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DEVELOPMENT OF JOB SCHEDULING AND STAFF MONITORING SYSTEMS FOR ORGANIZATIONS

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Abstract
Technology is being used to meet the demands of the employer. Businesses are adopting a broader range of monitoring technology to observe what their employees are doing at all times to save costs and boost efficiency. Negative behaviour of employees (disloyalty, treachery lack of commitment and dedication etc), downloading or transferring of malicious files from the internet and lack of transparency could all affect the reputation of the companies/organizations' images negatively, hence for the Management of the organizations to ensure the dedication, commitment and productivity of employees, there is utmost need to design a job scheduling and monitoring system for staff in their workplace. The objectives of the study are to formulate a model and develop a job scheduling and monitoring system for staff. The methods of the developed system involve the use of a model that incorporates decision variables for scheduling tasks/assignments and monitoring indicators such as variable, objective function, shift coverage, employee availability, monitoring and preference satisfaction. The new system contains different components: user management, scheduling module, task management and task management, reporting and analytics, communication, time and attendance. Developed/new system was implemented using programming tools: Hypertext Mark-up Language (HTML), PHP, and My Structured Query Language (MySQL). The interfaces generated are monitoring, employee list/ management, task creation/list, task operation and task progress update. The new system checks/monitors/schedules the tasks of the employees so that employers can have a creditable business value and customer satisfaction can be increased.

Keywords: Scheduling, task operation, monitoring, communication

Introduction

Some employees spend time on irrelevant activities while they are on duty. Some of the irrelevant activities can be online surfing, accessing websites that are not permitted by the employer, and making pointless phone calls or sending pointless messages. The managers are ignorant of that. Many reports focus on the things that employees do; it stands to reason that management may occasionally have good grounds for keeping an eye on the workers' behaviour so that the needful could be done (Peninsula Group Limited, 2020). Therefore, a system that informs the management of the employee's job description and the ability to deliver the job to expectation. Using this program, managers may easily keep an eye on the activities of their staff members while they are at work.

There is a need to monitor the jobs assigned to the employees as this kind of monitoring can have a big effect on the relationship between employees and their employers. For example, if an employee knows that their performance is being watched; and that it might be used in their performance review; they (employees) will do their jobs rightly so that they can have positive evaluations that will boost their

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morale, motivation and productivity (Jensen & Raver 2012).

The profit-driven organizations run their operations effectively and efficiently by using newer technologies to keep an eye on the workers' behaviour and ensure that employees are doing the work for which they are being paid (Semuels, 2013). The profit-driven organizations take advantage of the obvious empowering benefits that digital technologies can afford them by ensuring the scheduling of jobs for employees. The job scheduling initiates the flow of communication, location, and activities or operations, time for the job to be done and finished are all considered. The monitoring of jobs can also be tracked to see the progress of the jobs (Information Commissioner's Office, 2023). For organizations to strive in business, and to be productive; such organisations must have good grounds to watch over employee behaviours in the first place (Connolly, 2013).

Employees should have a kind of perception of the conditions of the employment relationship by knowing that their performances are being tracked; and that there is a greater chance that information about them could be used against them in performance evaluation or promotion evaluation (Nikita *et al*; 2013). The organization's success is dependent on employee performance, and poor performance is damaging to the company's success. An employer must maintain track of his staff at all times to ensure the quality of service and maximum production from them. Hence, an employee monitoring system was developed by Shoewu *et al*, (2015) where the call logs, sent and received messages and the Global Positioning System (GPS) location of an employee was monitored.

The process of scheduling and monitoring of jobs for staff is manual, the Personal Affairs, which is in charge of maintaining a good work structure, finds it challenging to effectively oversee employee tasks. Due to the manual process, Human Resources can't determine where the employee is working; this increases the risk of fake attendance and being unattended to urgent tasks. Communication is a way by which the Human Resources Department could get a general idea of where (location) each employee is and the task each staffer should do. While putting a call across to a staffer to know the progress of tasks given, there is the likelihood of receiving a fake status on the jobs' progress. To conquer the limitations of manual processes, and to ensure prompt operations of workers/staffers in businesses, there is a need to design and implement a model for job scheduling and monitoring for staff.

