

# Research and Design of a Customer Care Application Platform for Power Supply Stations

Yifan Hu\*, Zhihao Shen <sup>a</sup>, Xiaojun Shen <sup>b</sup>, Jinxia Jiang <sup>c</sup>, Jiawen Zhan <sup>d</sup>

Corresponding Author' Email: hu\_yifan@zj.sgcc.com.cn <sup>\*</sup>; shen\_zhihao@zj.sgcc.com.cn <sup>a</sup>; shen\_xiaojun@zj.sgcc.com.cn <sup>b</sup>; jiang\_jinxia@zj.sgcc.com.cn <sup>c</sup>; zhan\_jiawen@zj.sgcc.com.cn <sup>d</sup>

State Grid Zhejiang Electric Power Co., Ltd. Information and Communication Branch, Hangzhou, 310000; China

**Abstract:** In order to promote the transformation of digital intelligence in power supply stations, continuously improve their service capabilities, and effectively meet the new needs of multi subject, multi content, and multi mode services, based on the data supply platform and its mobile operating terminals, research and design of the power supply station customer care application platform are carried out from four aspects: government channel service optimization, branch channel service optimization, online channel service optimization, and on-site service record optimization. Among them, government channel services include smart city management services and government affairs services; outlet channel services include convenience services and electric love supermarkets; online channel services include non fault on-site services and customer demand services; on-site service records include customer visit registration, customer energy use services, on-site service records and box list verification services. Through the construction and application of this platform, the lean management of power supply service group is realized, and the Digital transformation of business management and control of grass-roots units is assisted.

**Keywords:** Power Supply Station; Customer Care; Mobile Terminal; Platform

## 1 Introduction

As the electricity retail market fully opens and market competition intensifies, improving customer service levels, customer satisfaction, and customer loyalty becomes an essential response to the current situation<sup>[1-3]</sup>. This is in line with the digital transformation strategy of the State Grid Corporation. To meet these requirements, this paper focuses on the goals of "digital empowerment, reducing the burden at the grassroots level, and enhancing quality and efficiency."<sup>[2,4]</sup> It involves implementing fine-grained management of users and services, developing and constructing a customer care system for power supply stations, continuously improving service capabilities, supporting rich and diverse service products, agile iterations, and flexible micro-applications, effectively meeting new service demands of multiple subjects, contents, and methods, achieving multi-channel service coverage, and extending the reach and value chain of services<sup>[2,5-8]</sup>.

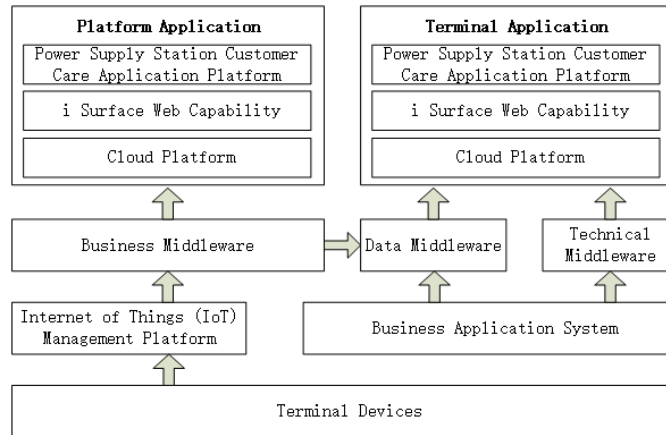
Through the construction and application of this project, the efficiency of on-site customer operations has increased by 66.7%, significantly improving the quality and efficiency of

customer service. Meanwhile, through the application of the project, the timely processing rate of work orders has reached 99%, significantly improving customer service satisfaction.

## 2 Research Approach

This paper fully integrates the current usage of existing system platforms and mobile applications in power supply stations, based on the management mode and business characteristics of these stations. Relying on the technical architecture of a big data cloud platform, the project continues to develop on the existing data supply platform, utilizing both new and existing software and hardware resources<sup>[6,9]</sup>. This approach deepens the application of business operations within the smart power supply stations system, resulting in a scientifically efficient, well-structured, fully functional, and highly implementable customer care application platform for power supply stations. The overall system architecture is illustrated in Figure 1.

For the digital intelligence power supply station production factor system, different technical options are adopted for each key part. The system as a whole employs a distributed application framework and distributed cache<sup>[1,10]</sup>. The interface uses technologies such as HTML, JSP, JavaScript, CSS, VUE, etc., as detailed in Table 1.



