*KOÇ UNIVERSITY*

## *College of Engineering*

**DEPARTMENT OF INDUSTRIAL ENGINEERING**

**INDR 291**

**SUMMER PRACTICE REPORT**

**SERVICE SYSTEMS**

<Your Name Here>

Internship Company and Department:

<Company / Department Name>

Starting Date / End Date

**KOÇ UNIVERSITY**

##### INDR 291 SUMMER PRACTICE MANUAL

The purpose of the summer practice is to improve your understanding of the industry and gain experience in industrial engineering. These goals can best be achieved through guided observations followed by a formal reporting. This manual provides guidelines for the summer practice and the preparation of the practice report of Koç University Industrial Engineering students who work in a service firm. The requirements of the summer practice report including the report style and format is described in the beginning of this manual. The manual is organized in eight sections, each section corresponding to a main part of the summer practice report. A detailed explanation of the subject that should be covered in each section is given with several questions. Students should elaborate on their responses to the questions and provide supporting discussions. A list of references is also provided.

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# INSTRUCTIONS ON THE FORMAT AND STYLE OF THE REPORT

The report must be written in English. The report must be typed.

The main section headings are to be numbered and written in capital letters. The sub-titles must be written in lower case letters and underlined. All pages should be given page numbers. Figures, drawings, tables, pictures, etc. should be numbered appropriately.

The report should consist of the following sections:

A cover page including the student name, the company, the company address, the starting date of the practice, the completion date of the practice, the department(s) where the practice has been completed, the contact person (supervisor) information including the name, department, phone and fax numbers, and e-mail

Table of contents (with corresponding page numbers)

Introduction (scope of the summer practice; main difficulties faced during the practice)

Main body of the report (detailed explanation of the work carried out)

Conclusion (evaluation of the experience gained and feedback on the content of summer practice)

References (list all the material referred to in the report text)

Appendix (all data, tables, diagrams, drawings, etc. which are not immediately relevant to the main text should be included in the appendix).

In writing up the report, the main sections of the manual and the questions may be followed in the given order. However, the content, the main body or a main section of the report may be reorganized in subsections defined by the student provided that all questions in this guide have been answered.

When a question is not appropriate for the case on hand or a suitable answer is not available, the question can be disregarded. However, a clear justification of why the question is not answered should be provided. The student can also attempt to modify and answer the question so that it is relevant to the practice organization.

It is advisable to add a glossary to the end of the report for technical terms used including the company specific jargon.

Summer practice reports are due within the first two weeks of the following academic term.

### INTRODUCTION TO SERVICE SYSTEMS

The service environment is sufficiently unique to allow us to question the direct application of traditional manufacturing-based techniques to services without some modification, although many approaches are analogous. Ignoring the differences between manufacturing and service requirements will lead to failure, but more importantly, recognition of special features of services will provide insights for developing enlightened and innovative approaches in service processes. In this booklet, we explain these features, and, when appropriate, point out the similarities of manufacturing and service systems.

**1. INTRODUCTORY FEATURES**

* 1. What is the full title of the firm? When was it founded and where is it located? (Give the full address).
  2. Is the firm a joint venture, a franchise, a part of a holding company or a part of a multinational group?
  3. Specify the sector and typical services the firm provides, and its shares in the domestic market and (if any) international markets.
  4. Who are regarded as the customers of your practice organization?
  5. Provide a list of functions performed by the industrial engineers in the practice organization.

**2. ANALYSIS OF MACRO ASPECTS**

**2.1** The distinction between a product and a service is difficult to make, because the purchase of a product is accompanied by some facilitating service (e.g., installation) and the purchase of a service often includes facilitating goods (e.g., food at a restaurant). Each purchase includes a bundle of goods and services in varying proportions, as in Figure 1.

Service systems have difficulty in identifying their product. This problem is partly a result of the intangible nature of services, but it is the presence of the customer in the process that creates a concern for the total service experience. Consider the following examples. For a sit-down restaurant, atmosphere is just as important as the meal because many diners regard the occasion as a way to get together with friends. A customer’s opinion of a bank can be formed quickly on the basis of a teller’s cheerfulness or the length of the waiting line.

