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# Labour Productivity

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| S.NO | Title of the Research paper | Author Name | Year of Research or Publication | Code of Journal | Name of Research Journal |
|---|---|---|---|---|---|
| **1** | **Labor Productivity in Construction project** | Mr.C.Thiyagu Mr.M.Dheenadhayalan | Nov-2015 | e-ISSN: 2395-0056 p-ISSN: 2395-0072 | International Research Journals of Engineering & Technology Volume: 02 Issue: 08 |
| **2** | **Improvement of Construction Labour Productivity in Chambal region.** | Vaishant Gupta1 R. Kansal2 | Oct-2014 | eISSN: 2319-1163 pISSN: 2321-7308 | IJRET: International Journal of Research in Engineering and Technology |
| **3** | **Importance of measurement of Labour productivity in Construction industry** | Prachi R. Ghate1 Prof. Pravin R. Minde2 | 6 June -2015 | | International Journal of Science and Engineering Research (IJ0SER), |
| **4** | **Study of Factors affecting labour Productivity at a Building Construction project in the USA: WEB SURVEY** | . Mahesh Madan Gundecha | September,2012 | | |
| **5** | **Critical Review of Labor Productivity Research in Construction Journals** | Wen Yi1 and Albert P.C. Chan2 | Feb, 2013 | doi:10.1061/(ASCE)ME.1943-5479.0000194 | Journal of Management in Engineering. |

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| **6** | **Factors affecting Labour Productivity in the Construction industry** | Paul Chan1 | September 2002 | | Association of researchers in Construction management , Vol. 2 791-800. |
| **7** | **Enhancing Labour Productivity within Construction Industry through Analytical Hierarchy Process, the Case of Gaza Strip** | Hasan Hamouda, Nadine Abu-Shaaban | 2015 | ISSN: 1392-3730 | Universal Journal of Management 3(8): 329-336, |
| **8** | **Factors affecting labour productivity in building projects of Pakistan.** | 1 Asadullah Tahir<br>2 Hashim hanif<br>3Zuhaib aslam<br>4.Abdullah hanif | March-2015 | ISSN: 2394-7926 | International Journal of Management and Applied Science, |
| **9** | **Factors Influencing Construction Labour Productivity: An Indian Case Study** | Anu V. Thomas and J. Sudhakumar | 2014 | Nil | Journal of Construction in Developing Countries, |
| **10** | **A Comparative Evaluation of Labour Productivity of Wall Plastering Activity Using Work study** | Dr. Kevin C. Okolie, Isaac A. Odesola Jovita N. Nnametu, | *May 2015* | | PM World Journal |

| S.NO | Definition of Labour Productivity |
|---|---|
| 1 | Productivity is the ratio of output to all or some of the resources used to produce that output. Output can be homogenous or heterogeneous. Resources comprise: labour, capital, energy, raw materials, etc. |
| 2 | Productivity" express the relationship between outputs and inputs .<br>labor productivity is the amount of good and services produced by a productive factor (manpower) in the unit of time.<br>productivity as a quotient obtained by dividing the output by one of the productivity factors. |
| 3 | a) Economic Model: Total Factor Productivity (TFP)<br>(TFP) =Total Output Labour/(Material+Equipment+Energy+Capital )<br>b) Project Specific Model:<br>Productivity = OutputLabour+Material+Equipment<br>c) Activity Oriented Model:<br>Labour Productivity = Output/Labour cost<br>Or Labour Productivity = Output/Work hour |
| 4 | labor productivity is the amount of goods and services produced by a productive factor (manpower) in the unit of time |
| 5 | Three distinct components of the concept of productivity are brought out by this definition:<br>1. Power of being productive is the force behind production itself 2. Efficiency is a measure of how well the factors are utilized;<br>3. Rate is a measure of the output of the factors of production over a defined period of time.<br>CLP =Work − hour Output = Actual work hours Installed quantity-------(1)<br>Performance ratio (PR)= Actual productivity/ Expected productivity---- (2) |
| 6 | Productivity improvement ultimately means reduced cost of construction and better value for money thus bringing improvement in economic growth & life style. |
| 7 | Labour productivity commonly known as ratio of output to input |
| 8 | Productivity is the art of effective and efficient conversion of resources into end products determine the profitability of projects |
| 9 | Total factor Productivity = Total output/∑(labour+materials+equipment+energy+capital)<br>Output quantity = Labour productivity/Labour hours |
| 10 | Labour Productivity = Output /Labour Cost<br>Labour Productivity = Output/Work-hour |

