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IMPROVING THE CUSTOMER SATISFACTION WITH AUTOMATING THE FACILITY MANAGEMENT SYSTEM

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Abstract: The Engineering Service is a public organization dedicated to building and maintaining facilities for garrisons in Pakistan. The mission of the Engineering Service is to provide efficient and effective facility management services that meet the expectation of users. The facility management involves tasks related to receiving, responding, and tracking service requests initiated by facility users and providing customer service as required and expected. For efficient delivery of the service, a computer-based application of facility management system was developed and implemented replacing the old manual system. The application can receive service requests electronically, maintaining the request record and generating reports of routine and emergency maintenance requests for residential facilities. This research measures the effectiveness of the newly implemented facility management system to handle service requests. This paper presents the application development process, implementation and survey results measure the effectiveness of the system. A case study method was adopted, and survey data from the operators, customers, and service request handlers (workers) were collected and analyzed. The result showed service requests are being handled efficiently as compared to the old system. This system is a valuable addition to improve the systematic management of maintenance requests and provide better services.

Keyword: Customer satisfaction, automation, facility management

1 Introduction

Public sector organizations usually spend a significant portion of their budget for the construction of new buildings and infrastructure systems. However, these organizations set aside a little amount of the budget to maintain and repair facilities. The outcomes of facility maintenance are subtle, less visible as compared to new construction (Ottoman et al. 1999). Therefore, the facility management area does not attract the attention of decision makers. This situation demands a facility management organization to develop efficient and effective methods to deliver services within limited resources. This paper presents a case of a publically funded organization called the Engineering Service (ES), responsible for conceiving, planning, constructing and maintaining facilities in the permanent military stations, garrisons, in Pakistan. The British colonial regime established the ES in the Indian sub-continent, and after independence from the British rule in 1947 and division of the sub-continent into India and Pakistan, both countries decided to maintain the same organizational structure in their own countries. The ES in Pakistan has been successfully engaged in constructing and maintaining buildings and infrastructure facilities in garrisons throughout the country. The ES classifies maintenance services into two broad categories of scheduled and emergency maintenance. Scheduled maintenances and renovations involve activities carried out periodically to keep roads, water supply system, power supply system, and residential and commercial buildings functional. While unscheduled maintenance in is urgent in nature, such as the breakdown of utility services (water supply, sewerage, electricity, gas, etc.). Unscheduled maintenance can involve fixing the faulty parts of the existing system or replace the certain parts of the electrical, water supply, gas or plumbing systems. The ES

provides the financial resources for emergency maintenance, and users bear the cost of the scheduled maintenance and replacement of large appliances and fixtures. Figure 1 presents a typical organizational structure and duties of different divisions within the ES.

