

***CHAPTER 06 - CASE SUDY: AUTOMATED &* Biometric Time Attendance MANAGEMENT System (Face Detection/Fingerprint)**



**6.1 Introduction:**

Time attendance systems are used to track and monitor when employees start and stop work. A time and attendance system enables an employer to monitor their employee working hours and late arrivals, early departures, time taken on breaks and absenteeism. It also helps to control labor costs by reducing over-payments, which are often caused by paying employees for time that are not working, and eliminates transcription error, interpretation error and intentional error. These systems can also be used to ensure compliance with labor regulations regarding proof of attendance. Similar & ILO standard staff duty roaster for all zonal offices and water or sewer treatment plants are recommendation

Modern digitized / automated time and attendance systems require employees to touch or swipe to identify themselves and record their working hours as they enter or leave the work area. Originally this consisted of using a (Radio-frequency identification) RFID electronic tag or a barcode badge but these have been replaced by biometrics (hand geometry, fingerprint, or facial recognition), and touch screens devices.

**6.2 Beginning of Biometric Attendance:**

July 2018, Dhaka WASA started its journey with biometric digital time attendance. Started with only 5 devices at Dhaka WASA head office (WASA Bhaban) 2 Number Devices at Saidabad Water Treatment Plant (SWTP)-1 & 2. Before COVID-19 Pandemic lockdown - Total Location covered: 32, Total Bio-Metric (Fingerprint) Device Installed: 48 (Including WASA head office).

**During lockdown:**

Government of Bangladesh declared lockdown from 26/03/2020. That’s why WASA all office stopped taking biometric attendance (Total Seven months) due to lockdown and so that the virus can’t speared by finger scanning devices.

**New Face detection Time attendance system:**

WASA authority took decision to replace biometric fingerprint attendance system with new technology 3D face detection attendance devices to avoid contagious contamination from finger touch.

Semi-Outdoor Multi-Biometric Time Attendance & Access Control Terminal which supports 3,000 face templates, 4,000 fingerprint templates and 10,000 cards – were to be installed.

New era of Face detection Time attendance system started on 2nd June 2020. DWASA installed 2 face detection devices at SWTP-1 & 2. Installed face detection attendance system at WASA Bhaban (Head Office) as well as different MODS zone, revenue zone, WTP etc. location.

**6.3 Customized Web based Realtime Attendance Software for DHAKA WASA:**

Connected Device in Different location WASA offices-

* WASA Bhaban/ Head office: 2 Devices
* MODS Zone-3 & Revenue Zone-3: 1 Device
* SWTP-1: 1 Device
* SWTP-2: 1 Device
* Total Device Connected: 5 Devices

**Features of present systems:**

* Dashboard for Management - A dashboard is a type of graphical user interface which often provides at-a-glance views of key performance indicators (KPIs) relevant to a particular objective or business process. In other usage it is considered as a form of data visualization tool. Digital dashboards allow managers to monitor various departments in their organization. The “dashboard” is often accessible by a web browser or an application and is usually linked to regularly updating data sources.
* Scheduled Reporting to Management by E-Mail – all the reports are automated to be sent to preset management members.
* Online access of Staff & user – all data can be accessed by internet if required.
* Android & iOS Application – Digital Apps for various devices can be developed.
* SMS alert – important data, information is automated to be sent to preset management members via SMS.

**6.4 Centralized customized Software feature:**

**User Management:**

* User administration – Creating new users, input various information, photograph entry, vital information about them, login authentication / authorization.
* Multi user Role access with different privileges - Users with single or multi user roles with different specified work can have only one or multiple user accounts.
* Role Based Access Control – various roles may allow or deny entry into the system from different devices or accounts.
* Role Based Input Control - various roles may allow or deny data input into the system from different devices or accounts.