| S.NO | Methodology |
|---|---|
| **1** | Questionnaire method was adopted & the questionnaires were collected and analyzed using statistical software package SPSS v 21. The ranking of factors was calculated based on Relative Importance Index as R.I.I= $\sum$ a $* \frac{n}{N} * \frac{100}{5}$ |
| **2** | Questionnaire survey was carried out. Likert Scale5 was used as Tool<br>R.I.I. = 5(n5) +4(n4) +3(n3) +2(n2) +1(n1) / 5(n1+n2+n3+n4+n5) x 100 |
| **3** | Questionnaire survey was carried out while Ordinal scale was adopted. The responses were ranked by using relative importance index using the formula. RII = $\Sigma W/A \times N$ |
| **4** | Ranking of the various factors according to their significance, and calculating their Relative Importance Index (RII) Ordinal scale was used Data was analyzed using RII= $\Sigma W/A \times N$ |
| **5** | The Author adopted the three stage literature eview to conduct a Content analysis of CLP papers from 1983 to 2011 & the author credits were divided proportionately in multi authored articles Score = $\frac{1.5^{n-1}}{\sum_{i=1}^{n} 1.5^{n-1}}$ |
| **6** | Questionnaires through interviews of three focus groups was collected.<br>Focus groups 1.Main Contractor 2.Conservation 3.Construction plant |
| **7** | This model was used as a basis for designing the questionnaire survey where relative importance of each factor in the hierarchy is determined Pair wise comparison scale was adopted by the author $m=Z^2 * P * (1-P)/\epsilon^2$ & n = m/1+(m-1/N) |
| **8** | Identification of 38 no key factors, filtration through interview & then adopted Questionnaire survey. Cronbach's alpha & Relative importance index techniques were used. 38 different factors were analyzed on Likert's scale. "1" described<br>as strongly disagrees, whereas "5" strongly agree .Factors were ranked & analyzed using RII = $\Sigma PiUi\ (1)/N\ (n)$ |
| **9** | Questionnaire method was followed by the author. 5 point Likert scale was used. The frequency of occurence for each factor was also measured on the 3-scale |
| **10** | This study adopts a descriptive research survey design approach using a project work study manual as the research instrument.<br>ANOVA test of difference. |

| S.NO | Recommendations |
|---|---|
| 1 | Proper Construction & safety supervisor should be appointed for the supervision of the site & Labour groups & must have a friendly attitude. Proper housekeeping of the Construction site should be followed to achieve hygienic environment, safety & avoid labour injuries to avoid loss in Construction labour productivity. Alcoholism should be banned on the site of Work. Payment to the workers should be in time, material & equipment should be of good quality to avoid double time of work.<br>Design issues must be addressed & followed within stipulated time. |
| 2 | Site Supervisors must be responsible for properly skilled labour supervision for 8 hours duration & the labour payment shall be in time. Group leaders shall be made for taking responsibility for labour productivity. |
| 3 | Skilled labours should be outsourced at the earliest to avoid loss of time & construction labour productivity. |
| 4 | Material schedule time with availability of material & equipment should be ensured in time by the Contractors has a positive effect on the task and thus, better labor productivity can be achieved. Safety training & implementation on the site to be followed. Storage of materials should be at the closest place possible to avoid loss of time. Strict drugs & alcohol tests should be implemented on surprise visits to the site.Labours should be rewarded on the basis of best employee of the year.<br>Absenteeism should be avoided by paying the labours paid time off as well as by giving them proper vacations.<br>Complex design & drawings as well as the confusion between various construction agencies should be avoided. |
| 5 | A Proper rest/Work schedule should be designed to have the balanced out put of Worker's health, comfort & productivity<br>However, how to schedule work-rest pattern to balance demands with safety concerns and the physical workload of the personnel in hot weather demands are different than other days & an out of box solution needs to be sorted out according to the Work of site Conditions by the Construction supervision team. |
