USING TECHNOLOGY AND SHARING DATA TO IMPROVE ELECTRICITY SERVICES

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ABSTRACT

This paper contains details of how the Metropolitan Electricity Authority improves electricity services by using technology to capture and manipulate data to achieve the maximum benefit when responding to customer requirements to access information and services. Furthermore, employees need convenient, speedy, and accurate information to complete their tasks. Data from the various systems are integrated to reduce duplication and processing time, thereby improving work efficiency.

INTRODUCTION

The Metropolitan Electricity Authority (MEA) is a public utility enterprise under the Ministry of the Interior of the Kingdom of Thailand with the objective of acquiring and distributing electrical energy to an area covering Bangkok, Nonthaburi, and Samutprakan, a total area of 3,192 square kilometers. The service area is divided into 18 branches. Currently, there are more than 3.7 million electricity users and more than 51,000 million units of electric power utilized per year [1].

Today, technology is becoming more advanced, especially in database management, storage media, and communication (including smartphones), and is evolving with easy access to data. MEA has recognized the importance of developing data management to achieve the maximum benefit when responding to customer requirements to access information and services. Moreover, employees need convenient, speedy, and accurate information to solve problems, and MEA has developed a stylish customer services system to manage and share data with employees in each relevant section.

IMPLEMENTED SOFTWARE

MEA has a number of software packages covering all of its work processes. The software used and details of the functional areas that support customer services are covered herein.

Systems, Applications, and Products – SAP

SAP is an enterprise resource planning (ERP) system recognized as the best practice business process management software mainly targeted at large businesses [2]. It allows organizations to use a system of integrated functions to manage their businesses and many back-office functions related to technology, services, and human resources are automated. There is a real-time connection from all relevant departments to the central database. There is no data duplication, data linking is efficient, and the user can acquire information accurately.

MEA has implemented SAP R/3, consisting of several modules, namely Financial Accounting (FI), Asset Accounting (AA), Material Management (MM), Project System (PS), Plant Maintenance (PM), Human Resources (HR), and Controlling (CO). It has been customized to fit MEA's specific requirements and has made the back-office management work as efficient and accurate as possible, thereby greatly improving work efficiency.

SAP is the business core system in MEA. There is a centralized database that allows each process access to the same data. Accordingly, SAP is a very important system, and so MEA have implemented a Disaster Recovery-Site (DR-Site) for SAP that replicates data in real-time. In the case of a disaster or if the main site is down, SAP will be immediately available on the DR-Site. For customer services, SAP provides many functions:

- FI: SAP contains professional financial accounting software. Therefore, the financial process is highly accurate, such as paying the vendor after the purchase of goods. There is a control process for the correct receipting for goods before payment can be made.
- PS: For new customer services and maintenance work, PS creates work orders to analyze expenses relating to the cost of the materials and labor for each process and assigns an owner.
- MM: There is a need for the disbursement of materials such as meters, transformers, power lines, etc. Therefore, the procurement of supplies to keep up with the use is another important issue. Analyzing and estimating the use of materials by considering the average volume of supplies used each year, the current work projects, and upcoming project plans, reorder points for supplies, and the time to procurement of supplies both locally and abroad can be accurately assessed.

Figure 1: The SAP modules utilized by MEA

Geographic Information System – GIS

GIS is a system designed to store, analyze, and present geographic data. Maps, building locations, and routes with their corresponding longitude and latitude coordinates are stored in different layers [3].

MEA has implemented GIS to increase the efficiency of the electrical system services. It enables data collection (including longitude and latitude information) for locating customers' meters, transformers, electrical distribution system equipment, and the locations of key places (e.g. supermarkets, temples, schools, etc.). GIS supports a number of standard functions.

Measurements: These can be by area and by distance.

- Area measurements: This function can draw an area from a mouse click. The measurement units for an area can be km^2 or m^2 (Figure 2).

Figure 2. An example of an area measurement.

- Distance measurements: These show the distance as lines between two points and summarizes it in km or m (Figure 3).

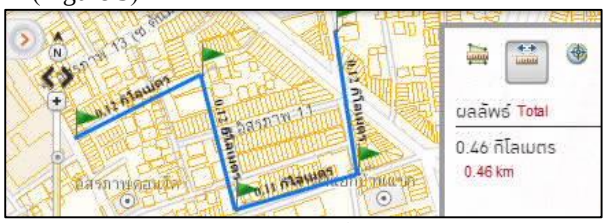

Figure 3. An example of a distance measurement.

