# Android Application-Control and Monitoring in Construction Project

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***ABSTRACT—***

***The aim of the project is to provide a generalized and integrated solution module to monitor the construction tasks carried out at different venues in the construction industry. This system consists of sequence of activities which are scheduled as per the company's calendar. It enables automatic rescheduling methodology in which the site engineers at different construction site can upload the images and the data like quantity of work executed, number of labours, expenditures, over heads etc of the completed tasks which are carried out each and every day. Those uploaded data and images can be viewed by the project manager their mobile module and the copy of those data are also sent to the default e-mail id of the project manager which act like a backup. Both project manager and site engineer can login into this module through their authenticated user name and password. Whenever the site engineer upload their data and image of the project and SMS alert will be received by project manager at that instance. This module possesses a way to export the data and images into MS Excel format from the mobile application.***

## I. INTRODUCTION

In the recent years the Android Technology with web services has brought many drastic changes in the mobile application development fields. Keeping this in mind, an android based mobile application to access the remote database has been developed. This application provides a generalized solution to monitor the various works that are carried out by a construction company at different geological points. By using a Web Service the data are stored in the remote database. Using data in the remote database various reports are generated and projected as a MIS [Management Information System] web application. Thus the construction can use the MIS to monitor the works carried out at various sites.

The various works at various geological points. Currently, for these works the construction company will be having the site supervisors, who will be taking care of the various sites. The site supervisors currently furnishes only their weekly or monthly expenditure details and progress of works, because of this the construction company has to wait, to know the expenditures and the progress of work made by the various construction site.

This process is very much time consuming and it involves a lot of manual work to be carried out. To update the day to day activities, every site supervisor requires a computer with internet connection at their sites. They also require a camera to capture the construction status. To provide all these facilities at the remote site the construction company has to spend huge sum of money, time and space. So to surmount this problem new framework was proposed.process of works monitoring in any construction company is a tedious job. The construction company performs Total Quality Management which is management philosophy focuses on continually work processes. Particularly, Six Sigma became a useful method as a performance indicator and process improver for the companies from different industry. Increasing numbers of companies start to integrate the full implications of Six Sigma. Six Sigma is a quality improvement technique based on statistics, was used firstly by Motorola in the 1980s. It helps to decrease costs, increase quality by improving process and reduce the production time.

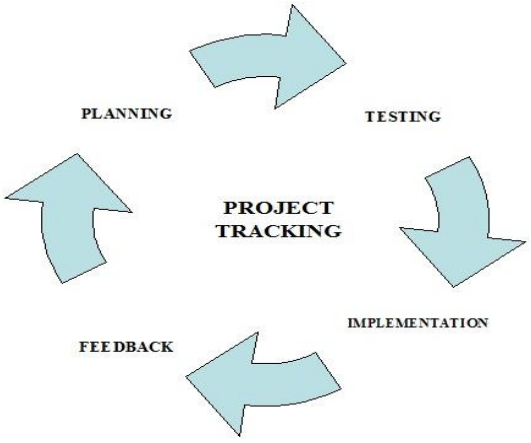
A mobile phone with advanced computing capabilities is a smart phone. Smart phones includes the functionalities of personal digital assists, portable media players, digital cameras, GPS navigation and high definition touch screens and web browsers, high speed data access. Android is open source and Google releases the code under the Apache license. Android has a large community of developers writing applications written in the Java programming language making Android to become the world's widely used smart phone

platform. Android has 75% of worldwide market share. Android was built to create mobile applications that take full advantage of all a handset offer. It provides with all tools for the developer. As it is an open source it is easy to get the tools required for application development. Application can have access to the entire phone's core application if required such as email, calendar etc.

The information technologies are growing faster and software system became larger and more complex, there is a need of effective software development management, which is a key factor to lead quality software systems. "Project management is the process of the application of knowledge, skill, tools, and techniques to project activities to meet project requirements". The internet, a new member of IT, offers a medium to manage projects throughout the world from anywhere at any time. Same is the case of using smart phones, project management application used in android mobile. It includes modules like assign projects, add employees, assign tasks, send alerts via email/SMS, testing and updates like upload work and many more.

## II. PROJECT TRACKING

This application is useful in software project management for managers, developers and tester in all phases of software development. This application will help for creating project schedules as well as budgets that optimize limited resource usage. It will also improve communication between project stake holders. As the application is embedded in mobile, it can be accessed anywhere at any time. Agile software development methodology is used in this application. It provides iterative software development methodology.




