Overview

Unit 8 is organized into six sections, the first being this overview and the introduction. The second section outlines the feasibility checkpoints in the development life cycle. The third section deals with various feasibility tests — operational, technical, economic and schedule. The fourth section covers different cost-benefit analysis techniques, including break-even analysis, pay-back analysis, return on investment and net present value. In the fifth section you will learn how to use a feasibility matrix to evaluate feasibility of competing systems. The last section includes a further installment of the case study on the Orient-Pacific Insurance Corporation, a unit summary, list of references, glossary of terms and solutions for the self-tests and activity.
Introduction

Systems analysts are change agents. Not only do they determine information requirements, they also evaluate feasibility of different solutions from economic, technical and operational perspectives, and then try to sell a suitable solution to end users and management.

Feasibility cuts across many phases of the systems development life cycle (SDLC). It is the responsibility of the systems analyst to examine various options at different junctures and recommend appropriate changes. This process, which is mainly non-technical, is difficult and requires creative thinking to consider the novel use of technology to solve certain business problems. Like systems analysis, this is not a prescribed process. There is no step-by-step method. The feasibility study is an approach which relies on one’s understanding of the fundamentals of systems analysis and design, as well as one’s past experiences. Through a feasibility study, users, managers and developers should be able to accurately size and cost a proposed solution, and evaluate the ensuing organizational impacts.

As you will see in the following sections, the objective of a feasibility study is to evaluate each option, determine its strengths and weaknesses, and propose a viable solution, taking into account all technical and non-technical considerations. The feasibility study is also a political process where, prior to commencing analysis, the analyst specifies the likely costs and benefits of a system to the different stakeholders.
Objectives

By the end of Unit 8, you should be able to:

1. Identify feasibility checkpoints in the development life cycle.
2. Define and describe the four categories of feasibility tests: operational, technical, schedule and economic.
3. Discuss various cost-benefit analysis.
4. Perform a feasibility analysis of competing systems.
Feasibility checkpoints in development life cycle

Feasibility studies occur at several checkpoints in the development life cycle:

- At the **preliminary investigation phase**, we need to gain a general understanding of the problem and the development costs. Because the scope and boundary of the system are not clearly known at this stage, the cost estimates are usually marked up to 100%.

- As more details about the problem under study are known, there is a need to evaluate feasibility at the **problem analysis phase**. At this checkpoint a significant increase in cost estimates may reflect a change in project scope.

- Determination of the information requirements sheds more light on the details of the project and, as such, calls for re-evaluation of feasibility. There may be a need to change scope, costs and schedule, or to cancel the project altogether at the **requirements analysis phase**.

- During the phases in the design stage, we also need to re-assess feasibility. This process is particularly crucial during the **decision analysis phase**, because we need to decide on many possible implementation plans. Options ranging from ‘do nothing’ to business process re-engineering (BPR), to buying an off-the-shelf software package, to in-house development needs to be evaluated. For the last option, questions related to timing (on-line versus batch processing) and geography (centralized versus decentralized versus cooperative) also need to be answered and appropriate solutions determined.

- Because implementation is an expensive and time-consuming exercise, we need to re-assess feasibility one last time at the **design phase** with a view to downsizing or cancelling the project.

**Reading**

‘Feasibility analysis and the system proposal’, pp. 364–67 in your text. This reading corresponds to Objective 1 of this unit.
Self-test 8.1

1 Differentiate between feasibility and feasibility studies.

2 Explain what is meant by the creeping commitment approach to feasibility.

3 Why is it important to install feasibility checkpoints into a systems development life cycle?
Feasibility tests

Operational

Changes in information systems affect the people in an organization. From the beginning of an information system development project, the following two questions need to be answered:

- Is the problem worth solving?
- How will the new system affect end users and management?

Computer-based information systems affect both the workforce (by requiring new skills or making old skills obsolete) and organizational structure (through centralization or decentralization). In order to understand these impacts, we need to make all details of a computerization proposal explicit. Management and staff should be fully aware of the impacts of a system before the implementation of that system.

One approach to this difficult task is to produce a technology impact table for each section of the organization. This shows a ‘before and after’ picture of a section’s work, summarizing any changes. It allows management and staff to contribute meaningfully to a decision about new information technology.