Negative behaviour of employees causes a bad reputation on the image of the organization publicity due to the offensive chain of information that is disseminated within the organization and their environs. As a result, monitoring tools to prevent the flow of offensive information could be deployed via the proposed system (Craver, 2006).

Lane (2003) pointed out how simple it was for disgruntled employees to download, transfer, copy, or post important corporate data and trade secrets onto a Web page. Internal attacks frequently target particular exploitable facts and seriously harm an organization (Stanton & Stam, 2003).

Lack of transparency in how the management gathers information and eventually uses the information may result in an imbalance of power and judgment. This can have a detrimental effect on employees, lowering their commitment, productivity and motivation to the organization.

The construction of a job scheduling and monitoring system for staff has significance in the sense that it will reduce the number of errors committed,

and provide more effective use of staffer's time; monitor the employers to identify their strengths as the developed system will increase a worker's productivity at work. It will decrease workplace blunders made by employees and highlight issues that can be resolved. It will enable a business to swiftly fix a problem and prevent such a problem from happening again.

With the desire to increase productivity, reduction of theft and avoid workplace disputes in the organizations, there is a justification for employees to be monitored so that the interests of the company/organizations can be defended (Lane, 2003).

The employers or the Management checkmates and addresses the moral and societal problems of the employees by using the monitoring tools. Additionally, the seamless integration of technology into the workplace can reduce the risk of internal attacks.

Review of Related Work

Researchers have worked on monitoring systems to monitor employees' commitment and dedication to their jobs.

Sonal *et al.* (2016) developed an Android-based employee tracking and monitoring system where smartphones were used for tracking all employees. The system contained phone data including SMS history, incoming and outgoing calls, employee locations, data consumption, web browsing history, and details of unauthorized calls. Employees must meet the requirement of owning an Android phone, and manager activities are also observed.

Android applications can be utilised to monitor employees' smartphones. Information on incoming calls, text messages, and multimedia messages, as well as the timely location update of the employees and their attendance can be all saved in the centralized server. Manager can access the central server later on and check specifics about their employee's mobile usage. The managers can monitor their employees using this system and their mobile phones (Priti *et. al*. 2015).

A Smartphone application called Personnel Attendance Management and Employee Registration allows staff to track the whereabouts of other staff members and report the attendance of employees (Avinaash *et. al*. 2015).

A system was developed to monitor users' daily activities when using Android smartphones. The missed calls, incoming and outgoing calls, call duration, and incoming and outgoing SMS messages, together with their date and time could all be tracked and uploaded to the server, which the administrator would be watching over. This data may be kept for organizational security purposes such as preventing data leaks and upholding organizational policies (Aparna, 2013; Dutta *et. al*. (2015).

Nirmal *et al.* (2016) developed an Android smartphone-based employee surveillance system that combines employee monitoring with Global Positioning System (GPS). Using this technique, the employee's entire activities are kept under surveillance. The entire employee's computer and mobile device activity, including data usage, all incoming and outgoing conversations, web surfing, secured document modification, and illegal transfer of sensitive company information like blueprints, stocks, projects, etc., would be kept under close observation. Additionally, GPS will be used to track the employee's overall geographic position. As a result, the company will be under observation to prevent employees from using company resources outside of work hours (Shermin *et al*. 2015; Ashwini *et al*., 2015).

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Methodology

The need for an efficient staff job management system arises from the challenges inherent in manual job scheduling and management processes. The manual method often leads to scheduling conflicts, suboptimal resource allocation, and difficulty in communicating updates. The proposed system addresses these issues by automating the scheduling process, hence resource allocation can be optimized, and communication between staff and management can be as well enhanced.