Figure 1 Proportion of Goods and Services in Purchase Bundle

Goods Services

100% 75 50 25 0 25 50 75 100%

Self-service gasoline

Personal computer

Office copier

Fast-food restaurant

Gourmet restaurant

Auto repair

Airline flight

Haircut

The *service package* is defined as a bundle of goods and services that is provided in some environment. This bundle consists of the following four features:

*1. Supporting facility.* The physical resources that must be in place before a service can be offered. Examples are golf course, a ski lift, a hospital, and an airplane.

2. *Facilitating goods*. The material purchased or consumed by the buyer, or the items provided by the customer. Examples are golf clubs, skis, food items, replacement auto parts, legal documents, and medical supplies.

3. *Explicit services*. The benefits that are readily observable by the senses and that consist of the essential or intrinsic features of the service. Examples are the absence of pain after a tooth is repaired, a smooth running automobile after a tune-up, and the response time of a fire department.

4*. Intensive services*. Psychological benefits that the customer may sense only vaguely or the extrinsic features of the service. Examples are the status of a degree from an Ivy League school, the privacy of a loan office, and worry-free auto repair.

In services, a distinction must be made between inputs and resources. For services, inputs are generally the customers themselves, and resources are the facilitating goods, employee labor, and capital at the command of the service manager. Thus, to function, the service system must interact with the customers as participants in the service process. Because customers typically arrive at their own discretion and with unique demands on the service system, matching service capacity with demand is a challenge. For some services, such as banking, however, the focus of activity is on processing information instead of people. In these situations, information technology, such as electronic funds transfer, can be substituted for physically depositing a payroll check; thus, the presence of the customer at the bank is unnecessary.

*What are the proportion of goods and services in the service bundle offered by your practice organization? Describe the service package. Identify the input(s) of the service system, as well as its resources.*

**2.2.** Services have a clear front-office (e.g., bank-teller interaction with a customer) and back office (e.g., a bank’s check-clearing operations) dichotomy in their operations. The front office interacts with the customer, so its characteristics should be considered separately. The back office, on the other hand, is isolated with almost no interaction with the customer, which allows us to apply the manufacturing techniques in a straightforward way.

*Identify the back and front offices of the service system. Discuss their individual effects on the service operations. Is one of them more dominant? Discuss the reasons.*

**2.3.** Any service organization performs its activities in some physical environment consisting of land, buildings, offices, roads, shops, garages, storages, etc. These are parts of the facilities of the organization.

*Identify the major facilities of the service firm you observed during your summer practice on a sketch.*

**2.4.** When deciding on the location of a service facility, there are many factors to be considered. Some of these are:

a) Flexibility of a location is a measure of the degree to which the service can react to changing economic situations. Because location decisions are long-term commitments with capital-intensive aspects, it is essential to select locations that can be responsive to future economic, demographic, cultural, and competitive changes. For example, locating sites in a number of states could reduce the overall risk of a financial crisis resulting from regional economic downturns. This portfolio approach to multisite location could be augmented by selecting individual sites near inelastic demand (e.g., locating a hotel near a convention center).

b) Competitive positioning refers to methods by which the firm can establish itself relative to its competitors. Multiple locations can serve as a barrier to competition through building a firm’s competitive position and establishing market awareness. Acquiring and holding prime locations before the market has developed can keep the competition from gaining access to these desirable locations and create an artificial barrier to entry (analogous to a product patent).

c) Demand management is the ability to control the quantity, quality, and timing of demand. For example, hotels cannot manipulate capacity effectively because of the fixed nature of the facility; however, a hotel can control demand by locating near a diverse set of market generators that supply a steady demand regardless of the economic condition, the day of the week, or the season.

d) Access

e) Visibility

f) Traffic

g) Parking

h) Expansion

i) Labor availability and quality

j) Environmental factors

k) Laws, taxation, incentives, government politics etc.

l) Cost of land and buildings.