Management has a responsibility to control a system once it is installed. They need details of facilities for systems monitoring, problem detection and correction. This is operational control.

Technical

A technical feasibility study aims to assess the impact of a system on an organization. It tries to determine whether the proposed technology is a practical solution, and whether the organization has the necessary technology and technical expertise to implement the proposed solution.

Schedule

Information systems (IS) projects are notorious for extending beyond their deadlines. Therefore it is important to fully evaluate the feasibility of the project schedule to ensure that the deadlines are reasonable and feasible.

Economic

In evaluating options, management initially asks two questions:

- What will it cost?
- What will we get for our money?
Several techniques, discussed in the next section, are used in assessing economic feasibility.

**Reading**

‘Four tests for feasibility’, pp. 367–70 in your text. This reading, which corresponds to Objective 2 of this unit, explains the four feasibility tests. Make sure you understand that operational, technical, schedule and economic tests can have conflicting objectives.

**Self-test 8.2**

1. Why is usability analysis performed when determining operational feasibility in the later stages of the development life cycle?

2. The emergence of state-of-the-art technology seems to bring a lot of conveniences to the business field; however, some firms are reluctant to try it. Why?
Cost-benefit analysis techniques

A cost-benefit study documents the estimated costs of developing, implementing and running a new system. It also documents the estimated benefits of a system. A consistent problem in computer development is that costs are underestimated and benefits are overstated. This has happened partly because analysts have not had a clear picture of a system they are trying to assess.

We can divide typical systems costs into three broad categories:

- development costs — for example, the costs of hardware, communications and software, special development facilities (such as CASE tools), systems developer and programmer time, and management time.

- implementation costs — for example, the costs of data conversion, acceptance tests, staff training time, printing of forms and special stationery.

- operational costs — for example, the cost of maintenance.

You divide typical systems benefits into three broad categories:

- revenue raising — for example, improving competitiveness, meeting new market trends.

- expense reduction — for example, reducing inventory levels, reducing level of staffing, reducing paper work, reducing debt exposure.

- increased productivity — for example, improved cash flow, efficient and effective staff.

Intangible costs and benefits are those that you cannot realistically value in monetary terms. However, they are no less important in evaluating the impact of a system than tangible dollar benefits. Public profile and image, or the effect on staff of improved working practices, are examples of intangible impacts.

Risk analysis

After asking about costs and benefits, management next asks:

What are the risks?

Some of the ways information systems fail include: not meeting requirements; costing more than the budget; not achieving expected benefits; being technically flawed; having an undesirable impact on an organization. Risk analysis assesses the likelihood of these disasters actually happening.

There are four main factors that influence IS development risk:
• the systems environment

If an organization is stable, its objectives clear and its procedures well known, then the risk from this factor is low. However, if an organization is in a state of rapid change or its procedures are not very structured, then the risk from this factor is high.

• the systems architecture

Systems that use established technology, with standard systems development tools addressing operational rather than managerial problems, are low risk. Systems that break new technological barriers or address decision support problems are high risk. Also, systems of large size or high complexity are high risk. Large size is defined as meaning taking more than one year to develop and implement. The longer a development project, the greater the possibility that requirements will change before the project is completed. High complexity means covering more than one functional area, integrating data from more than one other system or interfacing with more than one other system.

• the user

User knowledge and attitude is critical to the success of a development effort. Knowledgeable, experienced and cooperative users are low risk.

• the development team

Developer knowledge and attitude is also critical to the success of a development. Experience with technology and a strong ability to communicate effectively are low risk.

The type of risk has a bearing on the system scope and development strategy. For example, if the structure of a problem is unclear, a prototyping approach can minimize risk. Alternatively, if a system spans several organizational areas, it may be appropriate to pilot the system in one place and expand it to other areas progressively.

Financial evaluation

There are a range of analysis methods to examine the financial aspects of the systems architecture. These include return on investment, pay-back analysis, net present value and break-even analysis.

• Return on investment (ROI) is the net benefit expressed as a percentage of the investment amount. The ROI is calculated by dividing the net benefit by the investment amount. The ROI helps the evaluators compare budget issues for projects of different size or scope. A small investment in a small project or system can result in a greater return on investment than a large investment in a large project or system.