The development of the system contains some components which are user management, task assignment, communication tools, scheduling, reporting and analytics and attendance tracking as illustrated in Figure 1

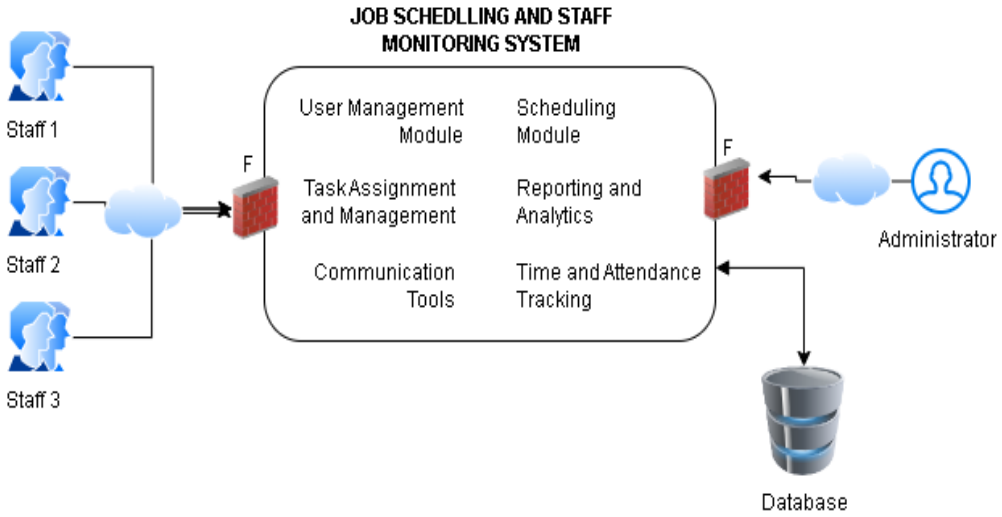

Figure 1: Job scheduling and monitoring system

From Figure 1 above, the system has firewalls that control access to the solution, the administrator monitors staff's activities and the database handles data control. The components of the architecture of the system are described as follows:

a. **User Management:** This component allows administrators to create and manage user accounts with different access levels, such as administrators, managers, and employees.
b. **Task Assignment and Management:** This component of the proposed system allows managers to assign specific tasks or projects to employees, set deadlines, and track progress.
c. **Communication Tools:** The communication tool contains features for internal communication, including internal messaging, notifications, and alerts. This ensures that employees are informed about their schedules and any changes in real-time.
d. **Scheduling component:** This core section handles the creation, management, and visualization of employee work schedules.
e. **Reporting and Analytics:** This part generates various reports and analytics to help managers make informed decisions. This can include attendance reports, work analysis, and performance metrics.
f. **Time and Attendance:** This component tracks employee clock-

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ins and clock-out hours virtually on the solution. It may also include features for time rounding, attendance tracking, and timesheet generation.

System Mathematical Model

This involves mathematical formulation, in which a mathematical description of the proposed system is developed. The mathematical model is composed of decision variables, objective function, shift coverage, employee availability and preference satisfaction. The model incorporates decision variables for scheduling tasks or assignments and monitoring indicators as follows:

(i) Decision variables

x_{ij}: This binary variable takes the value of 1 if employee **i** is assigned to job **j**, and 0 if not.

m_{ij}: This binary variable takes the value of 1 if job **j** is monitored by employee **i**, and 0 if not.

S_j: This represents the required number of employees to be assigned to job **j**.

A_{ij}: This indicates whether employee **i** is available to work on job **j**. If $A_{ij} = 1$, it means the employee is available; if$A_{ij} = 0$, the employee is not available.

P_{ij}: This represents the preference of employee **i** for job **j**. It could be a numerical value indicating how much the employee wants to work on that job.

(ii) Objective Function

The objective function defines what optimization is to be done on the system. In this basic representation, the objective is to minimize a combination of two terms:

The first term $\sum i \sum j x ij \cdot Pij$ represents the sum of preferences for all assignments, indicating that the system aims to assign employees to jobs they prefer.

The second term $\sum i \sum j mij$ represents the sum of monitoring assignments, suggesting that the system also aims to ensure jobs are monitored efficiently.