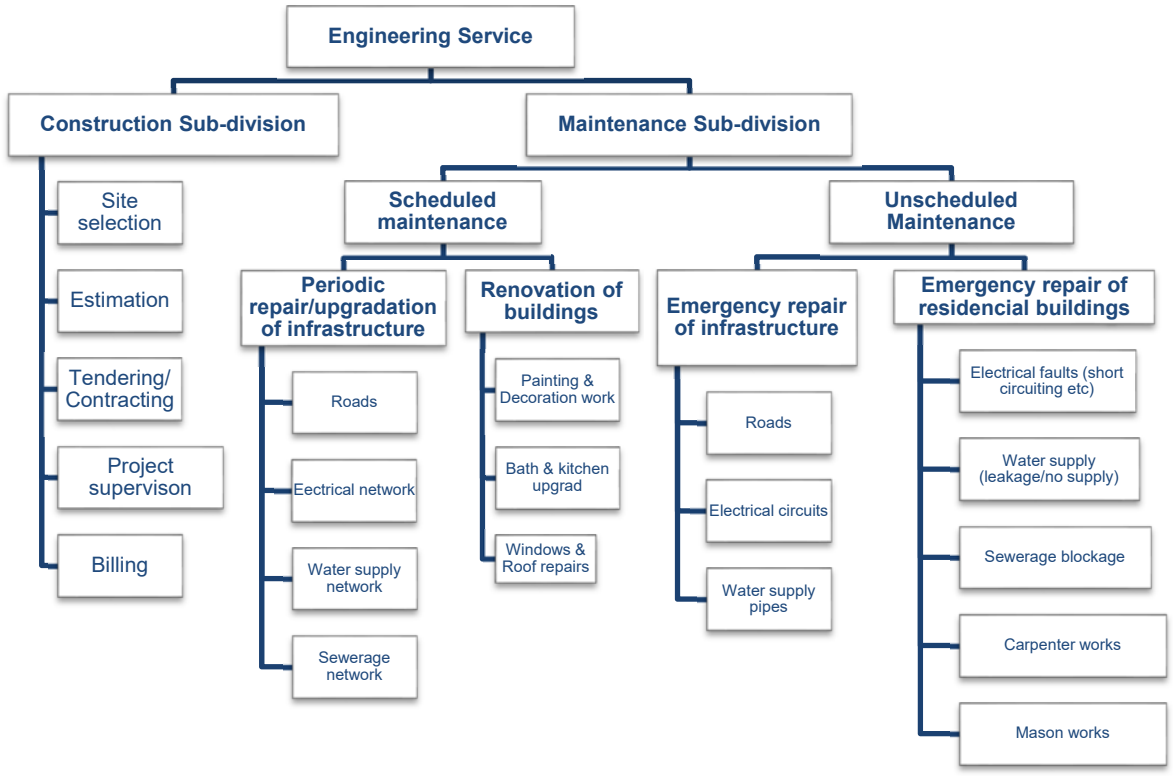


Figure 1: Engineering Services Organization's role and responsibility chart

The budgetary allocations for construction activities overshadow the maintenance quantum, but 70% of the workforce with the ES is dedicated to performing scheduled and emergency maintenances. As soon as a newly constructed facility is delivered to the client, the work of the maintenance division starts and continues through the rest of the facility life cycle ranging from receiving maintenance requests in case of urgent needs or performing routine upkeep works. Therefore, for the users in any garrison, maintenance team is the face of the ES. The prompt addressing of the maintenance service requests is a top priority of the organization.

Unscheduled maintenance needs can arise any time and need a prompt and effective response. This study will focus only on the management of unscheduled maintenance works.

2 Literature Review

According to the International Facility Management Association, "Facility Management is a profession that encompasses multiple disciplines to make sure the functionality of the built environment by integrating people, place, process, and technology (IFMA n. d.)".

The possible challenges in maintaining the built environment can be due to the involvement of an unusually large number of fields of activities (Nutt 1999) ranging from customer service to delivery of satisfactory product in a short turn around time. Most facility management organizations work on three levels—strategic, tactical and operational—and their main functions include advising, policy-making, and managing and executing maintenance tasks (Syed Mustapa and Jusoff 2009). In public sectors, such as garrisons, the maintenance of facilities is very complex because a large variety of facilities exist, such as buildings dedicated to domestic or commercial uses. The need for emergency maintenance can affect major operations of a commercial building or comfort of occupants in a residential building. Therefore, managing maintenance requests contributes to the goal of successful facility management (Lin and Su 2013) resulting in higher customer satisfaction. The financial resources for the maintenance of buildings and infrastructures are always limited. Hence, there is a need to find ways to utilize the resources carefully to address the

various needs for maintenance, rehabilitation, renovation, and upgrading (Shohet et al. 2004). Using information technology from receiving maintenance requests to addressing those requests is a need of the hour that will eliminate outdated manual record keeping and will cause transparency for the facility users and the organization's management.

The cost of computerization is getting lower every year, so digitization of manual work of record keeping seems a practical strategic decision. Forward-looking companies are leveraging the Internet's massive public technology infrastructure to create new value for their stakeholders and to attain new heights in productivity (Barua et al. 2000). Over the past years, the adoption of information and communication technologies has affected property management globally (Thompson 2005). Since the 1990s, computer-aided facility management has been providing efficient information technology (IT) tools for the mapping, evaluation and controlling of facility management structures and processes. Since then many software systems with various systematic approaches, functions and varying degrees of success have been established on the market (Madritsch and May 2009). In order to manage facilities at garrisons in Pakistan, a customized computer-based system was required, and existing software such as Facility Maintenance Management Software by Maxpanda (maxpanda n.d.) or UpKeep (UpKeep n.d.) in the market were not only expensive but also impractical due to their inability to recognize local needs of the organization. Therefore, the authors developed a customized facility management system locally.
This article provides an overview of a complainant management system that was developed locally and testing its effectiveness through conducting worker satisfaction and facility user surveys.

