

Evaluating Methods to Generate Automatic Daily Progress Report in Construction Sites

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Abstract: With the increase in the numbers of complexity of construction projects, the traditional methods of manual development of daily progress report are proving to be insufficient, tedious and time consuming, so the requirement of developing new automated technologies are taking space within the industry. This paper aims at finding out the main factors and problems associated with the same through literature review and questionnaire survey. An output framework for developing a mobile application that will help combat the problems has been proposed through the study. On that basis data required for input framework of android application was collected and modify accordingly. Mobile based android application that would help to simplify the factors for the smooth functioning of the project.

The use of mobile application would lead to an increase in the visibility of the site operation. The application would help in abolishing the use of registers for the attendance of staff members, labours and storekeeping on the sites.

Keywords: Construction Project, DPR, Material Management, Excel, Output framework of software, android application, civil engineering.

Introduction

Construction industry is one of the major sources of job creation in our country. Constructing process requires a huge number of materials and resources, almost the 50-60% of the project cost are incurred in the resources. With the increase in project size and complexity and efficient development of daily progress report has become must for noting and tracking each and every activity on site as well as every material present in the inventory.

Daily progress report (DPR) is a document made on site to show the daily progress on construction site. It shows detail of work executed, amount of material consumed, number of workers with their departments, any issues or problems faced and solution for them etc. in short it shows the detail history of project on a daily basis. The main purpose behind this is to be record proof for any unwanted litigation or disputes. Contract document shows plan story of the site execution, as DPR shows the day-to-day story of project executed. DPR helps to catch small issues before they become big issue. Also, DPR gives real time update. It helps in knowing material stock on site.

Current procedure of managing DPR onsite is semi-manual. Every activity is recorded in the books including attendance of workers material received and consumed onsite and daily progress of project. The documented papers or hard copies need to be appropriately stored and managed which is tedious. Also, manual management requires many copies depending upon departmental procedure of the organisation.

Related work

Dehnokhalaji et al. [1] have their approach based on the assumption that the decision maker (DM) may not have big changes in the structure of DMUs within a short term. Tiwana et al. [2] developed an application which includes the user login interface. It also identifies functions required to use for the application which has user login interface. Kim et al. [3] studied that statistical analysis supported the hypothesis that the task strings which were viewed as being more important to cost and schedule success would also be viewed as being more critically interdependent. Zhiliang Liu et al. [4] presents the integrated mobile material management system in which QR codes are developed for each material and based on that material tracking is done. Taghaddos et al. [5] studied simulation is also employed in large-scale projects to track the availability of resources, capture and release the resources, and satisfy constraints of the problem.

Saeed Karshenas et al. [6] presented in this paper attempts to increase scheduling efficiency by findings of modern cognitive theories that suggest human brain interacts effectively with 3D virtual worlds than a list of project activities. Yong-Cheol et al. [7] represents the methods used and case study of project management systems to manage daily progress in the construction of multiple apartment building. Lu et al. [8] used the popular P3 software as a tool for

investigating the current practice of CPM scheduling under resource limit and calendar constraints. Kartam et al. [10] presents his experience modelling of a multi-storeyed office building project for construction planning, implementing SIPE to plan the project, and describing SIPE's performance in planning the construction of large-scale multi-storey buildings. Kang et al. [10] presented study on how experiment participants at separate locations together detected logical errors in a construction schedule when the 4D visualization model was represented on the Web browser.

Bergeron et al. [11] introduced financial management for new principals and founders of small firms. Many small firms fail, or are not profitable due to not understanding the basics of financial management. Teresa et al. [12] classifies the resource allocation problems, comparing different methods and discussing how these different methods can be applied to the problems. Chin et al. [13] proposes a generate-select-check based daily reporting process, where tasks are generated at the microlevel through an interactive mode with the user, tasks to be performed are selected on the corresponding date and they are checked using a mobile device. Hegazy et al. [14] used a simplified approach for site-data recording and constructing "as-built" schedules, introduced through the use of intelligent bar charts. Zhang et al. [15] proposed fuzzy decision-making systems for dynamic resource allocation. Allocation of the research is carried out in priority-based manner

Current procedure of making DPR

Current procedure of maintaining DPR on site to record every activity in the book including attendance of workers, material received & consumed on site and daily progress of the project.

Also, in case of manual management the in-between corrections require to be change right from the start of the document, rather than simply getting updated which is possible in automated system. The study is about assessing the factors that affects successful completion of the construction project. The purpose of the study is to understand the current methods and procedures adopted by the organisation for maintaining the daily progress on construction project. Analysing the loop holes in manual method of maintaining DPR on site. Current procedure of managing DPR on site is semi-manual. The following are the common issues associated with manual management of DPR:

- Late / slow processing time
- Higher chances of human errors
- Time consumption in transfer of data and maintaining records
- Mis-interpretation of information
- Resource problems on site
- Less productivity
- Documents missing
- Unnecessary repetitive paperwork

Working of application

Mobile application named as "Daily Progress Report" which is based on Android platform developed for automatic generation of DPR on construction site. This application helps to simplify the factors for the smooth functioning.

Following are the detailed working of application "Daily Progress Report";

After installing application, first window is of Login interface without which user cannot get the access of the application. Login ID and Passwords are generated for the specifying the access of application, i.e., Application drawer has a function of;

- 1) Muster
 - Add contractor
 - Add labour
 - Add staff
 - Add designation
 - Add machinery
- 2) Attendance
 - Labour attendance
 - Staff attendance
 - Final attendance
 - Export labour reports

- Export staff reports
- 3) Store
 - Add material
 - See material
 - Add material stock
- 4) Inventory
- 5) Resource Allotment
 - Labour / Staff
 - Machinery
 - Material
- 6) Accounts
 - Add balance
 - Expense
 - Payments
- 7) Events
- 8) Generate DPR
- 9) Logout

Detail working of application

1) Muster

Muster is a book which keeps all contractor, labours, staff members, names who are working on a project. Also, provision for registering new staff having a new designation is done. New contractor, labour, staff member or machinery for a project should be initially register in the muster.