When constraints: (when decision variables take on 0 or 1)

(iii) Shift Coverage

For each job **j**, the sum of assigned employees x_{ij} must be greater than or equal to the required staffing S_j. This ensures that each job has sufficient employees assigned to it.

(iv) Employee Availability

Employee availability A_{ij} restricts whether an employee can be assigned to a specific job. The constraint $x_{ij} \leq A_{ij}$ ensures that an employee can only be assigned to a job if they are available for it.

(v) Monitoring

Monitoring can only happen if an employee is assigned to a job. Thus, $m_{ij} \leq x_{ij}$ ensures that monitoring m_{ij} can occur only when an employee x_{ij} is assigned to the job.

(vi) Preference Satisfaction

This ensures that each employee is assigned to jobs that fulfil their minimum preference level. The sum of the preference-weighted assignments for each employee $xij \cdot Pij$ must be greater than or equal to the minimum preference MinPreference*i*.

Database

Structured Query Language (SQL) is to manage and manipulate data stored in relational database management systems. The study has employees, new tasks and monitoring tables. The tables have the field name, data type and field size as presented in Tables 1-3

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Table 1: Employee list

Field Name	Data Type	Field Size
Date	Date	10
Employee code	Numeric	35
Name	Character	50
Status	Character	35

Table 2: Creation of new task

Field Name	Data Type	Field Size
Title	Character	50
Status	Character	35
Assign ID	Numeric	50
Task description	Character	150

Table 3: Monitoring system

Field Name	Data Type	Field Size
Date/Time	Date/Time	20
Task code	Alphanumeric	35
Title	Character	50
Status	Character	150

System Implementation

The new system was designed to have two users. The system administrator handles the operational management of the entire system and the staff that handles and operates operations assigned to them.

A new system can be designed by employing these programming tools: Hypertext Mark-up Language (HTML), PHP, and My Structured Query Language (MySQL). After the application of these programming tools to implement the development of job scheduling and monitoring of staff, the following interfaces are derived from it. The interfaces are administrator monitoring, employee management, task creation and task operation (involves task progress and task progress update) and they are described as follows:

a. Administrator monitoring interface enables the system manager to monitor and manage all staff of the organization. It gives the enablement to monitor the progress of tasks, gives feedback on activities and authenticates the status of the staff if working or not. The interface is shown in Figure 2.

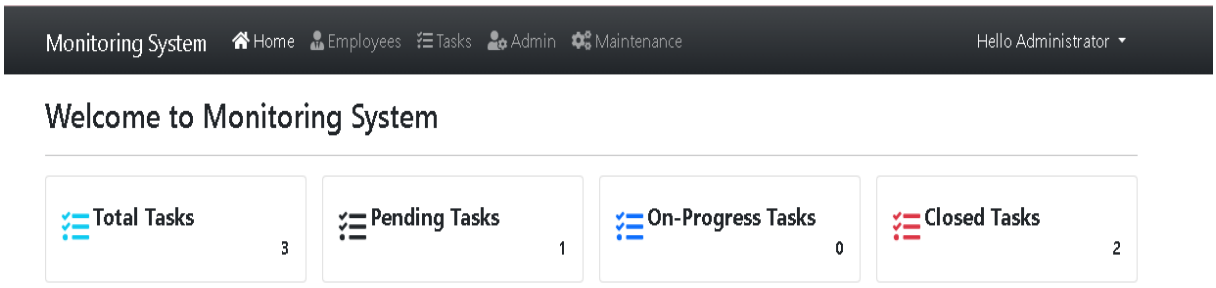

Figure 2: Administrator's Monitoring Interface

b. The **employee management interface** enables the easy management of the staff. It allows the system administrator to add, delete, update and view employee information. The interface consists of the employee's codes, name, pictures, date of job creation to the employees, and status to show whether the employee is active in the service of the organization or not as provided in Figure 3.