**Figure 1:** Overall Framework Diagram of the Power Supply Station Customer Care Application Platform.

**Table 1:** Overall Technical Route.

Category	Selection
Technology Selection	Interface Display Technology: HTML, JSP, JavaScript, CSS, VUE
	Server Development Technology: JDK1.8, J2EE
	Data Access Technology: JDBC
	Internal and External Network Penetration Technology: MQ
	Distributed Cache: Redis
	Distributed Application Framework: Dubbo, Zookeeper
Middleware	Application Server: tomcat 8.5

Database	OceanBase
Operating System	Linux
Open Source Software	Linux, OceanBase, Redis, MongoDB, Tomcat, RocketMQ

### 3 Platform Design and Research

#### 3.1 Application Architecture Research

The application functions of this platform include government channel services, branch channel services, online channel services, and on-site service records. These functions are deployed separately on the platform's PC end and terminal applications. The specific application architecture is illustrated in Figure 2.

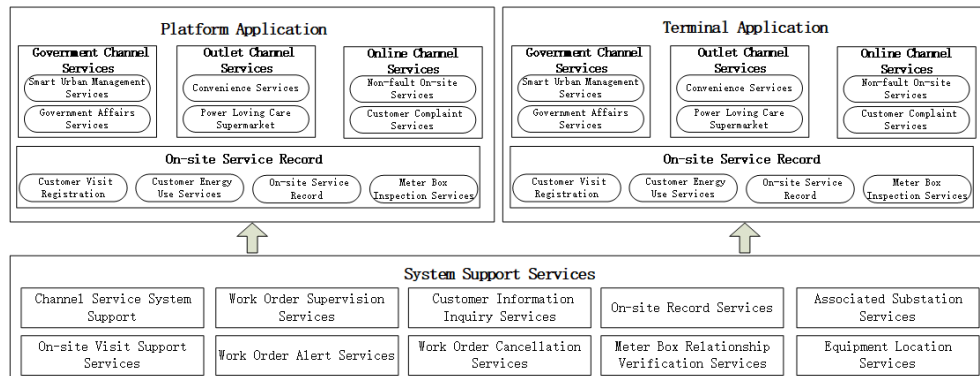
##### 1. Government Channel Services

###### (1) Smart Urban Management Services

Smart urban management services enable the acceptance and registration of electricity service demands such as business consultations, complaints, reports, suggestions, opinions, praises, and urgencies directly called in by electricity customers to the district managers. This includes collecting information such as customer contact, telephone number, type of demand, and content.

###### (2) Administrative Services

Utilizing a distributed database and microservices architecture, these standalone applications are designed, built, and operated with recompiled code. Services include registration, work order generation, dispatching, verification and processing of work orders, and numerical evaluation of work orders. Business consultations and on-site service demands from customers transmitted by the unified governmental consultation, complaint, and reporting platform of Zhejiang Province (mayor's hotline), Zhejiang Province's Three Services Little Housekeeper (enterprise user issue reporting), and grassroots governance comprehensive information platform (rural grid member issue reporting) are accepted and registered, work orders are generated, district managers handle work orders on the Mobile Data Supply, and team leaders complete work order evaluations on the Data Supply Platform.



**Figure 2:** Application Architecture of the Power Supply Station Customer Care Application Platform.

## 2. Branch Channel Services

### (1) Convenience Services

With a distributed database and microservices architecture, services include management of convenience service points, duty management, service registration, work order generation, dispatching, verification and processing of work orders, and numerical evaluation of work orders. Service demands such as business consultations by electricity customers at convenience service points are accepted and registered, work orders are generated, district managers handle work orders on the Mobile Data Supply, and team leaders complete work order evaluations on the Data Supply Platform.

### (2) Electricity Love Supermarket Services

The electricity love supermarket is a new form of service provided by the power supply station. The main business includes maintenance and queries of the power love supermarkets within the jurisdiction. Maintenance of the electricity love supermarkets involves comprehensive control over various types of service points served by the power supply station, including supermarket name, distribution grid, geographic location, person in charge, and personnel configuration needs. The query service involves searching information including distribution grid, geographic location, person in charge, and personnel configuration needs of the electricity love supermarkets under the jurisdiction of the power supply station.

## 3. Online Channel Services

### (1) Non-Fault On-Site Services

Non-fault on-site services use a distributed database and microservices architecture, with services including service registration, work order generation, dispatching, verification and processing of work orders, and numerical evaluation of work orders; direct business consultations and other electricity service demands by customers are accepted and registered, work orders are generated, district managers handle work orders on the Mobile Data Supply, and team leaders complete work order evaluations on the Data Supply Platform.

### (2) Customer Demand Services

Customer demand services include service registration, work order generation, dispatching, verification and processing of work orders, and numerical evaluation of work orders. The Data Supply Platform accepts and registers business consultations, complaints, and reports of electricity service demands transferred from the OA system, generates work orders, district managers handle work orders on the Mobile Data Supply, and team leaders complete work order evaluations on the Data Supply Platform.

## 4. On-Site Service Records

### (1) Customer Visit Registration

Customer visit registration services include querying the electricity information, basic information, and customer tags of targeted customers, as well as registering customer addresses, contact information, and comprehensive energy intentions during customer visits.