This helps to create new staff member, designation, contractor, labour, machinery profile for further functions of an application.

2) Attendance

Since attendance is a very important aspect of Daily Progress Report, this function is also included in the application.

All the labours and staff members who has their name register in the muster are eligible for the attendance.

Attendance of each day recorded separately and also has an option of exporting attendance of the labour or staff members for the respective date.

This function is important because without attendance of labour or staff members, there are no staff members or labours visible in the allotment of labour/staff members for any work. i.e., after filling attendance only present staff/labours are eligible to allot work in resource allotment function.

Attendance function also has a option of making half day present or full day present of a labour/staff for a particular date.

3) Store

store department is a factor which has a serious attention of a project manager. So, application includes function of store department. In this function user can add new material which is not used previously. i.e., user can create fresh profile for new arriving material for keeping stock record of every material.

Also, user can add the material stock of a respective material profile. The material profiles which have stock to consume are only visible to the function of material allotment and for further use. Material profiles whose stocks are exhausted or finished are not shown for material allotment.

4) Inventory

This function has the available quantity of material data and consumed quantity material data with date and time consumption of material. i.e., quantity of material available after consumption is shown here and this data can be also exported to the pdf file and excel sheets if required.

5) Resource allotment

Important resource of construction site are Men (labour / staff), Machinery, Material and Money. Among these four important M's money that is account part is kept as a separate function.

In this Resource allotment function labour/staff allotment, material allotment and machinery allotment are done. Also, in this function only present staff/labour are able to get allotted because absent staff/labour are automatically eliminated by the system itself. After selecting staff/labour to be allotment of work, user has to add description of work, location of work, in time, out time of work etc. and this data is then sent in the respective column of the "Execution of work" and "Labour & staff" in the final DPR Report.

Likewise, in the machinery allotment function there are machineries which are registered in the muster only those are visible for allotment of work. After selecting machineries user has to add description of work, location of work, quantity of

work performed, start reading and end reading of machineries etc. and this data is then sent to the respective column of "Machinery details" and "Execution of work" in the final DPR Report.

In this Material allotment function, only material names which has available quantity for consumption are visible with their available quantity. After selection of material and entering consumed quantity of material, this data is then sent to the respective column of "Material consumption" column in the DPR report and also inventory gets updated after consumption of material automatically.

6) Accounts

This function has an Accounting section which is use to add balance and record expense with description. Also, labour and staff payment record are maintained from this function, this data is then sent to the respective column of "Accounts" column in the DPR Report.

7) Events

Events function use to record an event which is to be scheduled on site.

8) Generate DPR

In this function, after selection of date for the DPR generation entire data which filled in the Store department, Resource Allotment, Accounts, Events. Date wise DPR are saved on the server and whenever there is a need of referring previous daily progress reports user can refer that by simply entering date and that DPR can be exported in the form of pdf file or excel sheet.

Result and discussion

The current method though it seems appropriate is actually very overwhelming and may lead to discrepancies. A more effective Application would eliminate this limitation and enables less tedious tasks to the data entry operator as well as the viewer.

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Factors which are important for making DPR on Construction site are taken to the consideration while developing the Mobile Application.

Factors which are taken as a main function for developing Mobile Application are Labour and staff attendance, Store department, Allotment of resources, Inventory Department, Accounts. Ultimate aim of developing mobile application is to simplify the factors for the smooth functioning.

Mobile Application names as "Daily Progress Report" has following benefits;

As entire data of project will be saved on server there is no chances of missing any kind of data, which is more in paperwork method for keeping records of DPR. Reduces complexity of keeping records and attendance of labour and staff, Machinery details along with Owner information. Increases the efficiency and transparency of project to the higher authority of project.

Back dated data of a project can be seen on a single touch so that there is no need to refer the previous DPR books. More convenient as application has a function of exporting report to the pdf file and Excel sheet as well, also has a function of copy the DPR report.

If there is any need to give proof for attendance of labours or staff members, function of labour and staff has option of Exporting back dated attendance in pdf file and excel sheets conveniently.

Also, Inventory function shows\ available quantity of material and consumed quantity of material and date and time on which material consumed. This section can also export in pdf and excel sheets as well.

For the selection of factors which are best for the maintaining daily progress report on site are done by collecting various DPRs and also discussion with expert related to the project management field.

Conclusion

The study of factors affecting generation of daily progress report concluded that for an efficient and timely completion of the project, a precise control over the material flow, machinery, labours and cash flow on site is important. In most of the construction companies resource management and generation of DPR is carried out manually, to achieve higher accuracy. Hence to reduce the tedious documented paper work there is requirement of change in the process of generation of DPR. Also, due to increase in the complexity of the project the manual method of generating DPR are proving to be insufficient. In this study, the current procedures of generation of DPR on different sites were assessed individually and on what basis DPR were generated is analysed, then factors are decided and model framework output for mobile application is prepared. So, the development of the mobile application is important to efficiently manage and track the ongoing site activities. By using application, the record maintaining of labour and staff members attendance, machinery details, inventory and store departments, accounts, stock material becomes easier.

Acknowledgement

With a deep sense of gratitude, the author would like to thank his guide, Mr. S. M. Waysal and all his friends and family who have supported him in his research work.

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