. Figure 1 Project Tracking

A. Control Desk

There is a user friendly interface which gives list of projects, tasks, events that are assigned to the user. It also gives the role of the user in the project development. There is a facility of graphical charts giving the status of the project to enable managers to intervene where required. Project managers add users to project team. It is very simple to use this application. If anyone wants to use this application, he/she has to register using email-id and mobile number.

B. Project Planning

Project manager assigns various tasks to the team members and these tasks need to be scheduled considering schedule of them.

- *Task assigning:* Interface that allows user to add or edit tasks, change schedules or assignments.
- *Resource allocator:* Customize work hours for the users. New tasks are scheduled automatically according the availability by the system.

C. Project Tracking

It is necessary to track the progress of project for its successful completion.

- *Project progress:* Manager or team members indicate progressas percentage. The system automatically calculates the projected end dates of the tasks and project.
- *Graphical charts:* Identify the available and overloaded resources across project.

D. Collaboration

- *Message board:* Using this facility user conducts secure online discussions with team members and client.
- *Attachments:* There will be a secure and shared storage of all documents on the server side.
- *Meetings and event scheduler:* Meetings and events are arranged using calendar by the system. Invites are also sent through email/SMS to team members.

E. Email alerts

Emails have become popular medium for exchanging information among people. So this system uses emails for giving alert to user about important events like task assignments, task updates, task start and end dates and so on. These alerts keep user updates wherever documents are uploaded or newer versions are available. Users can enable/ disable the notifications as per their needs. It also alerts project manager when tasks are delayed.

F. customizations

There are number of customization options for user's feasibility. Users can customize their dash boards, menus, date styles and much more.

## III. MODULAR DESIGN

1. Authenticated user login

The site supervisor located at different sites of the construction company, login with their user name and password. Every time when a user login through the mobile application the IMEI number, the latitude and the longitude of the work site and the mobile number are captured. By capturing these details we provide an authenticated way through which the site supervisor alone can use this mobile application. Thus the expenditure details and progress of work details can be sent from the site supervisor's mobile device.

2. Location based works entry

The works performed in the various sires of the construction company are monitored using the corresponding supervisor. The expenditure made on that day and the works performed are updated in this module.

## IV. METHODOLOGY

This system consists of sequence of activities which are scheduled as per the company's calendar. It enables automatic rescheduling methodology in which the site engineers at different construction site can upload the images and the data like quantity of work executed, number of labours, expenditures, over heads etc of the completed tasks which are carried out each and every day. Those uploaded data and images can be viewed by the project manager their mobile module and the copy of those data are also sent to the default e-mail id of the project manager which act like a backup. Both project manager and site engineer can login into this module through their authenticated user name and password. Whenever the site engineer upload their data and image of the project and SMS alert will be received by project manager at that instance. This module possesses a way to export the data and images into MS Excel format from the mobile application.

This flowchart shows the way in which the data are followed from Site Engineer module to the Project Manager module using RFID

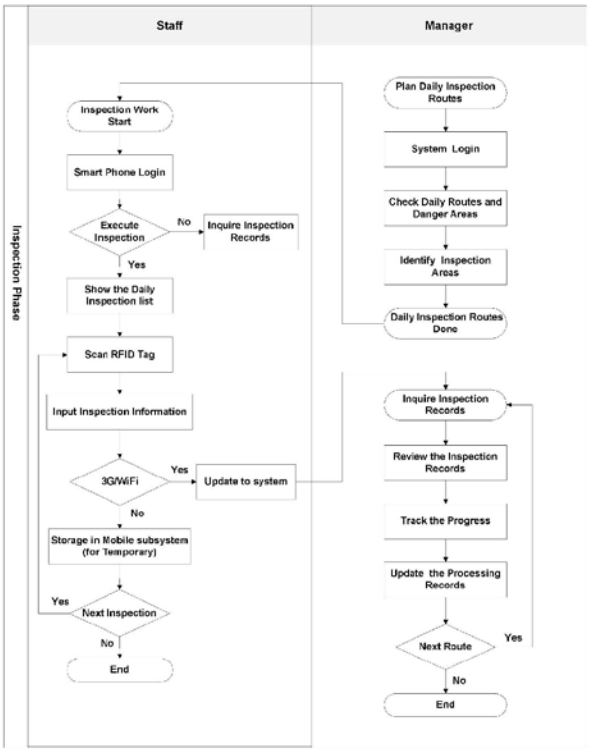



Figure 2 Data Flowchart

## V. RESULTS AND DISCUSSION

By preparing the following sheet, can easily control and monitoring in construction industry in android application.