| 6 | A favourable working environment incorporating three Rs e.g. Respecting, recruiting & retention covered by Site welfare & effective team work to focus Productivity improvement. Retention of experience working staff is a must to avoid loss of time in reorienting the staff for the project & for that the firm should invest in training & development.<br>Technical knowhow, experience & management style geared towards respect are all foundational requirements for effective productivity. |
| 7 | Job satisfaction & security is the dominant factor in the overall productivity improvement. Generally a Labour has a high esteemed attitude towards his work & increased commitment, is more punctual & with less absenteeism. Work planning & scheduling is a another dominant group affecting the labour productivity as it provides cover to the over all progress. |
| 8 | The Contractors should hire the services of experience staff & professionals on important projects. Proper training & development shall be a part of an organization's profile & incentives shall be there to the workers on best of the year basis. There should be a roation based work in shifts for the labours.The employer shall ensure availability of funds prior to the mobilization.<br>Redoing work shall be avoided by adopting proper constructional methodology & Safety standards regarding OSHA shall be followed. |
| 9 | The project management unit should make an effective strategy by incorporating difference of opinions of workers which includes Proper & in time pay, incentives, safety awared, availability of material,equipment,avoiding re work.<br>On the management side an actively pursued Plan, schedule & coordination will be the key to achieve in time completion of the project. |
| 10 | Differences in contractual claims across the states may have accounted for this difference since the evaluation of labour productivity from projects' records was based on labour cost rather than the time spent on the activity. |

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| S.NO | Conclusions |
|---|---|
| **1** | Looking at the result & analysis, the top most factors amongst 15 identified factors Labour factors , Supervision factors , External factors Owner/consultant factors , Execution plan factors , Designer , Working time factors , Equipment factors , Financial factors , Quality factors , Project factors , Organization factors , Leadership and coordination factors , Health and safety factors.<br>Topmost factors affecting labour productivity are sanitation & hygiene of the Construction site & temporary shed, labour injuries on the site,alcoholism,delayed payment, working over time, shortage of construction materials, misunderstanding amongst labours.. |
| **2** | On hand knowledge & experience of Construction labour productivity can help Constructional professionals in execution of the construction projects. Because of complexity & long term duration Construction is liable to risks. Low labour productivity can result in Cost overrun & time over run. |
| **3** | Work study & work measurement techniques are useful in labour data collection & improvement in labour productivity. Analysis of these factors showed that top ten ranked factors affecting labour productivity are Labour Supervision, Skilled Labour, Scheduling of work, Training of labour, Payment, Communication between site management and labour, Climatic condition, Expectations out of labour performance, Unscheduled extra work, Construction method, Availability of material, Availability of tools, Numbers of labours on site, Temperature on site, Safety conditions on site, Meetings with labour contractor, Motivation to labour, Project manager's leadership, Miscommunication between site management. |
| **4** | In today's times Construction industry is a key industry as it is linked to various other industries as well. Prior to the commencement of any construction project an in depth knowledge of labour productivity practices is very important to complete projects within time & Quality to avoid cost & time over run. |
| **5** | General management & Economics have made a rapid & evolutionary progress by the endurances offered by the professionals, scholars including bench marking CLP in the industry helping project performance improvement. With the computer aided technology high power computer tools have been developed ,new management & economics ideas & tools are envisaged to develop in the future. |
| **6** | The Research community & scholars have failed to address the human factors affecting productivity levels. There are four key areas namely Planning, team work, Job welfare & job security.A closer look & analysis of these factors can help construction experts to proactively benefit from the construction projects. |