*Specify the most prevailing factors for selecting the current location of the facility with regard to the factors listed above or the like. Support your ideas.*

**3. MANAGEMENT INFORMATION SYSTEM**

**3.1** Every organization has an information system which is designed to meet its information requirements. In this system data are recorded, classified, summarized and processed to produce information. Management information system should support decision making at three different levels:

a) Strategic level decisions (e.g. expansion of facilities, mergers, diversification, capital expenditures, etc.).

b) Tactical level - implementation of plans (e.g. allocation of resources to different products, formulation of budgets, funds flow analysis, facility layout decisions, personnel problems).

c) Operational level, day-to-day routine operations (e.g. receiving the clients, providing the required service, quality control and allocating workers to jobs)**.**

*Specify the decision makers (individual or group, their positions within the organizational structure) and the related subject of decision-making with regard to one decision-making activity in each of these decision levels.*

**3.2** Computers are widely used in processing data and providing information for managerial decision making. They are also employed in organizations to improve productivity and provide better utilization of resources. The physical units making up a computer system are called hardware.

*Identify the computer systems (computer networks, stand-alone PC’s, workstations, main frames etc.) in use and their spread (functions or departments with extensive or low computer support in their operations) in your practice organization.*

**4. AN OVERVIEW OF THE SERVICE SYSTEM**

* 1. Service process needs the flow of customers and/or information. Process and information flow diagrams help to define the service delivery system, and they point out the places where controls and service standards may be needed in order to preserve the service task intact, and thus to provide a pleasurable service encounter for the customer. The development of such diagrams can show where bottlenecks are, and so where equipment or people need to be added, or how the process layout could be altered. Process and information flow diagrams can point out where procedures need to be standardized, or operations split off on their own. They can be very clear about where demands are placed on workers and what needs to be done in the peak times and the off-peak times.

*Provide a schematic representation of the process and information flow diagram of a particular customer or product in your practice organization. Note that your diagram should include the complete flow starting from the time when the customer requests a certain service process till (s)he leaves the service facility after having her (his) request fulfilled.*

* 1. The service process matrix below, proposed by Roger Schmenner, shows one classification of services. Services are classified across two dimensions that significantly affect the character of the service delivery process. The vertical dimension measures the degree of labor intensity, which is defined as the ratio of labor cost to capital cost. Thus, capital-intensive services such as schools and legal assistance are found in the bottom row because their labor costs are high relative to their capital requirements. The horizontal dimension measures the degree of customer interaction and customization, which is a marketing variable that describes the ability of the customers to affect personally the nature of the service, being delivered. Little interaction between customer and service provider is needed when the service is standardized rather than customized. For example, a meal at McDonald’s, which is assembled from prepared items, is low in customization and served with little interaction occurring between the customer and the service providers. In contrast, a doctor and her (his) patient must interact fully in the diagnostic and treatment phases to achieve satisfactory results. Patients also expect to be treated as individuals and wish to receive medical care that is customized to their particular needs.

*Explain the type of operations in your practice organization with respect to the classification given in the service process matrix. Describe your reasons in detail.*

|  |  |  |  |
| --- | --- | --- | --- |
|  | | Degree of interaction and customization | |
| Low | High |
| Degree of laborintensity | Low | Service factory   * Airlines * Trucking * Hotels * Resorts and recreation | Service shop   * Hospitals * Auto repair * Other repair services |
| High | Mass service   * + Retailing   + Wholesaling   + Schools   + Retail aspects of commercial banking | Professional service:   * Physicians * Lawyers * Accountants * Architects |

**4.3** In manufacturing, materials handling is an important consideration. Layouts, therefore, are designed to facilitate the movement of materials and the routing of products through the factory. With this in mind, three main types of layouts have been concocted for manufacturing:

• *Job shop layouts*: A job shop is designed to produce anything, even in small quantities. To accomplish this, like equipment is grouped together and materials are routed from one department to another, anywhere at anytime.

• *Product-specific layouts*: These apply to most of the other manufacturing. Here, a particular product and the materials for it are routed along the same path. Different equipment is grouped together and the products are worked on sequentially by the equipment in place.

• *Fixed-position layouts:* Here, the products are usually so big or so delicate (airplanes, other defense and aerospace-related products) that they cannot be moved from workstation to workstation easily, so it makes sense to move the materials to the product, which stays put in a fixed position.

These layout types make a lot of sense only for the service systems where back-office work dominates, since only in these systems the movement of materials is of real importance to the operation. For other types of service operations, the front-office work is of particular importance, and thus, the movement of people frequently dominates the movement of materials.

In the service shop, the fixed-position layout can be important, particularly if the service is a repair operation (hospitals, auto service). There, as in aerospace, the movement of the “product” being worked on (human being, car) is either impossible or difficult, so materials for the service are brought to the “product” being worked on.