| S.NO | DESCRIPTION | COMPLETED Condition generally okay minor work may be needed | PARTIALLY COMPLETED Major work needed to correc deficiencies | PENDING Replacement needed generally not capable of repair | COMMENTS |
|---|---|---|---|---|---|
| | SUB STRUCTURE | | | | |
| 1 | Earth work | | | | |
| 2 | Sand Filling - 3"tk | | | | |
| | *Footing* | | | | |
| 3 | P.C.C - 3" tk - 1:4:8 | | | | |
| | *Footing* | | | | |
| 4 | Footing Centering - | | | | |
| 5 | Footing Concrete - 1:1.5:3 | | | | |
| 6 | Column Centering | | | | |
| 7 | Column Concrete - 1:1.5:3 | | | | |
| 8 | Soil Filling - Upto Earth Work Level | | | | |
| | *Footing* | | | | |
| 9 | Plinth Beam Centering | | | | |
| 10 | Plinth Beam - 1:1.5:3 | | | | |
| 11 | Soil Filling - Upto Plinth beam | | | | |
| 12 | Consolidation& Earth Ramer Work | | | | |
| 13 | Sand Filling - 3"tk – Flooring Purpose | | | | |

Figure 3 Checklist Page_1

| | | | | | |
|---|---|---|---|---|---|
| 14 | P.C.C - 3" tk - 1:4:8 – Flooring Purpose | | | | |
| 15 | 3" tk - 1:1.5"3 - Mat Concrete - M20 | | | | |
| 16 | 3" tk - 1:1.5"3 - Elise Pattern - M15 | | | | |
| SUPER STRUCTURE | | | | | |
| GROUND FLOOR | | | | | |
| 17 | Column Centering | | | | |
| 18 | Column Concrete - 1:1.5:3 | | | | |
| 19 | Beam Centering | | | | |
| 20 | Beam - 1:1.5:3 - M20 - 1'6"depth | | | | |
| 21 | Slab Centering | | | | |
| 22 | Slab Concrete - 1:1.5:3 - M20 - 6"tk | | | | |
| 23 | Staircase Centering | | | | |
| 24 | Staircase Concrete - 1:1.5:3 - 6"tk | | | | |
| | FIRST FLOOR | | | | |
| 25 | Column Centering | | | | |
| 26 | Column Concrete - 1:1.5:3 | | | | |
| 27 | Beam Centering | | | | |
| 28 | Beam - 1:1.5:3 - M20 - 1'6"depth | | | | |
| 29 | Slab Centering | | | | |
| 30 | Slab Concrete - 1:1.5:3 - M20 - 6"tk | | | | |
| 31 | Staircase Centering | | | | |

Figure 4 Checklist Page_2

| | | | | | |
|---|---|---|---|---|---|
| 32 | Staircase Concrete - 1:1.5:3 - 6"tk | | | | |
| | TERRACE | | | | |
| 33 | Column Centering | | | | |
| 34 | Column Concrete - 1:1.5:3 | | | | |
| 35 | Beam Centering | | | | |
| 36 | Beam - 1:1.5:3 - M20 - 1'6"depth | | | | |
| 37 | Slab Centering | | | | |
| 38 | Slab Concrete - 1:1.5:3 - M20 - 6"tk | | | | |
| | BRICK WORK | | | | |
| | GROUND FLOOR | | | | |
| | ***9" WALL*** | | | | |
| 39 | All Walls | | | | |
| 40 | Windows | | | | |
| 41 | Doors | | | | |
| | ***4.5" WALL*** | | | | |
| 42 | All Walls | | | | |
| 43 | Windows | | | | |
| 44 | Doors | | | | |
| 45 | Kitchen Open | | | | |
| | COVERED SERVICE LOBBY | | | | |
| | ***9" WALL*** | | | | |
| 46 | All Walls | | | | |

Figure 5 Checklist Page_3

| | | | | | |
|---|---|---|---|---|---|
| 47 | Windows | | | | |
| | STAIRECASE | | | | |
| | ***9" WALL*** | | | | |
| 48 | Staircase | | | | |
| | FIRST FLOOR | | | | |
| | ***9" WALL*** | | | | |
| 49 | All Walls | | | | |
| 50 | Windows | | | | |
| 51 | Doors | | | | |
| | ***4.5" WALL*** | | | | |
| 52 | All Walls | | | | |
| 53 | Windows | | | | |
| 54 | Doors | | | | |
| | COVERED SERVICE LOBBY | | | | |
| | ***9" WALL*** | | | | |
| 55 | All Walls | | | | |
| 56 | Windows | | | | |
| 57 | Doors | | | | |
| | STAIRECASE | | | | |
| | ***9" WALL*** | | | | |
| 58 | Staircase | | | | |
| 59 | Windows | | | | |
| 60 | Doors | | | | |