| **7** | This research revolves around fixing a base line research literature to capatilize further in the construction labour productivity using analytical hierarchy process to quantitatively analyze the inter relation between various factors.<br>Results from different sub-groups demonstrated that Job satisfaction& security, lack of incentive scheme, skill& experience, drug use, overtime and weather changes have a significant impact on labour productivity |
| **8** | The result indicate the 10 main factors negatively affecting labor productivity which are: (1) Lack of Laborer experience, (2) Low<br>amount of pay, (3) Working 7 days per week without taking rest, (4) Drawings and specifications alteration during execution, (5) Poor relations between labor and supervisors, (6) Payment delay, (7) Rework, (8) Increase of labor age, (9) Bad weather condition, (10)<br>Ignore safety precaution. |
| **9** | The conclusive evidences put forward by this literature reveals that the key issues first are Planning, scheduling & coordination on the part of Project engineers, site engineers, senior management to add to the labour productivity. Expert software engineers as well as drawing & design issues in time clearances, skilled labour, equipment availability is key to increase labour productivity. |
| **10** | Work study as the systematic study of work systems for the purposes of finding and standardizing the least-cost method, determining standard times, and assisting in training in the preferred method. The concept aims at improving productivity by examining in detail specific parts of a system rather than the system as a whole. The resource are then applied to the system to work out labour productivity as a whole. |

| S.NO | Variables |
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| 1 | 1: Design factors 2: Execution plan factors 3: Material factors 4: Equipment factors 5:Labour factors 6: Health and safety factors<br>7: Supervision factors 8: Working time factors 9: Project factors 10:Quality factors 11: Financial factors<br>12: Leadership and coordination factors 13: Organization factors 14: Owner/consultant factors<br>15:External factors |
| 2 | 1: Clarification in technical specifications 2: Labor supervision 3: Method of construction 4:Delay in payments 5:Labor fatigue<br>6: Lack of construction managers leadership 7: Extents of variations/change order during executions<br>8: Late arrival, early quit and frequent unscheduled breaks 9: Labor skills 10: Availabilty of experienced labor |
| 3 | 01: Labour supervision 2: Skilled labour 3: Scheduling of work 4:Training of labour 5: Payment 6: Communication between site management & labour 7: Climatic conditions 8: Expectations out of labour performance 9: Unscheduled extra work<br>10: Construction method 11: Availability of materials 12: Availability of tools 13:Incentives scheme<br>14:Number of labours on Site 15: Site lay out 16: Facilities provided to labour 17: Temperature on site<br>18: Materials storage location 19: Structural design complexity 20: Safety conditions on site 21:Meetings with labour contractor<br>22: Motivation to labour 23: Project manager's leadership 24: Miscommunication between site management |
| 4 | 1: Accidents 2: Construction method 3:Drawings & specifications altered during execution 4:Government regulation 5:High quality of required work 6:Increasing number of labours 7:inefficiency of equipment<br>8:Inspection delay 9:insufficient transportation mean<br>10: Insufficient lighting 11:Labour absenteeism 12:Labour disloyalty 13:Lack of competition 14:Lack of financial motivation system<br>15:Lack of labour experience 16:Lack of periodic meeting with labours 17: Labour personal problems<br>18:Lack of place eating & relaxation 19: Lack of training sessions 20:Low quality of raw materials<br>21:Material shortage 22:Misunderstanding amongst labours<br>23: Misunderstanding between labours & supertendents 24: Misuse of time schedule 25:Payment delays<br>26: Rework 27:Supervisor absenteeism 28; Tool & equipment shortages 29: Type of activities in the project 30: Unsuitability of materials storage 31:Violation of safety precautions 32: Wheather change<br>33:Working at high places 34:Working over time |
| 5 | 1: Management (proper planning, realistic scheduling, adequate coordination, and suitable control)<br>2: Labour (union agreements, restrictive work practices, absenteeism, turnover, delays, availability, level of skilled craftsmen, and use of equipment)<br>3: Government (regulations, social characteristics, environmental rules, climate, and political ramifications)<br>4: contracts (fixed price, unit cost)<br>5; Owner characteristics & financing |