In mass service operations, such as retailing, the presentation of materials is typically much more important than their movement. More consideration is given to the customer and his or her environment, rather than the cost of handling merchandise. Mass service operations are more concerned with the flow of people, rather than with the flow of any facilitating goods or paperwork controls. (It is intriguing that only for the so-called warehouse stores is materials handling important; there, customers are willing to forgo some of the amenities usually associated with retailing in order to save money.)

Professional service firms are least affected by layouts. The layouts they offer tend to be general purpose in nature, and thus are most likely to resemble the manufacturing job shop. There may be different departments where workers doing a particular task are grouped together. In an advertising agency, for example, creative people are typically housed in a distinctive location apart from the research or media people. The same is true for a health clinic or an accounting firm (tax people are segregated from audit or consulting people).

*Discuss the type or combinations of the types of layout you have observed in your practice organization. Support your points using rough sketches.*

**4.4** As mentioned in 4.3, in manufacturing, materials handling is an important consideration, which has implications in the “back office” of a service facility. The flow and movement of materials within the back office may be important for the whole process.

*If your summer practice organization has the back office as an important component of the whole service, then identify some of the materials handling equipment in the back office and state where and for what purposes they are used. If not, this question can be disregarded.*

**4.5** In manufacturing, unit-manufacturing costs can be estimated based on the determination of standard times for each part/product. Unit-manufacturing cost of a product has to be determined to be utilized in various planning and decision making functions. There are three basic cost elements: direct material cost, direct labor cost and factory overhead cost. Unit-manufacturing cost can be calculated as:

Unit-manufacturing cost = Unit direct labor cost + Unit direct material cost + allocated factory overhead to a unit.

In a service system where the back-office is dominant, the unit cost of services can be estimated similarly. However, if the front office is dominant with a major component of technology, it is more appropriate to replace the material cost with the cost due to information technology (which includes the investment as well as the maintenance and upgrade of the hardware, software, etc.).

*Are unit-service costs calculated in your practice organization? If yes, explain how they are calculated and provide an example. If no, discuss how they can be estimated. Comment on the strengths and shortcomings of your estimation procedure.*

**4.6** Productivity has a classically simple definition as the ratio of the outputs divided by the inputs. However, in a service organization, it is not easy to identify the inputs (and/or resources), the outputs of the system and their corresponding measures, as well as the appropriate ways of measuring the relationship between these inputs and outputs. To evaluate the operational efficiency of a branch bank, for example, an accounting ratio such as cost per teller transaction might be used. A branch with a high ratio in comparison with those of other branches would be considered less efficient, but the higher ratio could result from a more complex mix of transactions. For example, a branch opening new accounts and selling financial securities would require more time per transaction than another branch engaged only in simple transactions such as accepting deposits and cashing checks. The problem with using simple ratios is that the mix of outputs is not considered explicitly. This same criticism also can be made concerning the mix of inputs. For example, some branches may have automated teller machines in addition to live tellers, and this use of technology could affect the cost per teller transaction.

Broad-based measures such as profitability or return on investment are highly relevant as overall performance measures, but they are not sufficient to evaluate the operating efficiency of a service unit. For instance, one could not conclude that a profitable branch bank is necessarily efficient in its use of personnel and other inputs. A higher-than-average proportion of revenue-generating transactions could be the explanation rather than the cost-efficient use of resources.

*Compute and/or describe an appropriate productivity measure for your practice organization. Comment on the strengths and shortcomings of the measure you have described.*

**5. PLANNING AND CONTROL OF SERVICE OPERATIONS**

**5.1**Planning and control of service operations are concerned with providing information to: (a) efficiently manage the flow of customers, information, and materials, (b) effectively utilize workforce and equipment, (c) coordinate internal activities with the demand and, when appropriate, with the supply. Planning and control of service operations can be viewed as a system. Its components (like managing the demand and capacity, supplying the facilitating goods, planning the workforce levels, etc.) contribute to the overall objectives of the organization through the cost, volume, quality and timeliness of service activities.

Management of the types of services (so called service-mix) and their respective volumes brings the problem of determining the demand. This may require analysis of past data, collecting and processing of separate customer orders, signing contracts for supply on an agreed-upon routine basis or conducting a market research (especially for a new service).

