Case

ORION Systems (A)*

The office erupted into cheers when it was announced over the PA system that ORION had just been awarded the government contract to build the next generation of high-speed, light-rail trains. Everyone came over to shake Mike Rosas's hand and congratulate him. It was well known that Rosas would be the project manager for this important project, which would be code named Jaguar. Once the celebration subsided, Rosas gazed out the window and thought about what he had just gotten himself into.

The Jaguar project would be a high-profile project that would affect procurement of future contracts with the government. Increased competition had raised performance expectations regarding completion time, quality, reliability, and cost. He knew that major changes in how ORION organized and managed projects would be necessary to meet the expectations of the Jaguar project.

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PROJECT MANAGEMENT AT ORION

ORION was a division of a large aerospace company with 7,000 employees. ORION evolved from a project organization into a matrix structure to conserve costs and better utilize limited resources. At any point in time, ORION could be working on three to five large projects such as the Jaguar project and 30 to 50 smaller projects. Project managers negotiated personnel assignments with the VP of operations, who ultimately decided project assignments. It was not uncommon for an engineer to be working on two to three projects during a week.

Figure C3.1 portrays how new-product development projects were organized at ORION. Project management was limited only to the design and development of the new product. Once the final design and prototype were completed, they were turned over to manufacturing for production and delivery to the customer. A four-person management team oversaw the completion of the project and their responsibilities are briefly described here:

- *Project manager*—responsible for all aspects of design and development of the product.
- *Planning and control manager*—responsible for building an overall project network, scheduling, managing the budget, controlling and evaluating the design and development program, and preparing status reports.
- *Electronics system engineer*—responsible for providing technical expertise on electronic systems issues.
- *Mechanics system engineer*—responsible for providing technical expertise on mechanical system issues.

The core work was completed by 12 to 20 design teams. Each team had a leader, who was responsible for designing, developing, building, and testing a specific

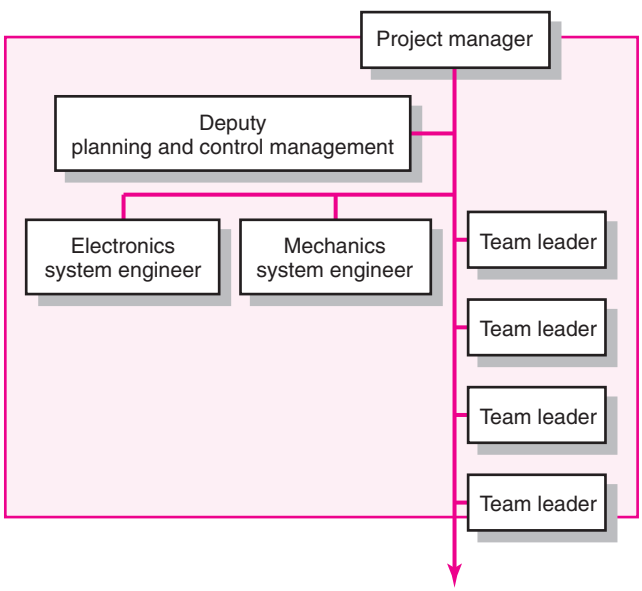
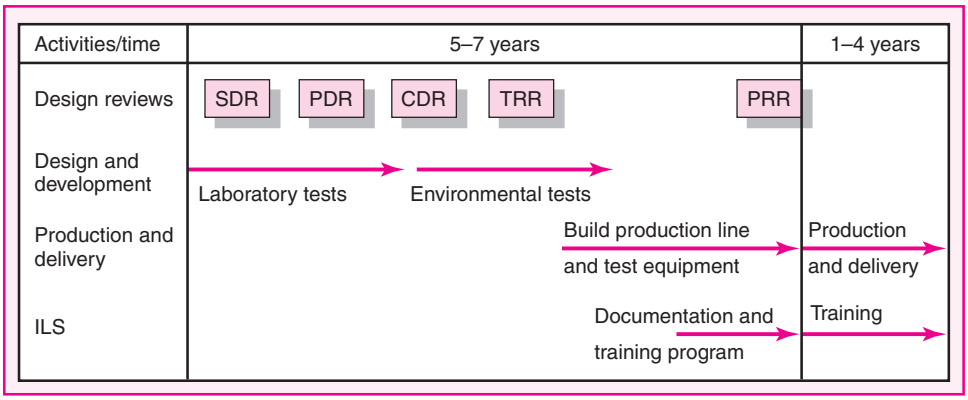


FIGURE C3.1
Organization of Product Development Projects at ORION

FIGURE C3.2
Traditional Master Plan at ORION



subsystem of the product. The size of individual teams varied from 5 to 15 engineers, depending on the scope of their work. These engineers split time across multiple projects.