• The pay-back analysis technique gains its popularity because it is a simple method for determining if and when an investment will pay for itself. It devises how much time will lapse before accrued benefits overtake accrued and continuing costs.
• Another useful cost-benefit measure is the **net present value** — that is, the difference between the present value of the benefits and the present value of the investment. The net present value can be viewed as the amount of benefit over what could have been earned on an imaginary, risk-free investment. If the net present value is zero, the project will return the same amount as that risk-free investment and, thus, is probably not worth doing. If the net present value is negative, the project is definitely not worth doing, as the imaginary risk-free investment would earn more.

• A **break-even analysis** examines the interaction among fixed costs, variable costs, prices and unit volume, in order to determine that combination of elements in which revenues and total costs are equal. Fixed costs are those dollars which must be spent to be in business and are not impacted by sales. Variable costs include those expenses which change as a result of sales volume.

One further method is to consider the impact of information technology expenditure on cash flow. For example, in seasonal industries, large cost outlays associated with new equipment purchases must be carefully planned to coincide with seasonal income. This planning method is called **schedule feasibility**.

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**Reading**

‘Cost-benefit analysis techniques’, pp. 370–77 in your text. This reading, which corresponds to Objective 3 of this unit, discusses different techniques used in the evaluation of IS projects. Most of these techniques are used in other types of projects. If you are still unfamiliar with these techniques, ensure that you understand them by consulting any introductory finance textbook.

**Self-test 8.3**

1. What is the difference between a tangible benefit and an intangible benefit?

2. Why is it important for a systems analyst to know about the time value of money?

3. Identify the two categories of cost.
Feasibility analysis of competing systems

As you saw before, during the selection and procurement phases we need to make a choice among a number of alternatives. A feasibility analysis matrix is a good method for this task. The columns in such a matrix correspond to each candidate system, while the rows correspond to different criteria used in the evaluation. You need to follow the following procedure to construct a feasibility matrix:

1 List all decision criteria. Many of the evaluation methods discussed above provide suitable criteria for comparison. However, more subjective criteria are also used in the decision process. Sample criteria include: the degree to which requirements are met; financial criteria (cost-benefit ratio, return on fixed assets, break-even point, cash flow implications); management perception of risks; performance criteria such as reliability and stability; organizational ‘fit’ (for example, match to user characteristics, maintainability); and ability to control the system.

2 Weight each criterion to reflect its importance as a decision-making factor. Total weight should be 100. Again, these weights are a matter of managerial judgement as they reflect management’s values, not objective facts. It is essential that the criteria to be used in the comparison and the relative weightings are approved by management before the ratings of each option are made. The importance of this work is simply that it makes a decision process more rational. A weighted criteria list is shown in Figure 8.1.

<table>
<thead>
<tr>
<th>Feasibility criteria</th>
<th>Weight</th>
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<tbody>
<tr>
<td><strong>Operational feasibility</strong>&lt;br&gt;Functionality — the degree to which the candidate would benefit the organization and how well the system would work.&lt;br&gt;Political — a description of how well received this solution would be from both the user and organizational perspective.</td>
<td>30%</td>
</tr>
<tr>
<td><strong>Technical Feasibility</strong>&lt;br&gt;Technology — an assessment of the maturity, availability (or ability to acquire) and desirability of the computer technology needed to support this candidate system.&lt;br&gt;Expertise — an assessment of the technical expertise needed to develop, operate and maintain the candidate system.</td>
<td>30%</td>
</tr>
<tr>
<td><strong>Economic feasibility</strong>&lt;br&gt;Cost to develop&lt;br&gt;Payback period (discounted)&lt;br&gt;Net present value&lt;br&gt;Detailed calculations</td>
<td>30%</td>
</tr>
<tr>
<td><strong>Schedule feasibility</strong>&lt;br&gt;An assessment of how long the solution will take to design and implement.</td>
<td>10%</td>
</tr>
<tr>
<td><strong>Ranking</strong></td>
<td>100%</td>
</tr>
</tbody>
</table>

Figure 8.1  Example of a weighted matrix
Rate each design option in terms of each decision criterion on a scale of 1 to 100. Rating an option against a criterion is not always easy. Again, judgement is required. A typical evaluation matrix is shown in Figure 8.2.