3 Earlier System

The old system to handle the unscheduled maintenance request was outdated because requests were recorded in hard copy format and were poorly compiled and hard to track, thus resulting in a poor record of maintenance data, lacking the ability to contribute to the future planning of maintenance works and service management. Following is the workflow of the old system.
When a customer submits a maintenance request to the ES complaint office, and request can be submitted calling an internal phone (intercom) or in person. In the old system, a Complaint Receiver records the request in a register and passes on the request in writing on a separate piece of paper to the concerned supervisor. The paper becomes the part of the record and a work crew receives verbal instructions to perform the task. The Complaint Receiver updates the status of the request in the same register.

3.1 Weaknesses of the Existing System

Following are the weaknesses of the existing system:

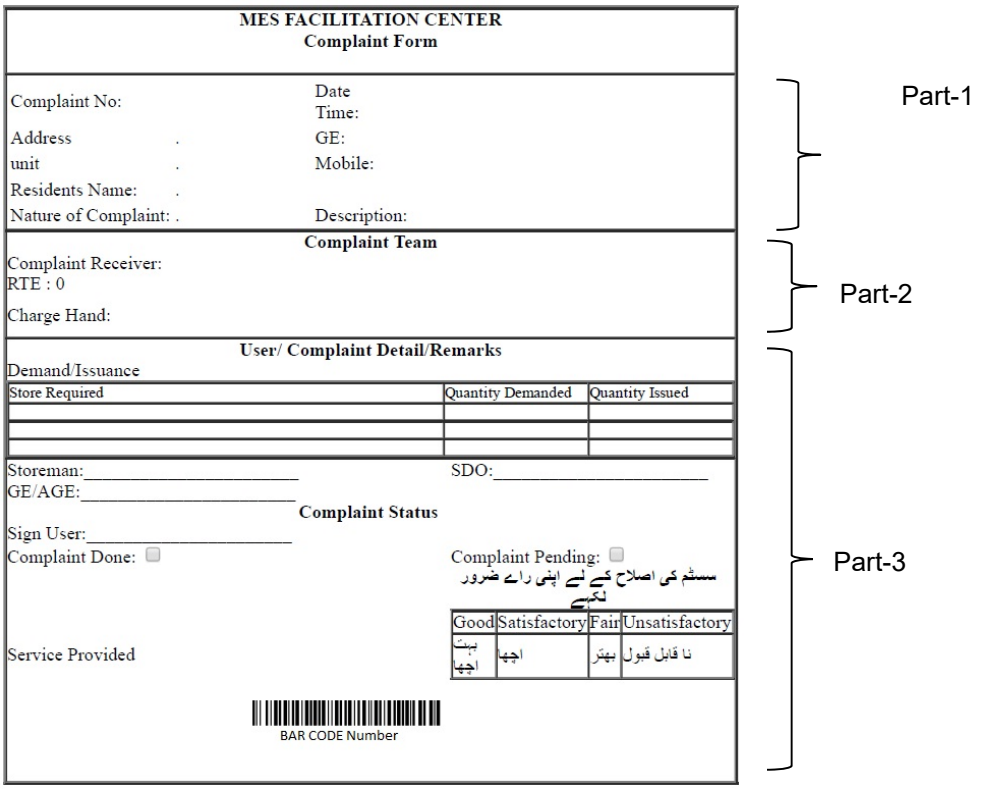
1. Nearly half of the residents in the garrison do not have access to the internal telephone network. Therefore, they have to send a maintenance request in-person.
2. Maintenance crew found it hard to recall the maintenance details due to the absence of any written instructions.
3. The maintenance request tracking number was not issued to the Customers unless they ask for one.
4. Customers could not track the progress of their request.
5. The system had no mechanism to collect feedback from the customers.