**Staff Attendance:**

* Staff Attendance Entry – Only previously set employees can give easy automated attendance.
* Customized Reporting of Section Wise & Individual Staff Attendance – as required by managers.
* Daily Absent & Absconding SMS Notification to Staff - as required by managers.
* Customized Reporting on Staff & Assigned Subject Mapping - as required by managers.

**Software Features:**

* Complete Admission Process – Easy process for initial entry of a new staff or user.
* Staffs Details Profile – Detail staff profiles can be stored and used.
* Customized Reporting on Staff – Various types of reports for variety of staff or users.
* Attendance Automation – only fingerprint or face placement needed for attendance, no manual record keeping or sign in or authorization is needed for attendance.
* Staff Migration between Branch, Shift, & Section – when staffs get posted or promoted to a different office or to a different role.
* Staff Management – This system can also be connected to other digital management tools.

**Advanced Software Reporting Management:**

* Shift information for different staffs and different offices for different days.
* Employee information report/details.
* Leave information integration with other leave management tools/software/systems.
* Daily in/out report – time logging.
* Daily absent, present & leave report.
* Daily late arrival or early leave report.
* Daily over time (OT) report, Daily summary OT information.

**6.5 Additional Software Features:**

* Easy to use & fully customized, Ability to add employees easily.
* Reduces HR daily work & increases productivity.
* Integration attendance with various fingerprint or face detection devices.
* Tracks up to date work status.
* Centralized monitoring & Enhanced Reporting Capabilities.
* Employee personal information connected with MIS software.
* Attendance Management, Holiday Management & Leave Management -
* Employee wise leave day, General shifting and Employee wise shifting.
* Daily summary attendance information.
* Monthly in/out report, Monthly absent, present & leave report, Monthly late report.
* Employee over time (OT) calculation.
* Monthly over time (OT) report & Monthly summary OT information.
* Monthly summary attendance information for management.