*State subjects of typical decisions on the types and volumes related to some specific services of your practice organization. Who make(s) these decisions? How are the decisions recorded and transferred to others in the organization? What is the basis for these decisions?*

**5.2** Almost every production firm stocks goods to ensure smooth and efficient running of its operations. A service system where the back-office is dominant may also choose to use inventories for various reasons: (a) stocks accumulated against seasonal fluctuations, (b) stocks caused by receiving in large quantities, (c) stocks of parts being processed due to movement in batches or processing rate differences between successive stages, (d) stocks due to transport delays during delivery. Hence inventory exists whenever it is necessary (or sometimes unavoidable) to stock for the requirements over a specified time into the future. Decisions regarding how much and when to order are typical in any planning and control system as problems in inventory management. Stocking large quantities would require higher invested capital but would result in less frequent shortages and placement of orders. On the other hand, little or no stocks would decrease the invested capital, but would increase the frequency of ordering as well as the risk of not satisfying requirements on time. Both extremes are costly.

*If back-office is dominant in your practice organization, state which items are kept in stocks. What requirements do they serve, or what causes them? Use a graph to plot the inventory on hand (i.e. in the storage or use areas within the facilities of the company) versus time for at least one of these items. Do you observe any pattern? How can you explain that pattern (or none)? Supply your sources of data used in the plot. If no inventory is kept, explain why. If back-office is not dominant, continue with the next question.*

**5.3** Unlike products that are stored in warehouses for future consumption, a service is an intangible personal experience that cannot be transferred from one person to another. Instead, a service is produced and consumed simultaneously. Whenever demand for a service falls short of capacity to serve, the results are idle servers and facilities. Further, the variability in service demand is quite pronounced, and, in fact, our culture and habits contribute to these fluctuations. For example, most of us eat our meals at the same hours and take our vacations in July and August, and studies of hospitals indicate low utilization in summer and fall months. These natural variations in service demand create periods of idle service at some times and of consumer waiting at others.

One way of dealing with these variations is to smooth the demand by offering price incentives, promoting off-peak demand, creating complementary services to balance the total demand among several services, and developing reservation systems. In addition, the controversial practice of *overbooking* can allow a better use of perishable service capacity.

*What techniques are used in your practice organization to smooth the demand? Give examples for specific services.*

**5.4**Queues of customers in service systems serve the same purpose that inventories do in production systems, i.e., they ensure smooth and efficient use of the capacity. Hence, the planning decisions in services, similar to the decisions in inventory management, involve a trade-off between the cost of providing a service and the cost or inconvenience of customer waiting. The cost of service capacity is determined by the number of servers on duty, whereas customer inconvenience is measured by waiting time.

*State when queues of customers are allowed in your practice organization. What requirements do they serve, or what causes them? Use a graph to plot the number of customers waiting for a certain service versus time. Do you observe any pattern? How can you explain that pattern (or none)? Supply your sources of data used in the plot. What difficulties do you observe regarding to managing queues?*

**5.5** Capacity is the ability to deliver the service over a particular time period. For services, the horizon can vary from decades to hours. Capacity is determined by the resources available to the organization in the form of facilities, equipment, and labor. Although the capacity due to facilities and equipment is fixed in general, the workforce level can be planned according to the anticipated demand. Hence, another way of dealing with the variations of demand is to adjust the workforce level accordingly. Examples include increasing the number of employees in restaurants during lunch or dinner hours, and decreasing the number of employees during the winter months in a hotel by the seaside.

*Does the demand of certain services have a “seasonal” pattern? Does your summer practice organization adjust the workforce level according to the varying demand? Explain how the workforce level is planned.*

**6. QUALITY PLANNING AND CONTROL SYSTEM**

* 1. There is little agreement on what constitutes quality. Most people conceive quality as an attribute of a product or service that can be improved. However, quality is not only associated with products and services, but also includes processes, environment and people. It is an ever-changing state; what is considered quality today may not be enough to be considered quality tomorrow. Hence, quality can be defined as a dynamic state associated with products, services, processes, environments and people that meets or exceeds expectations.