3.2 System Schematic Design and Development

3.2.1 Application Development.

The fundamentals of effective service request systems are accessibility, speed, confidentiality, informative, user-friendly, fair, effective and regularly monitored and audited (Brennan and Douglas 2002). Based on these principles, the author envisaged a digital complaint management system. The Complaint Office was renamed as the Engineering Facilitation Center (EFC). The new software, Digital Complaint Management System (DCMS), was developed by the Alison Technologies keeping in view the user requirements. A

dedicated server was installed in the EFC building, and two complaint receiver consoles were built where a user can call or walk-in to register a maintenance request. The new system had three telephone lines; one internal telephone line, one local landline, and one cell line, to give access to all residents. After placing a service request, the customer will receive a confirmation text message, and upon completion of the request, the customer will also receive a text message. Particular emphasis was placed on receiving customer feedback to improve response time, quality of equipment installed, the quantity of the material used by the technical staff, etc**.** Figure 2 presents the new form that has three sections to record, process, and close the request.



MES FACILITATION CENTER
Complaint Form

Complaint No: Date
Time:
Address . GE:
unit . Mobile:
Residents Name: .
Nature of Complaint: . Description:

Complaint Team

Complaint Receiver:
RTE : 0
Charge Hand:

User/ Complaint Detail/Remarks

Demand/Issuance

Store Required	Quantity Demanded	Quantity Issued

Storeman:_____ SDO:_____
GE/AGE:_____

Complaint Status

Sign User:_____
Complaint Done: ☐ Complaint Pending: ☐

سسٹم کی اصلاح کیے لیے اپنی راے ضرور لکھیے

Service Provided	Good	Satisfactory	Fair	Unsatisfactory
	بہت اچھا	اچھا	بہتر	نا قابل قبول

BAR CODE Number

Part-1
Part-2
Part-3

Figure 2: Digital complaint (service request) form

Part-1: This section contains the details of the customer, details of the request and date and time of the request. The date and time fields are auto-filled.
Part-2: This part contains information on the assignment of the ES technical staff, which is automatically performed based on the data of the staff in attendance on that particular day.
Part-3: This section contains user remarks on the quality of the service and the quantity of material used.
The workflow of the DCMS is illustrated in Figure 3 below.

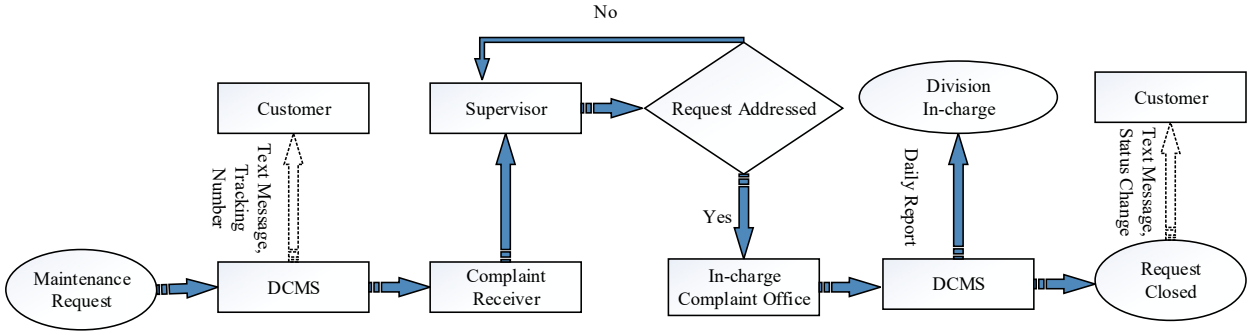


Figure 3: Workflow of the Digital Complaint Management System

4 Evaluation

After ten months of the implementation, the DCMS generated following reports, which were used in planning of the resources.

4.1 Area-wise Service Requests

Using the Geographic Information System, spatial maps were generated to visualize the spread of maintenance request geographically. For example, the spatial visualization of electrical maintenance requests helped to identify the areas of concerns that this data led to an informed decision on the allocation of resources to replace the old components of the power lines. Based on this data, a maintenance proposal was prepared for the improvement of the electric power system.Currently, the electric power system improvement work is in progress.

The accurate digital data with spatial information about the water supply maintenance requests were very helpful in determining the deteriorated sections of the water supply network. The water supply improvement works are also in progress.