Coordinates: This function shows the latitude and longitude by clicking on the map.

Location: Finding a place by latitude and longitude coordinates that are shown on the map.

Routing: GIS can show the route from the two points on the map and specify the fastest route, the shortest distance, or the route with the least number of junctions. Figure 4 shows an example.

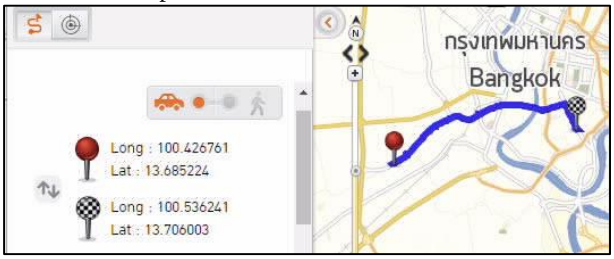

Figure 4. Directions based on coordinates.

Labeling key places in an area: This function labels the key places on the map in a specified radial area (Figure 5).

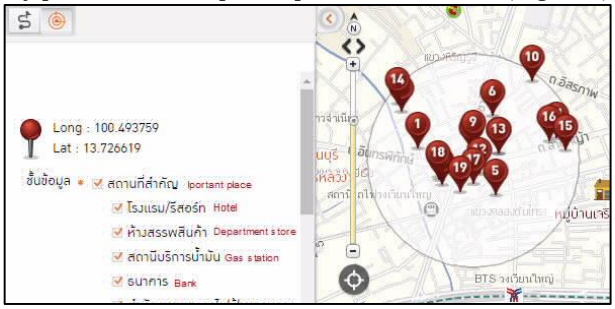

Figure 5. Labeling key places in an area.

Accordingly, GIS collects data from electrical distribution system equipment (meters, transformers, circuit breakers, etc.), and so we have configured the GIS functions to achieve maximum benefit. An example of one of the most important ones is given here.

Searching: GIS provides two searching functions and shows information on the equipment at the locations.

- By equipment number: Used to search for or locate equipment by, for instance, specifying a customer's meter number. The location of the customer meter is then shown on the map (Figure 6).
- By area: GIS can search by the user pointing or drawing an area on the map. The results contain all equipment in that area.

Figure 6. An example of equipment location and details.

Tracing: Tracing is used to display the analysis of the number of meters and the location linked to the meter or transformer.

- Trace-down: Figure 7 shows the location of the meters linked to a specific transformer.

Figure 7. Tracing the location of meters linked to a transformer.

- Trace-up: Figure 8 shows the hierarchical devices linked to the location of a transformer [4].

Figure 8. The location of the hierarchical devices linked to a transformer.

Field Force Management – FFM

MEA has 18 district departments that respond to customer queries and carry out customer services. All types of work follow the same process. FFM is a system that supports the fixing of power failures and enables effective fieldwork for the electrical system services by helping to reduce duplication and operating to the same standard. Its focus is on simplicity and flexibility in field work and speed and modern techniques in the service of electricity users, thereby increasing customer satisfaction and instilling a good image of MEA. The procedure in FFM is as follows.

Receiving information on the problem: FFM receives information on the issue from the customer, including the location of the power failure (Figure 9), and supports employees to analyze the problem, find a solution, and show the location of the device that has failed on the map. After that, FFM creates a work ticket.

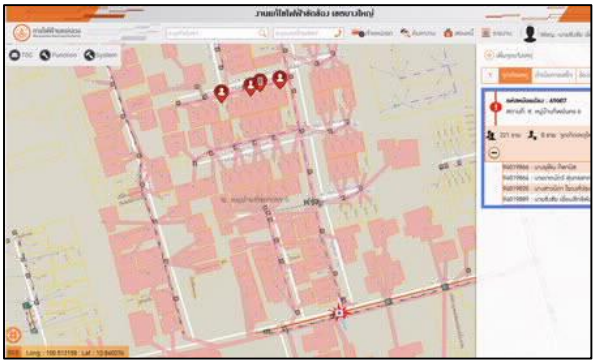

Figure 9. Customer power failure location.

Addressing the problem: FFM finds the nearest appropriate employee vehicle and assigns the work ticket including details of the cause, solution, and location. The employee can accept the ticket via a smart device and navigate to the destination to fix the electrical fault (Figure 10).