Design engineers ran the show at ORION, and manufacturing, marketing, and other groups were expected to follow their lead. The special status of the design engineers was reinforced by the fact that they were actually paid on higher pay curves than the manufacturing engineers.

The overall product development and manufacturing process is captured in the master plan chart (Figure C3.2). New-product design and development evolves around five major reviews: system design review (SDR), preliminary design review (PDR), critical design review (CDR), test readiness review (TRR), and production readiness review (PRR).

Design and development work begins within the laboratory and progresses to field tests of specific subsystems and ultimately final product prototypes. Once completed, the design and prototype are turned over to manufacturing, which begins building the production line for the new product. Manufacturing also develops the necessary test equipment to confirm that manufactured components perform correctly. During this time, integrated logistical support (ILS) teams prepare product documentation, users' manuals, maintenance programs, and training programs for the customers who will be using the product. It typically takes ORION six to seven years to develop and manufacture a product such as the Jaguar.

ORION just completed a major assessment of how projects are managed. Below is a brief description of some of the major problems that were identified:

- *Higher than expected production costs.* Once products were developed, there was a tendency for them to be "thrown over the wall" to manufacturing to produce. Very little design for manufacturability was done, and the production ramp was complicated, inefficient, and stressful to the people in the plant.
- *Quality concerns.* Increased competition had raised customer expectations with regard to quality. Customers expected fewer defects and longer replacement schedules. ORION had a tendency to deal with quality issues after the fact, initiating quality improvements after the production process was set up. Not enough attention was devoted to incorporating quality considerations into the original design of products.

- *Problems with customer support.* User manuals and technical documentation sometimes failed to address all of a customer's concerns, and the follow-up training was not always adequately prepared. These problems contributed to increased costs in customer service and a decline in customer satisfaction.
- *Lack of strong project ownership.* While everyone accepted that a matrix arrangement was the only way to accommodate all the projects at ORION, the shifting back and forth of personnel across multiple projects took its toll on the progress of individual projects. Members often failed to identify with individual projects and develop the sense of excitement that contributed to superior performance. The shuffling of personnel slowed down progress because additional time had to be devoted to bringing returning members up to speed on current developments.
- *Scope creep.* ORION was renowned for its engineering prowess. However, there was a tendency for design engineers to get so absorbed with the science of the project that they lost focus on the practical considerations. This led to costly delays and sometimes design modifications that were inconsistent with customer requirements.

Rosas was aware of these and other concerns as he sat down with his staff to figure out the best way to organize the new Jaguar project.

1. What recommendations would you make to Rosas about organizing the Jaguar project, and why?
2. How would you change the organizational chart and master plan to reflect these changes?

Case

ORION Systems (B)