<table>
<thead>
<tr>
<th>Feasibility criteria</th>
<th>Weight</th>
<th>Option 1</th>
<th>Option 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Operational feasibility</strong></td>
<td>30%</td>
<td>Only supports inventory control requirements, and current business processes would have to be modified to take advantage of software functionality.</td>
<td>Fully supports user required functionality.</td>
</tr>
<tr>
<td><strong>Technical feasibility</strong></td>
<td>30%</td>
<td>Current production release of Platinum Plus package is version 1.0 and has been only on the market for 6 weeks. Maturity of product is a risk and company charges an additional monthly fee for technical support. Required to hire or train C++ expertise to perform modifications for integration requirements.</td>
<td>Senior analysts who saw the performance of MS Visual Basic at demonstration and presentation have agreed to adopt the technology because it is mature and easier to use than PowerBuilder.</td>
</tr>
<tr>
<td><strong>Economic feasibility</strong></td>
<td>30%</td>
<td>Approximately $350,000, Approximately 4.5 years, Approximately $210,000</td>
<td>Approximately $418,040, Approximately 3.5 years, Approximately $306,788</td>
</tr>
<tr>
<td><strong>Schedule feasibility</strong></td>
<td>10%</td>
<td>Less than 3 months</td>
<td>9–12 months</td>
</tr>
<tr>
<td><strong>Ranking</strong></td>
<td>100%</td>
<td>Rating: 95</td>
<td>Rating: 80</td>
</tr>
</tbody>
</table>

*Figure 8.2 Example of an evaluation matrix*

*Source: Adapted from Whitten et al. (2000, p. 381, Fig. 9.9).*
These ratings reflect management’s perceptions of how well an option satisfies each criterion. In Figure 8.3, option 2 looks technically better (28.5 for technical feasibility) than option 1. However, it takes longer time to be completed (perhaps qualified technical staff are difficult to recruit and management has doubts about keeping control of the system).

4 Calculate a weighted score for each option. Multiply each rating by its relevant weight and calculate the weighted score. Figure 8.3 shows a complete weighted matrix.
<table>
<thead>
<tr>
<th>Feasibility criteria</th>
<th>Weight</th>
<th>Option 1</th>
<th>Option 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Operational feasibility</strong></td>
<td>30%</td>
<td>Only supports inventory control requirements, and current business processes would have to be modified to take advantage of software functionality. Rating: 60 Score: 30% * 60 = 18</td>
<td>Fully supports user required functionality. Rating: 100 Score: 30% * 100 = 30</td>
</tr>
<tr>
<td><strong>Technical feasibility</strong></td>
<td>30%</td>
<td>Current production release of Platinum Plus package is version 1.0 and has been only on the market for 6 weeks. Maturity of product is a risk and company charges an additional monthly fee for technical support. Required to hire or train C++ expertise to perform modifications for integration requirements. Rating: 50 Score: 30% * 50 = 15</td>
<td>Senior analysts who saw the performance of MS Visual Basic at demonstration and presentation have agreed to adopt the technology because it is mature and easier to use than PowerBuilder. Rating: 95 Score: 30% * 95 = 28.5</td>
</tr>
<tr>
<td><strong>Economic feasibility</strong></td>
<td>30%</td>
<td>Approximately $350,000 Approximately 4.5 years Approximately $210,000 See Attachment A Rating: 60 Score: 30% * 60 = 18</td>
<td>Approximately $418,040 Approximately 3.5 years Approximately $306,788 See Attachment A Rating: 85 Score: 30% * 85 = 25.5</td>
</tr>
<tr>
<td><strong>Schedule feasibility</strong></td>
<td>10%</td>
<td>Less than 3 months. Rating: 95 Score: 10% * 95 = 9.5</td>
<td>9-12 months Rating: 60 Score: 10% * 80 = 8</td>
</tr>
<tr>
<td><strong>Ranking</strong></td>
<td>100%</td>
<td>60.5</td>
<td>92</td>
</tr>
</tbody>
</table>

**Figure 8.3** Example of a feasibility analysis matrix

*Source: Adapted from Whitten et al. (2000, p. 381, Fig. 9.9).*
The totals give an indication of a gross value that management places on each option. Of course, as this task is often done on a spreadsheet, there is inevitably a lot of ‘juggling’ with figures (sometimes to make them prove what management wants them to!). Still, decision criteria and the weight associated with each is management’s concern, not the analyst’s. However, an analyst can set up a skeleton matrix and be available to assist in an assessment process.