Figure 6 Checklist Page_4

| | | | | | |
|---|---|---|---|---|---|
| | BRICK WORK – TERRACE | | | | |
| | STAIRECASE | | | | |
| | ***9" WALL*** | | | | |
| 61 | Staircase | | | | |
| 62 | Windows | | | | |
| | PARAPET WALL | | | | |
| | ***9" WALL*** | | | | |
| 63 | All Walls | | | | |
| | LINTEL& SUNSHADE CENTERING | | | | |
| 64 | Lintel | | | | |
| 65 | Sunshde | | | | |
| | LINTEL& SUNSHADE CONCRETE - 1:1.5:3 | | | | |
| 66 | Lintel | | | | |
| 67 | Sunshde | | | | |
| | MALL FIXING & BOX PACKING | | | | |
| 68 | All Floor's | | | | |
| 69 | Corridor (2times) | | | | |
| 70 | Steps | | | | |
| | CHICKEN MESH FIXING – INNER | | | | |
| 71 | Rooms | | | | |
| 72 | Corridor | | | | |

Figure 7 Checklist Page_5

| | | | | | |
|---|---|---|---|---|---|
| 73 | Staircase | | | | |
| 74 | Lift | | | | |
| | CHICKEN MESH FIXING – OUTER | | | | |
| 75 | OUTER SIDE WALL - Hori | | | | |
| 76 | OUTER SIDE WALL - Vertical | | | | |
| | LIME MORTOR PACKING – INNER | | | | |
| 77 | Rooms | | | | |
| 78 | Corridor | | | | |
| 79 | Staircase | | | | |
| | LIME MORTOR PACKING – OUTER | | | | |
| 80 | OUTER SIDE WALL - Hori | | | | |
| 81 | OUTER SIDE WALL - Vertical | | | | |
| | PLASTERING - INNER | | | | |
| | GROUND FLOOR | | | | |
| 82 | All Walls | | | | |
| 83 | Above Lintel Plastering | | | | |
| 84 | Ceiling | | | | |
| 85 | James Plastering | | | | |
| 86 | Windows | | | | |
| 87 | Doors | | | | |
| | WALL LOBBY | | | | |
| 88 | All Round Wall | | | | |

Figure 8 Checklist Page_6

| | | | | | |
|---|---|---|---|---|---|
| 89 | Ceiling | | | | |
| 90 | Windows | | | | |
| 91 | Doors | | | | |
| | STAIRECASE | | | | |
| | **9" WALL** | | | | |
| 92 | Staircase | | | | |
| 93 | Staircase Waist Slab | | | | |
| 94 | Windows | | | | |
| | HEAD ROOM & PARAPET WALL | | | | |
| 95 | All Inner Wall | | | | |
| 96 | Parapet Wall | | | | |
| 97 | Doors | | | | |
| | OUTER PLASTERING | | | | |
| 98 | ALL ROUND WALL | | | | |
| 99 | James Plastering | | | | |
| 100 | Doors | | | | |
| 101 | Windows | | | | |
| 102 | Ventilator | | | | |
| 103 | Utility Open | | | | |
| 104 | Head Room & OHT | | | | |
| | SURUKI LAYING | | | | |
| 105 | Open Terrace | | | | |
| 106 | Toilet Sunken | | | | |

Figure 9 Checklist Page_7

| | | | | | |
|---|---|---|---|---|---|
| | ELISE PATTERN CONCRETE | | | | |
| 107 | ROOMS | | | | |
| 108 | Lobby | | | | |
| | TILES LAYING WORK | | | | |
| | FLOOR TILES | | | | |
| 109 | ROOMS | | | | |
| 110 | Lobby | | | | |
| | WALL TILES | | | | |
| 111 | M.Bed Toilet | | | | |
| 112 | Bed.1 Toilet | | | | |
| 113 | Kitchen | | | | |
| 114 | Utility | | | | |
| | SKIRTING TILES & PACKING | | | | |
| 115 | ROOMS | | | | |
| 116 | STAIRCASE | | | | |
| | WEATHERING TILES | | | | |
| 117 | Open Terrace | | | | |
| | WOOD WORK | | | | |
| 118 | Main Door 3'6"x7' - D4 | | | | |
| 119 | Bed Room Door 3'x7' - D3 | | | | |
| 120 | Toilet Room Door 2'6"x7' - D26 | | | | |
| | ACCESSORIES | | | | |