**6.6 Software Architecture Details:**

**Cloud Based Solution & Software Tools:**

* Development in Frontend: HTML-5 used for showing contents to the user – HTML5 is a markup language used for structuring and presenting content on the World Wide Web. It is the fifth and final major HTML version that is a World Wide Web Consortium (W3C) recommendation. The current specification is known as the HTML Living Standard. It is maintained by the Web Hypertext Application Technology Working Group (WHATWG), a consortium of the major browser vendors (Apple, Google, Mozilla, and Microsoft). (Markup refers to data included in an electronic document which is distinct from the document's content in that it is typically not included in representations of the document for end users, for example on paper or a computer screen, or in an audio stream. Markup is often used to control the display of the document or to enrich its content to facilitate automated processing. A markup language is a set of rules governing what markup information may be included in a document and how it is combined with the content of the document in a way to facilitate use by humans and computer programs.)
* CSS & Bootstrap CSS Framework – easy way of styling text, numbers, charts etc. Cascading Style Sheets (CSS) is a style sheet language used for describing the presentation of a document written in a markup language such as HTML. CSS is a cornerstone technology of the World Wide Web, alongside HTML and JavaScript. CSS is designed to enable the separation of presentation and content, including layout, colors, and fonts. This separation can improve content accessibility; provide more flexibility and control in the specification of presentation characteristics; enable multiple web pages to share formatting by specifying the relevant CSS in a separate .css file, which reduces complexity and repetition in the structural content; and enable the .css file to be cached to improve the page load speed between the pages that share the file and its formatting. A style sheet language, or style language, is a computer language that expresses the presentation of structured documents. One attractive feature of structured documents is that the content can be reused in many contexts and presented in various ways. Different style sheets can be attached to the logical structure to produce different presentations.
* Development in Backend/ server-side programming: PHP & PHP Codeigniter Framework. PHP is a general-purpose scripting language geared toward web development. It was originally created in 1994. The PHP reference implementation is now produced by The PHP Group. PHP originally stood for Personal Home Page, but it now stands for the recursive initialism PHP: Hypertext Preprocessor. PHP code is usually processed on a web server by a PHP interpreter implemented as a module, a daemon or as a Common Gateway Interface (CGI) executable. On a web server, the result of the interpreted and executed PHP code – which may be any type of data, such as generated HTML or binary image data – would form the whole or part of an HTTP response. The standard PHP interpreter, powered by the Zend Engine, is free software released under the PHP License. PHP has been widely ported and can be deployed on most web servers on a variety of operating systems and platforms. CodeIgniter is an open-source software rapid development web framework, for use in building dynamic web sites with PHP.
* Intelligent Technology – vendor to DWASA will host the TIME ATTENDANCE MANAGEMENT CUSTOMIZED SOFTWARE Solution on Cloud Based server infrastructure
* User will access the application over the internet using Web Browser.
* Java-Script programming language - JavaScript often abbreviated JS, is a programming language that is one of the core technologies of the World Wide Web, alongside HTML and CSS. Over 97% of websites use JavaScript on the client side for web page behavior, often incorporating third-party libraries. All major web browsers have a dedicated JavaScript engine to execute the code on users' devices.
* jQuery Framework of JavaScript - jQuery is a JavaScript library designed to simplify HTML manipulation, as well as event handling, CSS animation, and Ajax. It is free, open-source software using the permissive MIT License. As of May 2019, jQuery is used by 73% of the 10 million most popular websites. Web analysis indicates that it is the most widely deployed JavaScript library by a large margin, having at least 3 to 4 times more usage than any other JavaScript library. jQuery's syntax is designed to make it easier to navigate a document, select DOM elements, create animations, handle events, and develop Ajax applications. jQuery also provides capabilities for developers to create plug-ins on top of the JavaScript library. This enables developers to create abstractions for low-level interaction and animation, advanced effects and high-level, theme-able widgets. The modular approach to the jQuery library allows the creation of powerful dynamic web pages and Web applications.
* Ajax - Ajax short for "Asynchronous JavaScript and XML" is a set of web development techniques that uses various web technologies on the client-side to create asynchronous web applications. With Ajax, web applications can send and retrieve data from a server asynchronously (in the background) without interfering with the display and behavior of the existing page. By decoupling the data interchange layer from the presentation layer, Ajax allows web pages and, by extension, web applications, to change content dynamically without the need to reload the entire page. In practice, modern implementations commonly utilize JSON instead of XML. Ajax is not a technology, but rather a programming concept. HTML and CSS can be used in combination to mark up and style information. The webpage can be modified by JavaScript to dynamically display—and allow the user to interact with the new information. The built-in XMLHttpRequest object is used to execute Ajax on webpages, allowing websites to load content onto the screen without refreshing the page. Ajax is not a new technology, nor is it a new language. Instead, it is existing technologies used in a new way.
* JSON - JavaScript Object Notation is an [open standard](https://en.wikipedia.org/wiki/Open_standard) [file format](https://en.wikipedia.org/wiki/File_format) and [data interchange](https://en.wikipedia.org/wiki/Electronic_data_interchange) format that uses [human-readable](https://en.wikipedia.org/wiki/Human-readable_medium) text to store and transmit data objects consisting of [attribute–value pairs](https://en.wikipedia.org/wiki/Attribute%E2%80%93value_pair) and [arrays](https://en.wikipedia.org/wiki/Array_data_type) (or other [serializable](https://en.wikipedia.org/wiki/Serialization) values). It is a common data format with diverse uses in [electronic data interchange](https://en.wikipedia.org/wiki/Electronic_data_interchange), including that of [web applications](https://en.wikipedia.org/wiki/Web_application) with [servers](https://en.wikipedia.org/wiki/Server_(computing)). JSON is a [language-independent](https://en.wikipedia.org/wiki/Language-independent_specification) data format. It was derived from [JavaScript](https://en.wikipedia.org/wiki/JavaScript), but many modern [programming languages](https://en.wikipedia.org/wiki/Programming_language) include code to generate and [parse](https://en.wikipedia.org/wiki/Parsing) JSON-format data. JSON filenames use the extension .json.
* Rest API - API is the acronym for "Application Programming Interface". It is a software that allows two applications to communicate with each other over the internet and through various devices. Every time you access an app like Facebook or check the weather on your smartphone, an API is used. The abbreviation REST stands for "Representational State Transfer" and refers to a software architectural style. It is based on six principles (not standards) that describe how networked resources are defined and addressed on the web, for example in a cloud. The six principles of REST - Client-server architecture, Statelessness, Caching, Uniform interface, Layered system, Code-on-demand.