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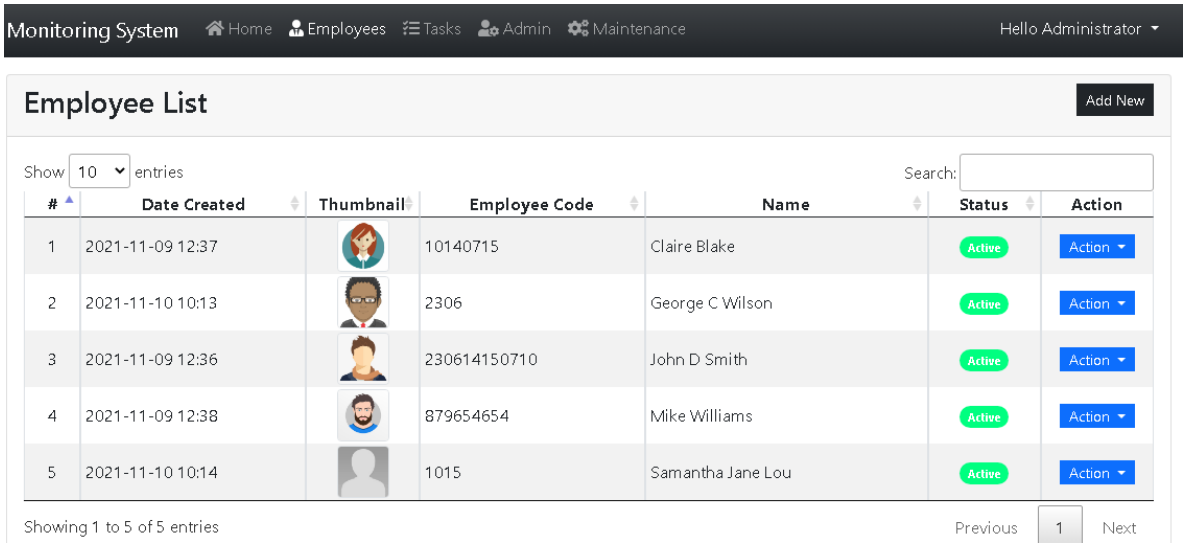

Figure 3: Employee List

c. **The task creation interface** allows the business manager or supervisor to create tasks/activities on the system. These tasks will later be assigned to staff and the system will take proper monitoring of the progress from the initial stage to the completion stage of the job/task. The interface contains the title of the task/job, the status of the work whether the work is progressing or not, the job/task is assigned to a particular employee and the description of the job has to be detailed in the interface as indicated in Figure 4.

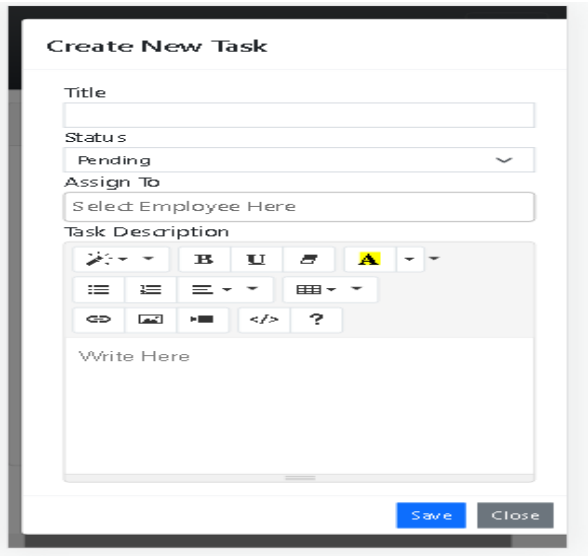

Figure 4: Task Creation

d. The **task lists interface** contains the list of all available tasks created and their status. It allows task assigners to see current activities and status and also to create a medium by which the administrator or system manager can monitor the progress of the tasks created. The interface contains the date the job/task is created for the employees, the code given to the task/job, the title of the job/task and the status of the job/task(progressing or closed, pending)