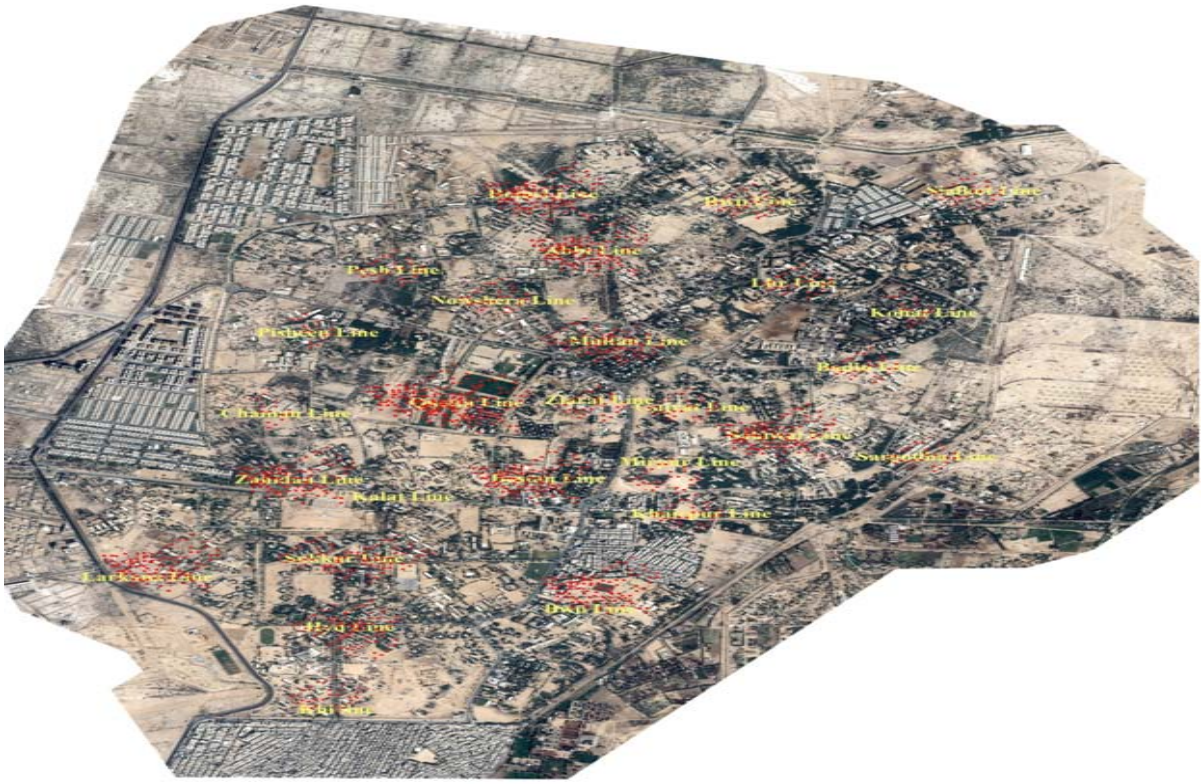


Figure 4: A typical spatial representation of service requests

4.2 Monthly Maintenance Request Reports

The data of the electric power system failure in 2016 helped the ES to plan electric maintenance of the overhead power lines to avoid such problem in the year 2017. The improvements included the tightening of conductors, replacement of worn out conductors and tree trimming, etc.

The maintenance of failure data of the electric power system and water supply network helped to predict the needs of material and labor.

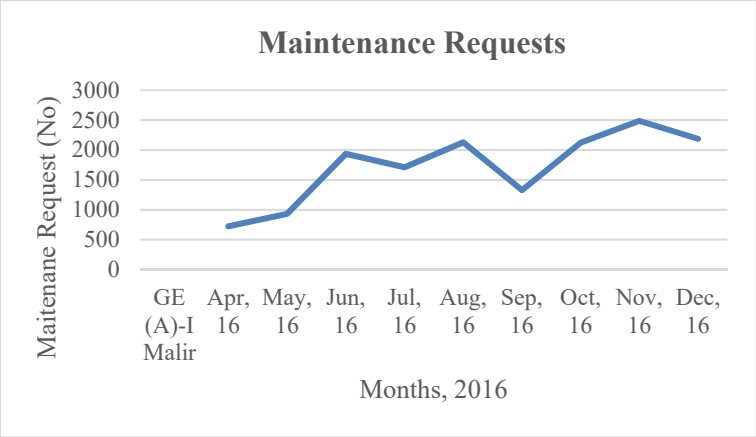


Figure 5. Maintenance requests

Figure 5 shows the number of maintenance request handled in a month. The data helped the monitoring team to understand the causes of delay in the first evaluation period of ten months. Several changes were observed in the overall maintenance request handling system. For example, a decrease in customer complaints against the Call Receivers due to the call recording feature; improvement in efficiency of maintenance crews due to user feedback; certainty in the forecast for material and equipment due to proper record keeping of materials and equipment used; transparency in the overall procedures resulting in identification of shortcomings of the maintenance department; identified needs for improvement in water and electricity networks when the network failure data was organized spatially.