| 6 | 1: Well-thought out, realistic plan 2:Building design that enables the use of trade skills 3:Good communication between senior<br>management and operatives 4:Training investment 5:Experienced staff 6:High staff morale 7: Good welfare<br>8:Experienced and self-motivated site manager 9: Site near to home 10: Job security and retention of staff |
| 7 | **Psychological**<br>1: Stress 2: Project location 3:Job satisfaction 4: Lack of essential needs 5: Fear of heights 6: Personal clashes<br>**Experience**<br>7:Level of Skills 8: Level of training 9: Lack of experienced workers 10: Familiarity with the job<br>**Physical:**11: Disease 12: Accidents 13: Hunger 14: Drug use 15: Fasting<br>**Time & Work load:** 16: Crew size 17: Rework 18: Absence of holidays 19: Evening shifts 20: Overtime<br>**Supervision & leadership:** 21: incompetent supervision 22: Lack of incentives scheme 23: Communication problem<br>24: Communication problems 25:Work planning & scheduling 26:Supervisor's absenteeism 27: Lack of training<br>**External:** 28:Natural disasters 28 Local authority registration 29:Economic conditions 30:Wheather changes |

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| **8** | : Lack of Laborer experience 2:High workforce absenteeism 3:Labor dissatisfaction 4:Increase of labor age 5:Poor health of the workers 6:Poor relations among workers 07:Labor disloyalty 8: Lack of empowerment (training and resourcing) 9:Leadership and competency of construction management 10:Poor relations between labor and supervisors 11:Lack of labor observation 12:Lack of periodic meeting with labor 13:Unavailability of safety engineer on site 14:Ignore safety precaution 15: Inadequate lighting 16:Accident 17:Pollution/ Noise 18:Dangerous working conditions 19 Inadequate safety plan 20: Payment delay 21:Low amount of pay22: Lack of financial motivation system 23:Poor condition of camping 24: Lack of training sessions 25:Lack of place for eating and relaxation 26: Working 7 days per week without taking a holiday 27: Work overtime 28; Misuse of time schedule 29 :Increasing number of labor in order to accelerate work 30:Rest time(s) during the work day 31:Material shortages 32: Unsuitable material storage location 33:Tool and equipment shortages 34 :Drawings and specifications alteration during execution 35: Changing order 36:Incomplete/revise drawing 37:Inspection delay 38:Rework 39: Low quality of raw materials 40:Inefficiency of equipment 41:High quality of required works 42:Working within a confined space 43:Interference 44:Construction method 45: Bad weather condition 46 Augmentation of Government regulations |
| **9** | 1:Lack of experience of supervisor 2:Craftsmen unaware of safety precautions 3: Poor quality of materials 4:Lack of maintenance of tools and plants 5:Rework due to field errors committed by craftsmen 6:Unsafe working conditions 7:Unavailability of tools on time at the worksite 8:Lack of team spirit among craftsmen 9: Lack of adequate space for storage of materials 10: Inadequate instructions provided by supervisor 11:Lack of recognition of good and efficient workers 12: Communication problem among craftsmen and supervisors 13: Labour strikes 14:Slow response on doubts arising from the drawings 15: Poor quality of tools provided /used 16: Accidents causing stoppage of work at the site 17: Disputes with consultants/ owner causing stoppage of work 18: Lack of interaction among the site community 19: Interference from other trades or other crew members 20: Lack of periodic meeting among the management, site personnel and the contractors 21: Lack of weekly project evaluation meetings 22: Lack of monetary incentives 23: Unrealistic project goals and deadlines 24: Poor temporary facilities at the site 25:Site congestion 26: Design difficult to construct 27: Disregard of craft worker suggestions/ideas 28: Supervisor absenteeism 29: Excessive overtime |
| **10** | 1: Daily Labour Productivity of Wall Plastering Activity in Akwa Ibom State<br>2: Daily Labour Productivity of Wall Plastering Activity in Rivers State<br>3:Daily Labour Productivity of Wall Plastering Activity in Bayelsa State<br>4:Daily Labour Productivity of Wall Plastering Activity in Cross River State<br>5:Daily Labour Productivity of Wall Plastering Activity in Delta State<br>6: Daily Labour Productivity of Wall Plastering Activity in Edo State |