Figure 10: An example of the employee vehicle and power failure locations.

Closing the ticket: The employee can record the material or equipment used to fix the electrical fault and close the ticket immediately via a smart device if successful or update the ticket with details if unsuccessful after finishing work in the field [5].

MEA Smart Life

To support the lifestyles of people in the metropolitan area with smartphone technology, MEA has provided an innovative solution for direct responses from and to customer needs to make customers' lives more convenient. MEA Smart Life is a smartphone application available on both iOS and Android with many functions for customers to access services anywhere and at any time on any device. Some of these functions are as follows.

Obtaining electricity supply: New customers, either normal people or juristic persons, can apply for electricity supply via smartphone. MEA Smart Life provides MEASY for the customer to carry this out anywhere and at any time. All they need to do is fill in the form and specify the location for installing the meter (Figure 11).

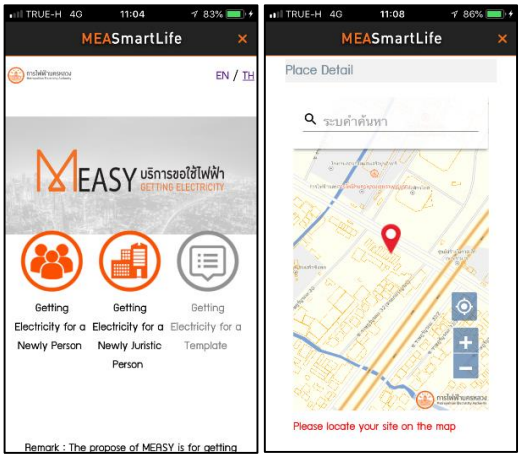

Figure 11. Application form to request electricity supply at a location.

Payment: Customers can pay their electricity bills on a smartphone by credit card (including Visa and Master Card) or QR code/Barcode via an agent (e.g. Tesco Lotus, Family Mart, etc.) (Figure 12).

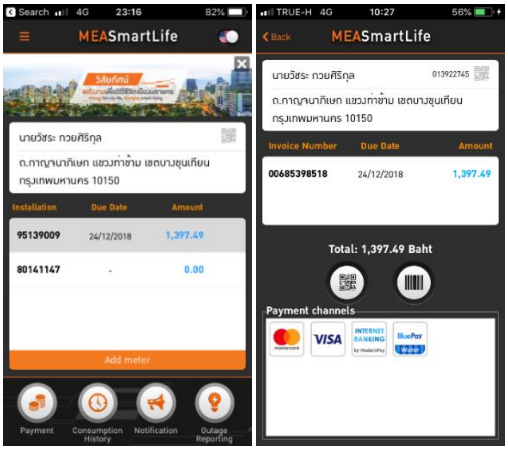

Figure 12. The payment screen.

Consumption history: MEA Smart Life provides the last 6 months of consumption history as a bar chart. Customers can view consumption history by units or by charge (Figure 13).

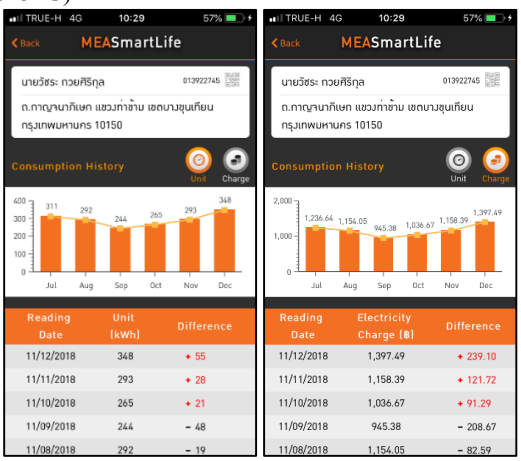

Figure 13: Consumption history screen by unit and charge.

Outage reporting: Customers can report power failures or even the device causing the power supply failure (e.g. a power line, pole, transformer, etc.) to MEA via MEA Smart Life. They can specify the location and/or take a photo (Figure 14) [6].