**Reading**

‘Feasibility analysis of candidate systems’, pp. 377–80 in your text. This reading, which corresponds to Objective 4 of this unit, discusses feasibility analysis of candidate systems.

**Self-test 8.4**

1. What is the difference between a candidate systems matrix and a feasibility analysis matrix?

2. State some advantages of using the candidate systems matrix and a feasibility analysis matrix.

**Activity 8.1**

For each of the following, indicate whether they are a consideration of operational (O), technical (T), economic (E) or schedule (S) feasibility.

1. Will our current printer be able to handle the new reports and forms required of a new system?

2. What are the fixed and variable costs of operating the system?

3. Does the system provide adequate throughput and response time?

4. Does the system offer adequate service level and capacity to reduce the costs of business or increase the profits of the business?

5. What are the tangible and intangible benefits of the system?

6. Does the system offer adequate controls to ensure against fraud and embezzlement, and to guarantee the accuracy and security of data and information?

7. Does the system make maximum use of available resources, including people, time, flow of forms, minimum processing delays, and so on?
8 Does management support the system?

9 What is the net present value of the solution?

10 How will the working environment of the users change?

11 How do the users feel about their role in the new system?

12 Do we have the expertise to implement the solution?

13 What is the payback period for the proposed system solution?

14 Does the system provide users and managers with timely, pertinent, accurate and usefully formatted information?

15 What is the return on investment for the new system?

16 Is the project deadline mandatory or desirable?

17 Does the system provide desirable and reliable service to those who need it?

18 Is the system flexible and expandable?

19 Is the resource available in our data processing shop?

Summary

Systems analysts need to assess and re-assess the feasibility of a system periodically. The reason behind the continual feasibility re-assessment is that information requirements may not be clearly known at the outset of a project. Furthermore, the project scope and boundary can change over time.

In this unit, you learned about the feasibility checkpoints that are important in the development life cycle. You also learned about different feasibility tests and cost-benefit analysis techniques. Because these tests may have competing objectives, you also learned how to use a feasibility analysis matrix to choose among candidate solutions.

It is important to note that feasibility is a cross-life activity. We have covered this topic in this unit — almost halfway through the course — to emphasize its importance both in the analysis and design stages. In Units 9 to 14, you will learn about various aspects of systems design and implementation.
References

You should be able to meet the learning objectives of this course and successfully complete your assessment on the basis of your study units and your textbook. These references are not prescribed reading; they are provided to enable you to develop your knowledge beyond the requirements of this course.


Glossary

This glossary provides brief definitions of the main technical terms you encountered in Unit 8. The definitions given here are offered in addition to, or in place of, those found in your textbook.

**Break-even analysis:** A break-even analysis examines the interaction among fixed costs, variable costs, prices and unit volume in order to determine the combination of elements in which revenues and total costs are equal.

**Cost-benefit analysis techniques:** These are methods to assess economic feasibility; i.e., the cost-effectiveness of a project.

**Definition phase:** Also called requirements analysis. In this phase the analyst determines the users’ needs. The definition phase identifies and analyses business requirements that should apply to any possible technical solution to the problems.

**Design phase:** The design phase specifies the technical requirements for the target solution.

**Economic feasibility:** A measure of the cost-effectiveness of a project or solution. This is often called a cost-benefit analysis.

**Feasibility analysis matrix:** A feasibility analysis matrix is used to evaluate and rank candidate systems. It is useful for presenting the results of a feasibility analysis as part of a system proposal.

**Feasibility checkpoints:** Feasibility checkpoints identify specific times during the systems development life cycle when feasibility is re-evaluated. A project may be cancelled or revised at any checkpoint, despite whatever resources have been spent.

**IS development risks:** Information systems development risks can be defined as possibilities or chances of suffering loss and uncertainties during the development of a system.

**Net present value:** The net present value is the difference between the present value of the benefits and the present value of the investment.