Figure 10 Checklist Page_8

| | | | | | |
|---|---|---|---|---|---|
| 121 | Door stopper | | | | |
| 122 | Bush 3" | | | | |
| 123 | Tower bolt | | | | |
| 124 | Hinges | | | | |
| 125 | Main Door lock & handle | | | | |
| 126 | Door lock & handle | | | | |
| | MODULAR KITCHEN | | | | |
| 127 | Table Top Granite Steel Granite | | | | |
| 128 | Bottom unit Area | | | | |
| 129 | Top unit Area | | | | |
| 130 | VINYAL WINDOW | | | | |
| 131 | WINDOW GRILL | | | | |
| | PAINTING WORK | | | | |
| | GROUND FLOOR | | | | |
| 132 | All Walls | | | | |
| 133 | Above Lintel Painting | | | | |
| 134 | Ceiling | | | | |
| 135 | James Painting | | | | |
| | FIRST FLOOR | | | | |
| 136 | All Walls | | | | |
| 137 | Above Lintel Painting | | | | |
| 138 | Ceiling | | | | |
| 139 | James Painting | | | | |

Figure 11 Checklist Page_9

| | | | | | |
|---|---|---|---|---|---|
| | WALL LOBBY | | | | |
| 140 | All Round Wall | | | | |
| 141 | Ceiling | | | | |
| | STAIRECASE | | | | |
| | 9" WALL | | | | |
| 142 | Staircase | | | | |
| 143 | Staircase Waist Slab | | | | |
| | PARAPET WALL | | | | |
| 144 | All Inner Wall | | | | |
| 145 | Parapet Wall | | | | |
| | OUTER PAITING | | | | |
| 146 | ALL ROUND WALL | | | | |
| 147 | James Painting | | | | |
| | Head Room & OHT | | | | |
| 148 | All Inner Wall | | | | |
| | DOOR FRAME POLISHING | | | | |
| 149 | M.Door | | | | |
| 150 | Bed Room Door | | | | |
| 151 | Toilet Door | | | | |
| | ELECTRICAL | | | | |
| 152 | Roof Conduit Pipe Laying | | | | |
| 153 | Wall Cutting Purpose Electrical Gudy Work | | | | |
| 154 | Pipe Laying Work | | | | |

Figure 12 Checklist Page_10

| | | | | | |
|---|---|---|---|---|---|
| 155 | Wire Laying Work | | | | |
| 156 | Switch Fixing Work | | | | |
| 157 | D.B Wiring | | | | |
| 158 | CFL Pulb Fixing | | | | |
| | PLUMBING | | | | |
| 159 | Water Line – Toilet | | | | |
| 160 | 3/4" Cpvc Pipe | | | | |
| 161 | Diverter Fixing | | | | |
| 162 | Pipe Gudy | | | | |
| 163 | Brick Holes | | | | |
| 164 | Waste Line (Toilet & Kitchen) | | | | |
| 165 | 4" Pvc Pipe | | | | |
| 166 | 21/2" Pvc Pipe | | | | |
| 167 | 1 1/2" Pvc Pipe | | | | |
| 168 | Anger Pastner | | | | |
| 169 | Fittings | | | | |
| 170 | EWC | | | | |
| 171 | Qwal Wash basin | | | | |
| 172 | Counter W/B | | | | |
| 173 | Shower | | | | |
| 174 | Health Faccet | | | | |
| 175 | Pillar Cock | | | | |
| 176 | Spout | | | | |

Figure 13 Checklist Page_11

| | | | | | |
|---|---|---|---|---|---|
| 177 | Cockroch Treap | | | | |
| 178 | Angle Valve | | | | |
| 179 | Diverter | | | | |
| 180 | Kitchen & Uutility - Water Line | | | | |
| 181 | 3/4" Cpvc Pipe | | | | |
| 182 | Pipe Gudy | | | | |
| 183 | Brick Holes | | | | |
| 184 | Sink | | | | |
| | FINAL CLEANING WORK | | | | |
| 185 | Ground & First Floor | | | | |
| | GENERAL FITTINGS | | | | |
| 186 | E.B Panel (B.k) | | | | |
| 187 | Gas Line (Ambal) | | | | |
| 188 | Genset | | | | |
| 189 | FALL CEILING | | | | |

Figure 14 Checklist Page_12

## VI.CONCLUSION

In the first phase of this project feasibility studies like Literatures journals belongs to the authors of both national and international level has been collected and studied. Through which the initial feasibility for the project has been determined. There are several firms approached and their opinions are kept for the purpose of assisting module creation. A checklist has been created in order to cover up the parameters which are related to civil, electrical, steel, centering, and plumbing, carpentry, tiles, fall ceiling and painting are included in it. From the related journals study it clearly furnishes that this type of module enables the construction site to save their expenditure up to the minimum 6.5%of their budget.

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