compliance score of local builders. From Fig. 6, no local builders have obtained the overall score of bylaws compliance. However, in comparison with other performance indicators, the bylaws and standards compliance at the site was found to be satisfactory.

Aje & Famakin (2012) have studied the impact of contractors' technical capability on cost and time performance of building projects in Nigeria. The study has clearly shown that contractors' technical capability is an essential criterion for evaluating the potential performance of construction contractors. The study has identified that the past performance and quality achieved, contractors' experience, management knowledge and quality control are significant variables for evaluating contractors' technical capability. The study further revealed that contractors' technical capability significantly impacts cost and time performance. This study shows that the least technical capability of local builders observed at the site has significant impact on the performance of local builders at residential building construction sites. Due to the low scores of technical capabilities, the performance of local builders is weak compared to the five different indicators of performance observed at the site.

Mishra et al. (2021) have studied the compliance status of building bylaws and codes in high-rise apartment buildings of Nepal. The study has found that most of the provisions of the building bylaws are complied with by all apartments but some of the provisions are not fully complied with by apartments. The study has also shown that the quality of most of the apartments is good to satisfactory. Similarly, this study has also shown the partial compliance of building bylaws and standards in different residential building construction sites.

As per the Standard Bidding Document (SBD) published by the Public Procurement Monitoring Office (PPMO) for procurement of work in Section 3 under National Competitive Bidding (NCB), it is indicated to specify the own-owned equipment and leased equipment list in the bidding document for technical evaluation. Similarly, in this research, checklists of tools and equipment are evaluated, which has shown that local builders do not have adequate tools and equipment ownership required for residential building construction.

CONCLUSIONS

The technical capacity and performance of local builders in residential building construction work are found to be very weak in Gaindakot Municipality.

It was identified that the five performance indicators, i.e., time, cost, quality, client satisfaction, and standards compliance, are very weak in providing the best performance in residential building construction works. Well-equipped tools and machinery, provision of technical supervision, skilled and adequate workforce, proper planning and execution of work are the main components identified in this study, which are required for better technical competence to perform better construction works.

RECOMMENDATIONS

Technical capability is an important criterion for evaluating the potential performance of construction activity. A local builder's technical capability significantly impacts time, cost and quality performance. Therefore, technical

capability is considered an important criterion for awarding the residential building construction work contract to local builders.

Regarding technical capacity and performance, local builders should be capable of holding the self-owned machinery and equipment related to building construction, which will help to reduce the time and labour force required for particular work. Local builders should provide the employees with proper training. Pursuing further training will help local builders adopt the latest construction technology. It will also enhance managerial competence and help in accident avoidance as the trainees may be subjected to safety training in the course of their pursuit of further training.

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REFERENCES

Adhikari, R. K., & D'Ayala, D. (2020). 2015 Nepal earthquake: seismic performance and post-earthquake reconstruction of stone in mud mortar masonry buildings. *Bulletin of Earthquake Engineering*, *18*(8), 3863–3896. https://doi.org/10.1007/s10518-020-00834-y

Aje, I. O., & Famakin, I. O. (2012). The impact of contractors' technical capability on cost and time performance of building projects in Nigeria. *Conference paper: RICS COBRA 2012.*

Carstens, D., Richardson, G., & Smith, R. (2013). *Earned value management, Project Management Tools and Techniques*. 1st ed. Boca Raton: CRC Press.

Egan, J. (1998). *Rethinking Construction. The report of the construction task Force*. Crown.

International Labor Organization (ILO), (2017). *Handbook for rural masons*. New Delhi, India: ILO.

Mishra, A. K., Karmacharya, G., & Aithal, P. S. (2021). Compliance status of building bylaws and codes in high-rise apartment buildings of Nepal. *International Journal of Applied Engineering and Management Letters*, 66–79. https://doi.org/10.47992/ijaeml.2581.7000.0093

Oke, A., Aigbavboa, C., & Khangale, T. (2018). Effect of skills shortage on sustainable construction. *AHFE 2017: Advances in Human Factors, Sustainable Urban Planning and Infrastructure,* 303–309. https://doi.org/10.1007/978-3-319-60450-3_29

Zainal, R., Hamza, G., Manap, N., & Syahrom, N. S. (2019). Significant ways to improve the performance of medium and large local contractors in the Jigawa State, Nigeria. *MATEC Web of Conferences*, *266*, 03018. https://doi.org/10.1051/matecconf/201926603018