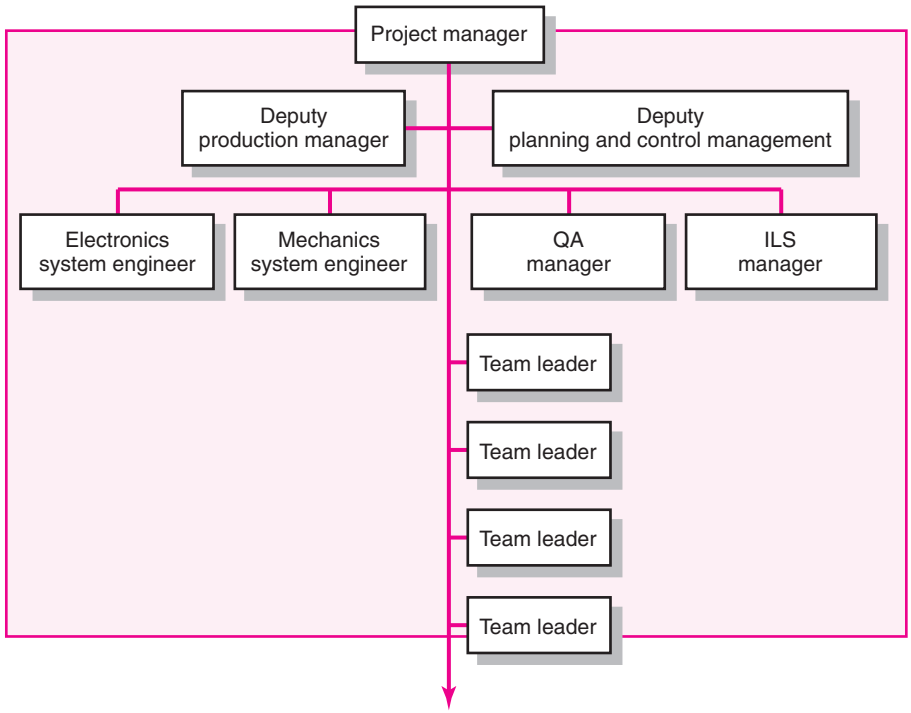
ROSAS'S PLAN

Rosas and his staff worked hard over the past week to develop a plan to establish a new standard for completing projects at ORION. The Jaguar project management team will be expanded to seven managers, who will be responsible for overseeing the completion of the project from design to delivery to the customer. A brief description of the responsibilities for the three new positions follows (see Figure C3.3):

- *Production manager*—responsible for raising production issues during the design phase; responsible for building and managing the production line.
- *ILS (integrated logistical support) manager*—responsible for all activities that require project/customer support after delivery including customer training, documentation, and equipment testing.
- *QA (quality assurance) manager*—responsible for implementing a quality program that will enhance the reliability, availability, and maintainability of the product.

These seven managers (the three just described plus the four discussed in Part A) will coordinate the completion of the project and see that their respective

FIGURE C3.3
Proposed Project Organization for the Jaguar Project



disciplines are factored into all major decisions. Rosas, as project manager, will work toward achieving consensus, but he will have the authority to intervene and make decisions if necessary.

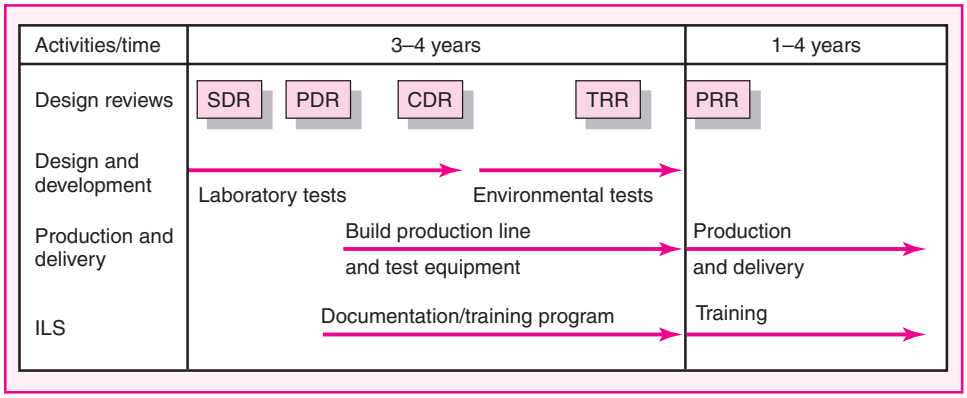
The core work will be completed by 35 teams. Each team will have a "leader," who will be responsible for designing, developing, building, and testing a specific subsystem of the project. They will also be responsible for the quality and productivity of the subsystems and for doing the work on time and within budget.

Individual teams will consist of 5 to 12 members, and Rosas insists that at least half of each team be assigned to work full time on the project. This will help ensure continuity and enhance commitment to the project.

The second key feature to the plan is the development of the overall master plan for the project. This involves abandoning the traditional sequential approach to product development and adopting a concurrent engineering approach to the project (see Figure C3.4).

Once the system design is reviewed and approved, different teams will begin working within the laboratory to design, develop, and test specific subsystems and components. Soon after this has begun the ILS team will start gathering information and preparing product documentation. Once the PDR is completed, the production teams will begin designing the necessary production lines. The CDR will include not only resolution of major technical questions but also a plan for manufacturing. Once the CDR is completed, project teams will begin field tests under a variety of different environmental conditions according to government specifications. Subsequent design refinements will be closely coordinated with manufacturing and ILS teams so that, ideally, ORION will be ready to begin producing the Jaguar upon completion of the PRR.

FIGURE C3.4
Jaguar Master Plan



Rosas believes that the phasing of the production and documentation work alongside the core development work will accelerate project completion, reduce production costs, and contribute to customer satisfaction.

1. What are the major changes between this plan and the way ORION has managed projects in the past?
2. How well do you believe these changes deal with the problems identified in Part A?
3. Who is likely to support this plan? Who is not likely to support this plan?