**Operational feasibility:** A measure of how well the solution will work in the organization. It is also a measure of how people feel about the system/project.

**Pay-back analysis:** The pay-back analysis technique is a simple and popular method for determining if and when an investment will pay for itself. It determines how much time will lapse before accrued benefits overtake accrued and continuing costs.

**Procurement phase:** Also called purchase, this phase relates to purchase of any required technology, including both hardware and software.
Return on Investment (ROI): Return on investment is the net benefit expressed as a percentage of the investment amount. The return on investment is calculated by dividing the net benefit by the investment amount. The return on investment helps the evaluators compare budget issues of different size or scope. A small investment in a small project or system can result in a greater return on investment than a large investment in a large project or system.

Schedule feasibility: A measure of the degree of reasonableness of the project timetable.

Selection phase: The selection phase represents a major feasibility analysis activity as it charts one of many possible implementations as the target for system design. During the selection phase, alternative solutions are defined in terms of their input/output methods, data storage methods, computer hardware and software requirements, process methods and people implications.

Study phase: The study phase identifies and analyses both the business and technical problem domains for specific problems, causes and effects.

Survey phase: Also called preliminary investigation or feasibility study. It is during this phase that the project context, scope, budget, staffing and schedule are established.

Systems benefits: Systems benefits are the tangible and intangible benefits provided by the system.

Technical feasibility: A measure of the practicality of a specific technical solution and the availability of technical resources and expertise.
Answer key for self-tests and activity

Self-test 8.1

1 Feasibility is a measure of how beneficial the development of an information system would be to an organization; while feasibility analysis is the process by which we measure feasibility.

2 The creeping commitment approach to feasibility means that feasibility should be measured throughout the systems development life cycle. Under this approach, a project is subject to continual evaluation and may be cancelled, revised or continued at various checkpoints in the life cycle.

3 Feasibility checkpoints should be installed because they identify specific times during the systems development life cycle when feasibility is re-evaluated. A project can be cancelled or revised in scope, schedule or budget at any of these checkpoints.

Self-test 8.2

1 When determining operational feasibility in the later stages of the development life cycle, usability analysis is often performed with a working prototype of a system to test the system’s user interfaces. Usability analysis measures how easy the interfaces are to learn and to use, and how they support the desired productivity levels of the users. It is related to the end-users’ feelings towards the solution to the system.

2 Although the emergence of state-of-the-art technology brings a lot of conveniences, some firms prefer to use mature and proven technology because mature technology has a larger customer base for obtaining advice concerning problems and improvements.

Self-test 8.3

1 A tangible benefit is different from an intangible benefit because it can be easily quantified, while the latter is difficult or impossible to quantify.

Tangible benefits can be expressed in terms of direct dollar values; for example, the benefit of future equipment or personnel cost avoidance.

Intangible benefits are more difficult to be quantified, but these benefits are often associated with information resource management issues. Examples of intangible benefits include: the effects of an improved service to the public, greater timeliness, improved accuracy, better control and security, productivity savings.

2 The time value of money is a concept which states that a dollar today is worth more than a dollar one year from now. For, if one invests a dollar
today, it will accrue interest and become more than a dollar. The same principle can be applied to costs and benefits before a cost-benefit analysis is performed. Some of the costs of a system will be accrued after system implementation and all the benefits of the new system will be accrued in the future. Because projects are often compared against other projects that have different lifetimes, it is important to bring back the costs and benefits to current dollars before doing the analysis.

3 Costs fall into two categories: development and operating. Development costs are one-time costs associated with analysis, design and implementation of the system. Operating costs may be fixed over time or variable with respect to system usage.

Self-test 8.4

1 A candidate systems matrix is used to document the similarities and differences between candidate systems; however, it offers no analysis. A feasibility analysis matrix analyses and ranks the candidate systems, based on the results of the candidate systems matrix.

2 Both the candidate systems matrix and the feasibility analysis matrix offer comparisons and analysis of the candidate systems so that a systems analyst can decide what and which functions are the best for the new system. The two matrices are useful for presenting the results of a feasibility analysis as part of a system proposal.

Activity 8.1

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Unit 8

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Figures 8.2 and 8.3.

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