### (2) Customer Energy Use Services

Customer energy use services include customer electricity bill queries, peak and valley electricity usage change analysis, suggestions, customer list production, precise targeting and push of changes, service registration, and calculation and query of available capacity.

### (3) On-Site Service Records

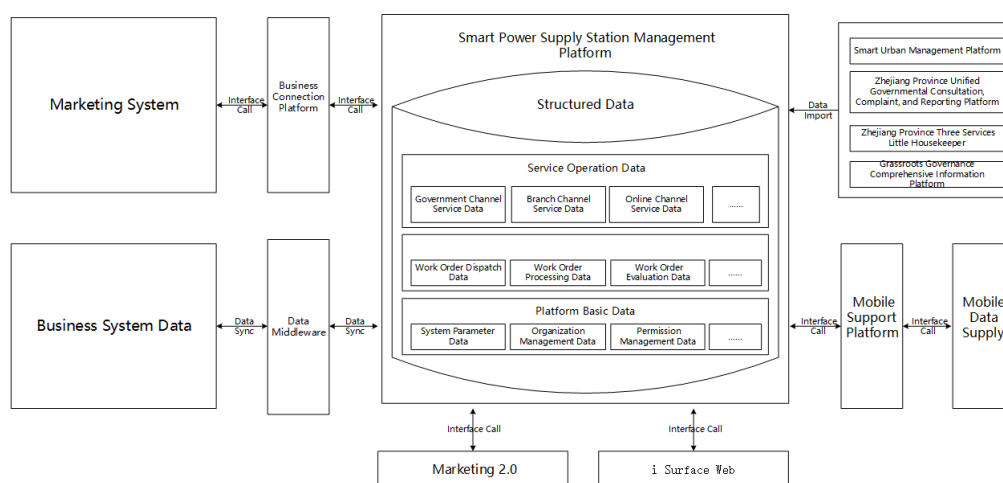
On-site service records include detailed information recorded by district managers during on-site services, safety supervision on-site records, and equipment information collection.

### (4) Box and Meter Verification Services

Box and meter relationship verification services include abnormal box and meter relationship registration, display, and rectification.

## 3.2 Data Architecture

The data architecture is designed from the perspective of system data support, involving the planning and design of data classification, data characteristics analysis, data storage, and data flow<sup>[2,4,9]</sup>.



**Figure 3:** Data Architecture Diagram.

As shown in Figure 3, offline data from Marketing 2.0 and the Power Supply Service Command System are synchronized to the data middleware platform. After statistical analysis, the data is displayed on the Data Supply Platform. The Data Supply Platform interfaces with the Marketing 2.0 Document Center for the storage of unstructured data such as photos and videos. The Mobile Support Platform interfaces with the Data Supply Platform to forward mobile Data Supply business data. Marketing 2.0 interacts with the Data Supply Platform for business data exchange through the Business Connection Platform. Additionally, the Mobile Support Platform interacts with Marketing 2.0 via an interface for the exchange of mobile Data Supply business data. The specific data architecture is shown in Table 2.

**Table 2:** Data Architecture Table.

No.	Data Content	Source System	Target System	Implementation Technology	Frequency	Storage Location
1	Customer Complaint Data, Customer Electricity Billing Information, Customer Visit Information	Data Supply Platform	Mobile Data Supply	RESTFUL	On Demand	Data Platform Business Database
2	Convenience Service Point Information, Electricity Love Supermarket Information	Data Supply Platform	Mobile Data Supply	RESTFUL	On Demand	Data Platform Business Database
3	Customer Archive Data, Comprehensive Energy Intent Information	Marketing 2.0	Data Supply Platform	Data Middleware Data Integration	Scheduled Sync	Data Platform Business Database
4	Policy Announcements	Data Supply Platform	Mobile Data Supply	RESTFUL	On Demand	Data Platform Business Database

## 4 Conclusion

This study leverages the data supply platform and mobile operation terminals to innovate customer care applications for power supply stations from a user-service perspective. It incorporates a comprehensive suite of services: government, branch, online channels, and direct on-site service records.

Currently, the system boasts 27,316 registered users, with an active user base of around 24,000 and a 90% functional application rate. By centralizing the monitoring of production and operational metrics—traditionally dispersed among teams—it disrupts the prevalent multi-headed control system, streamlining statistics and communication processes. This optimization significantly cuts down on managerial time and costs for station directors. The platform's advanced analytics enable real-time adjustments and provide insights into business system utilization and user activity, markedly improving user experience. Ground-level feedback has been overwhelmingly positive, evidencing the platform's contribution to corporate initiatives aimed at workload reduction and enhanced operational efficacy. Additionally, the task management module digitizes daily employee tasks into online work orders, further supported by a work point system and an indicator display module, which collectively facilitate a scientific approach to workload management and the promotion of quality and efficiency among power station staff.

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