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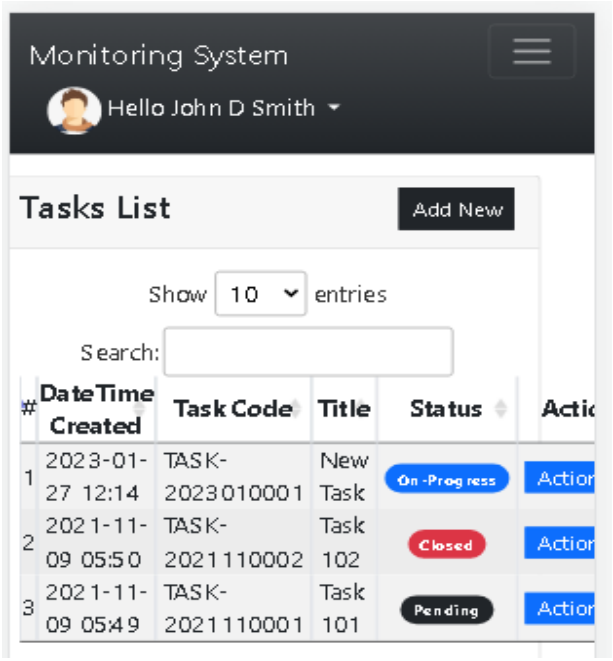

Figure 5: Tasks Lists

e. Tasks Operational Interfaces

The task's operational interfaces allow the staff to properly manage all assigned tasks and properly give feedback on their activities. They are represented in Figures 6a and 6b.

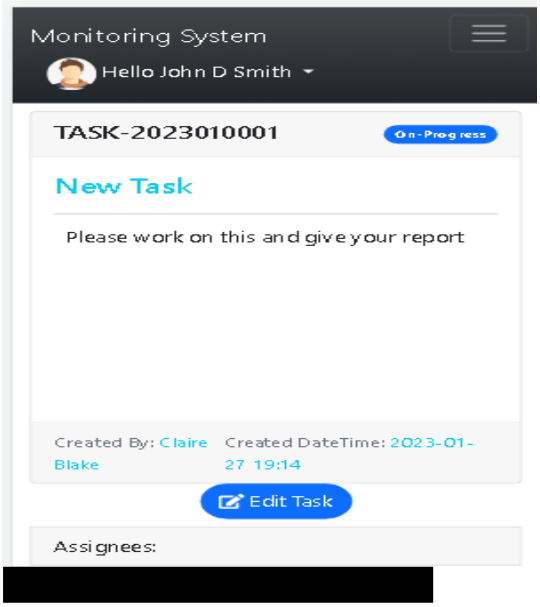

Figure 6a: Task Progress

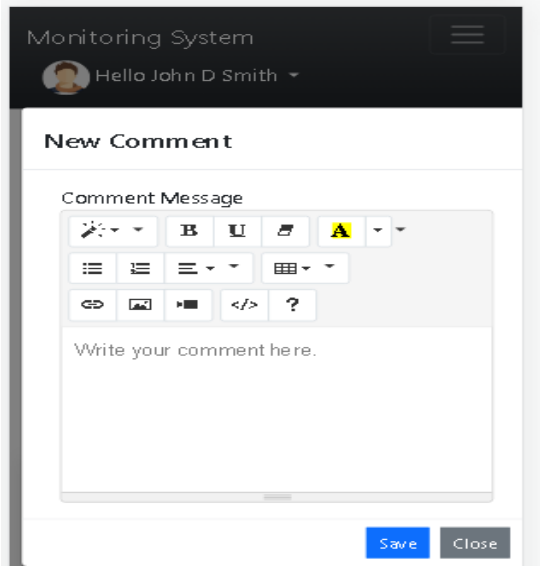

Figure 6b: Task Progress Update

Conclusion

The developed/new system is designed to meet the organization's requirements in terms of scheduling and monitoring staff activities for staff effectiveness and productivity. This application enables the managers to update and monitor the overall tasks of the employees in their respective areas. The developed system eliminates the need for a manual method of entering the daily activity details of each employee. It completely abolishes the

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traditional way of monitoring and scheduling the jobs assigned to staffers. It provides a substantial business value because it reduces hardware, and maintenance costs and increases customer satisfaction.

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