5 Survey Results

The motivation of this research is to study the effectiveness of the Digital Complaint Management System (DCMS). Survey results helped to understand the challenges in the full implementation of the DCMS. The survey was conducted offline. Three separate questionnaires were designed considering the main stakeholders of the complaint management process; those are compliant receivers, technical staff (work crews) and customer. There were a total of 101 respondents, nine request receivers, thirty-one technical staff and fifty customers. Every questionnaire had various questions and responses were graded on a Likert Scale ranging from one to five, one being the lowest and five being highest grade.
Also, an interview with an authorized key person from the ES was conducted which focused on the complaint handling process for emergency repairs.

5.1 Maintenance Request Receivers

There are nine maintenance request receivers in the ES, and all responded to the survey. The 100% response rate is an indicative of the high interest. All the service request receivers strongly agreed to that the system is helping them to perform their duties efficiently with the average grading of 4.67 on a Likert scale. The role of the digital system to increase the personal effects of the maintenance request receivers was not graded very well with an average grading of 3.44. As their nature of the job did not change, so they considered their efficiency did not improve. As far as performance was concerned, they all agreed to have enhanced it with the average score of 4.45. System understanding of installation was not very easy for most the request receivers, so only one person rated it high as four on a Likert Scale with a cumulative average less than 3. Most of the request receivers, 90%, feel comfortable using the new application. Eight out of the nine request receivers graded high for the useful features of the system.

5.2 Maintenance field teams

The skilled workers who respond maintenance service calls were invited to take part in the survey, and 31 out of 40 workers responded. Around 90% of the technical staff were highly satisfied with the details printed on each section of the complaint form. The diverse response was received on the fact that new complaint form portrays the better impression of the ES to its customers with an average grade of 3.7. More than 80%

of the technical staff members believe the new system is better than the previous system and their skills have been improved.

5.3 Customers

Fifty residents customers participated in the survey. The ease in the registration of the maintenance service request was well received due to the availability of three different telephone lines especially 45% respondents who did not have access to the internal telephone network. Automated welcome voice & automated guidance was graded above average by 70% of respondents. Half of the respondents, 25, did not agree that the new system has improved the response time to address request. It indicates that system automation alone can't enhance the service response time. Around 80% of the respondents believe that material and equipment are installed transparently and reported on the ES system. Informing customers through an SMS notification from the DCMS was appreciated by 65% respondents, while complaint tracking via SMS was liked by 55%. This might be due the text messaging feature does not meet the expectation of customers.

6 Results and Discussion

The Engineering Service is a public organization dedicated to building and maintaining facilities for garrisons in Pakistan. The facilities management services involve tasks related to receiving, responding, and tracking maintenance service requests initiated by facility users. For efficient delivery of the service, a computer-based application of facility management system was developed and implemented replacing the old manual system. The application is capable of receiving maintenance requests electronically, record and report routine and emergency requests about building or equipment faults and request for maintenance. The purpose of this research was to measure the effectiveness of the newly implemented facility management system to handle service requests and to obtain users' satisfaction feedback. This paper presented the application development process, implementation and surveys to measure the effectiveness of the system. A case study methodology was adopted, and survey data from the operators, customers, and service request handlers (workers) were collected and analyzed. The result showed that service requests were being handled efficiently as compared to the old system. The new system is a valuable addition to improve the systematic management of users' service requests and provide better services. The initial evaluation of the system indicated that majority of the workers involved in receiving and recording the service requests found the system useful. While, the skilled workers responsible for performing maintenance tasks were not completely aware of the effectiveness of the system because the digitization did not affect their work directly. On the other hand, the availability of the reliable spatiotemporal data found to be very useful for future planning efforts.

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