**6.7 Challenge to implement this software:**

* Old Fingerprint Attendance Device connectivity is a problem, as they have older hardware and old software not used for integration.
* All Pump House connectivity to this software - almost 1000 water pump have various challenges.
* Different Time Schedule in different office/zone – this increases the complexity if software.
* Others software like Leave management integration – old leave management web app portal was not made to be integrated with the new software.
* Roaster duty/ Roaster Shifting changes almost every month for a large portion of workers, changing duty or shifts and office time for them may cause error for other staff data.
* 24hours duty schedule (6AM-2PM, 2PM-10PM, 10PM-6AM) and 12 hours schedule (8AM-8PM & 8PM-8AM) and General Duty(9AM-5PM) - these creates additional data sets.
* Data Collection and maintenance covering whole of DWASA – employees at all offices of DWASA have to be covered, that is a big task.

**6.8 Reasons to track employee hours:**

* Regular pays or Wages paid to employees are determined by the number of days or hours worked. Employers will want to be sure that they're accurately paying employees whether they're in the office or in a remote location.
* Overtime paid to most workers, whether hourly or salaried, are eligible for overtime pay when they work more than 40 hours per workweek. So, time tracking is important.
* Employees receive certain breaks & rest periods during their shifts. Tracking hours can show that employers are compliant with rules in providing these breaks.
* Companies that award paid time off for personal, vacation, and sick days based on work days, must calculate the earned time correctly.
* Tracking hours can help determine whether workers are arriving to the office on time.

**6.9 Benefits of automated time and attendance systems:**

* The biggest benefit of digital time and attendance tracking systems is that they eliminate the need for manual records. All the time data is collected electronically, with the desired data processing and calculations on demand.
* Since time and attendance software systems are automated, they cut down on the chance of human errors in calculations of labor and job costing. They also free up the person who was responsible for time and attendance tracking before to work on other tasks. Additionally, with fewer error comes lower risk of noncompliance with labor laws and regulations.
* Another positive is that these systems manage all your time needs – employee attendance etc. – in one program. This can be both cost-effective and a boost to productivity, as employees won't waste time toggling between different programs to ask for time off or look at their schedules. In short more efficient time tracking.
* With time and attendance software, we don't have to round the hours employees worked to more convenient numbers that work better with [payroll calculations](https://www.businessnewsdaily.com/12008-how-to-process-payroll.html) and pay rules. Our software of choice will automate and ensure the accuracy of all wage payments. In short - more accurate payroll processing.
* Most time and attendance tracking software platforms integrate with many other human resources tools, so they improve all workforce management tasks, not just attendance-related processes.

**6.10 These are the main drawbacks of automated time and attendance systems:**

* Cost- The biggest drawback of time-tracking systems is that they are more expensive than the manual method where employees write down their hours each day.
* Errors-Even the best software programs may occasionally malfunction. There's always a mild risk of tracking or calculation errors when you use any software for time and attendance systems.
* This system is heavily reliant on electricity supply and communication network.

**6.11 Future activity related to automated time and attendance systems:**

* Administrative, salary and other stakeholders should get through training on all hardware, software and how to use them for maximum benefit of DWASA.
* Software should be commercially available and licensed. Customization of software can be developed after gaining experience.
* All employees (Permanent, temporary, Master-roll, outsourced, contractual) should be included in this system.
* All biometric attendance machines should be covered by monitoring camera also.