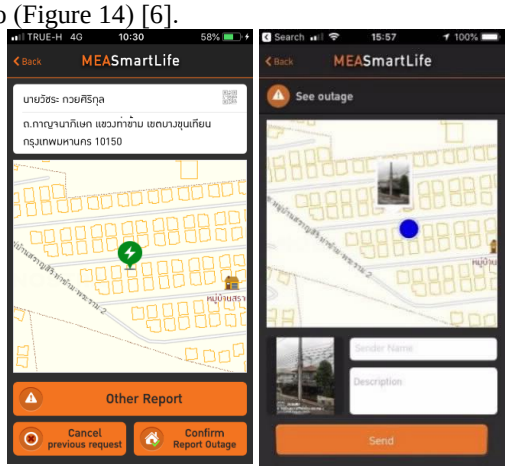

Figure 14. Outage reporting including the customer location and a photo.

DATA SHARING

Specifically, SAP is suitable for accounting work, material management, and back-office tasks; GIS for geographic information and location finding; FFM for resolving power failures; and MEA Smart Life to respond to customer needs anywhere and at any time. Each software package has different strengths in both data content and functional capability. To enhance these strengths, thereby maximizing the benefit to the company, MEA has integrated these software packages (Figure 15) by implementing information sharing, reducing duplication of work, reducing repetition in the data store, and increasing work efficiency.

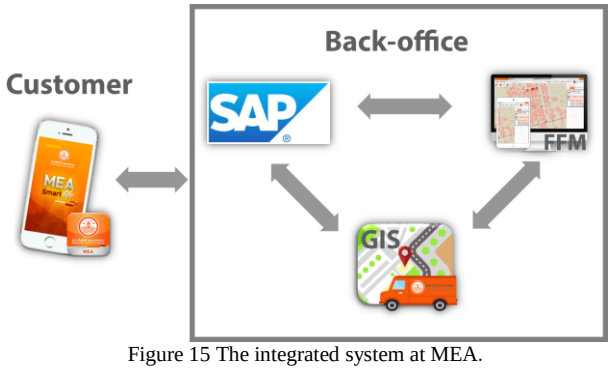

Figure 15 The integrated system at MEA.

The integrated data is used as follows.

Using equipment information

For the data on equipment information (such as meters, transformers, and power lines), the process of managing the master data is located in the SAP system for sufficient supply planning, procurement operations, classification of equipment by budget, accounting records, and reserving/goods issuing of materials. This enables SAP to control the quantity of supplies and equipment in the warehouse. The other systems can immediately access this information to accurately determine the items and quantities that are actually in the system.

- FFM uses the equipment and materials in the inventory to fix power outages.
- GIS uses data on meters and transformers as well as customer data available in SAP when determining their locations on the map.

Applying for electricity

New customers can fill out the electricity request form in MEA Smart Life, which uses the location data from the GIS system. The electrical request data is generated automatically in SAP, after which it can calculate the cost, supply the equipment (meters, poles, etc.), and assign the employee to proceed with the request. After that, the employee attains the request location from GIS, the availability of the electrical installation can be checked, and the installation can be quickly carried out.

Inquiry information and payment

Customers can inquire about their electrical usage and consumption history via MEA Smart Life, which accesses information in SAP. When customers pay for an electricity bill, MEA Smart Life will send the transaction to SAP. The payment transaction is recorded in SAP immediately and the result returned to MEA Smart Life.

Outage reporting

When customers experience a power failure, they can report it via MEA Smart Life by using their meter number. The system will retrieve information from SAP and GIS on the customer information and location, respectively. Moreover, customers can report if they find the device that has failed (e.g. power line, pole, etc.) and can take pictures and specify the location on the map retrieved from GIS. In both cases, MEA Smart Life sends information to FFM, which stores power failure information and location on the GIS map. The data can be used to trace-up/down to find the cause of the power failure. At the same time, SAP creates a work order for incident. FFM finds the nearest employee vehicle and supplies navigation information on the destination using map from GIS. In the work process, FFM records the materials used to solve the problem. After finishing the work, all materials are reserved and issued in SAP, and the work order is closed as well.

CONCLUSIONS

Customers can retrieve information and request services very conveniently and quickly via MEA Smart Life, thereby saving their time by not having to visit an MEA outlet. MEA employees receive the issue from the customer and can take action immediately. According to the need, they know the exact location and have sufficient information to analyze the cause of the problem, which can help to solve the problem quickly. In addition, all data is stored in a reliable system and is accurate and consistent. The world is changing quickly in many ways, and MEA is ready and committed to developing the organization in line with the changes in every aspect, especially in technology. Information and technology are used effectively to provide seamless and stable services to customers.

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