Service quality is even more complex, as shown by the need for a definition that includes five dimensions:

1. *Reliability:* The ability to perform the promised service both dependently and accurately. Reliable service performance is a customer expectation and means that the service is accomplished on time, in the same manner, and without errors every time. For example, receiving mail at approximately the same time each day is important to most people. Reliability also extends into the back office, where accuracy in billing and record keeping is expected.
2. *Responsiveness*: The willingness to help customers and to provide prompt service. Keeping customers waiting, particularly for no apparent reason, creates unnecessary negative perceptions of quality. If a service failure occurs, the ability to recover quickly and with professionalism can create very positive perceptions of quality. For example, serving complimentary drinks on a delayed flight can turn a potentially poor customer experience into one that is remembered favorably.
3. *Assurance:* The knowledge and courtesy of employees as well as their ability to convey trust and confidence. The assurance dimension includes the following features: competence to perform the service, politeness and respect for the customer, effective communication with the customer, and general attitude that the server has the customer’s best interest at heart.
4. *Empathy*: The provision of caring, individualized attention to customers. Empathy includes the following features: approachability, sensitivity, and effort to understand the customer’s needs. One example of empathy is the ability of an airline gate attendant to make a customer’s missed connection at the attendant’s own problem and to find a solution.
5. *Tangibles*: The appearance of physical facilities, equipment, personal and communication materials. The condition of the physical surroundings (e.g. cleanliness) is tangible evidence of the care and attention to detail that are exhibited by the service provider. This assessment dimension can also extend to the conduct of other customers in the service (e.g. a noisy guest in the next room at a hotel).

Customers use these five dimensions to form their judgments of service quality, which are based on a comparison between expected and perceived service. The gap between expected and perceived service is a measure of service quality; satisfaction is either negative or positive.

Figure 2. Perceived service quality



Word of

mouth

Personal

needs

Past

experience

Expected

service

Perceived

service

**Service Quality**

**Dimensions**

Reliability

Responsiveness

Assurance

Empathy

Tangibles

**Service Quality Assessment**

1. Expectations exceeded

ES<PS (Quality surprise)

2. Expectations met

ES~PS (Satisfactory quality)

3. Expectations not met

ES>PS (Unacceptable quality)

*Choose a service and explain how the organization defines its quality. How would you define it? How are customer requirements translated into service specifications (or characteristics)? Provide examples. Also describe the quality control activities that take place throughout the life cycle of that service.*

**7. OBSERVATIONS OF A PROFESSIONAL AT WORK**

**7.1** In every organization, we encounter professionals with different backgrounds and expertise such as product/process designers, marketing managers/specialists, accountants, human resource managers/specialists, service planners, purchasing managers, manufacturing supervisors, maintenance engineers, quality engineers, and computer specialists. One of the major difficulties lies in communication of these people for achievement of common objectives of the organization. On the average, 75% of a workday passes by communicating. Effectiveness of communication is essential for industrial engineers due to the nature of their work. Hence, industrial engineers are expected to have high communication skills.

Understanding and appreciating the people we communicate with and the characteristics of their work is an important requirement of successful communication.

*Identify the most appealing position to you at the firm. Observe a professional who has this position, and narrate your observations. You may want to mention his/her tasks/responsibilities, how he/she lives a typical workday, %breakup of activities, who he/she manages, who he/she reports to, and which background and skills he/she needs, and so on.*

**8. CONCLUSION**

**8.1** The following questions are prepared to obtain your own assessment of the summer practice. You can add as many ideas as you wish besides answering these questions. You should not, however, ignore any question. Your answers and additional ideas and suggestions will guide the reorganization of this manual in the future**.**

*Is the procedure you have followed in this summer practice sufficient in its scope, method and general approach? If not, identify the drawbacks. State your suggestions for an improved procedure. If you found it sufficient, state what you enjoyed most about it.*

*If you had another four weeks of time in the same firm, what would you like to do and why?*

*What do you expect to learn in your future training as an industrial engineer that will help improve your understanding of service systems? How can you further develop your capability of handling problems of these systems?*

*Drawing on your experience of this practice, discuss the differences between industrial engineering and other disciplines (such as other engineers, managers) with respect to their responsibilities and ways of approaching their duties in the service environment.*

*If industrial engineers are employed by the firm, what are the areas they work in? If no industrial engineer is employed, what activities (if any) do you think are suitable for IEs in your practice organization?*

*Discuss top management's impression and attitudes towards industrial engineering functions and activities.*

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