

# TRIOLE: IT Industrialization Is Here and It Works

● Ryuichi Tanaka

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To expand their business, customers need information technology (IT) that offers agility, continuity, and efficiency. Unfortunately, IT has until now been unable to simultaneously offer all three. A legacy system that has been operated for more than 10 years may be highly stable but is very expensive to modify. Open systems, on the other hand, are easy to modify and easy to use with the latest technologies. However, it is difficult to develop and operate a stable open system because customers can choose various hardware equipment, OSs, middleware products, and application packages in an open environment. The Japanese manufacturing industry today relies on industrialized processes that make it possible to manufacture products efficiently and reliably while at the same time achieve the continuous improvements that help to distinguish Japanese products from others in the global marketplace. With TRIOLE, to provide consistently standardized functions and performance, Fujitsu has applied this sort of industrialization process to IT. This paper describes how TRIOLE achieves efficient, reliable, and secure construction and operation of IT infrastructures and business applications.

## 1. Introduction

In 2002, TRIOLE indicated that the future of information technology (IT) was in the direction of integration, virtualization, and automation. In 2003, Fujitsu began to offer TRIOLE Template, which makes it possible to construct IT infrastructures efficiently, reliably, and securely.

In 2004, the Fujitsu Group made TRIOLE globally available as a common basis for responding to customers' needs for greater business agility, continuity, and efficiency.

In 2006, Fujitsu announced an industrialized IT process designed to achieve efficiency, reliability, and security over the entire life-cycle of an IT system. **Figure 1** shows the TRIOLE roadmap.

This paper describes some further developments in TRIOLE and its future direction.

## 2. Expansion of the role of IT systems

In the 21<sup>st</sup> century, the spread of the Internet and ubiquitous IT will lower barriers such as national borders, distance, time, and language, allowing dynamic changes to sweep the globe, and it is said that these changes will make it difficult to predict social and business activities. At the same time, governments, local authorities, and corporations are becoming strongly aware of their responsibilities to their various stakeholders, and as a result compliance issues are becoming a top priority.

Fujitsu understands that the role of IT is to provide prompt responses and to visualize these changes. Fujitsu has been and will be working to optimize the utilization of IT in the construction and operation of customer systems. **Figure 2** shows how an IT system supports a customer's

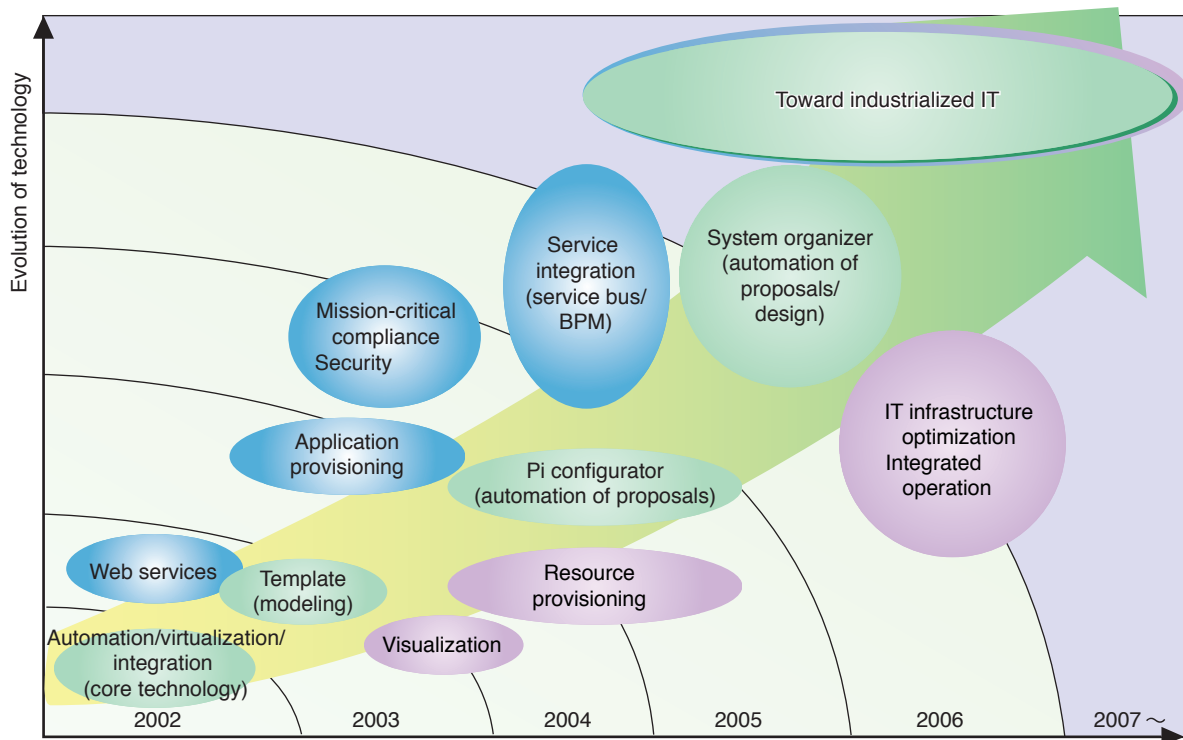


Figure 1  
TRIOLE roadmap.

business.

In order to survive in business, an organization's IT system must have the following three characteristics:

- 1) **Agility:** The ability to appropriately change, expand, or contract according to the speed and timescale demanded by the market
- 2) **Continuity:** The strength, sturdiness, and flexibility needed for business to continue under any conditions without enormous maintenance outlays
- 3) **Efficiency:** The ability to rapidly process information at minimal cost

Until now, it has been unusual for IT systems to simultaneously meet all three of these needs. A large-scale system can be designed to be highly stable, but the large amount of time needed for its design and construction means that the system takes a long time to modify. On the other hand, Web-based systems that can be quickly developed are agile enough for new functions

to be added, but they tend to be less operable, scalable, and robust. In fact, such systems were the cause of many of the difficulties experienced by new businesses at the beginning of the Internet era.

Another major issue in the 21<sup>st</sup> century is how to continue using the enormous system assets created in the last century. In the same way that railway systems and road networks continue to use the assets built up over decades while advancing with the latest technology, the time has come to create industrialized IT platforms for IT systems. In this era, IT systems must:

- 1) Be composed of standardized forms and functions
- 2) Be highly reusable
- 3) Have a short implementation time
- 4) Support easy and efficient maintenance
- 5) Have the flexibility to be changed and expanded.

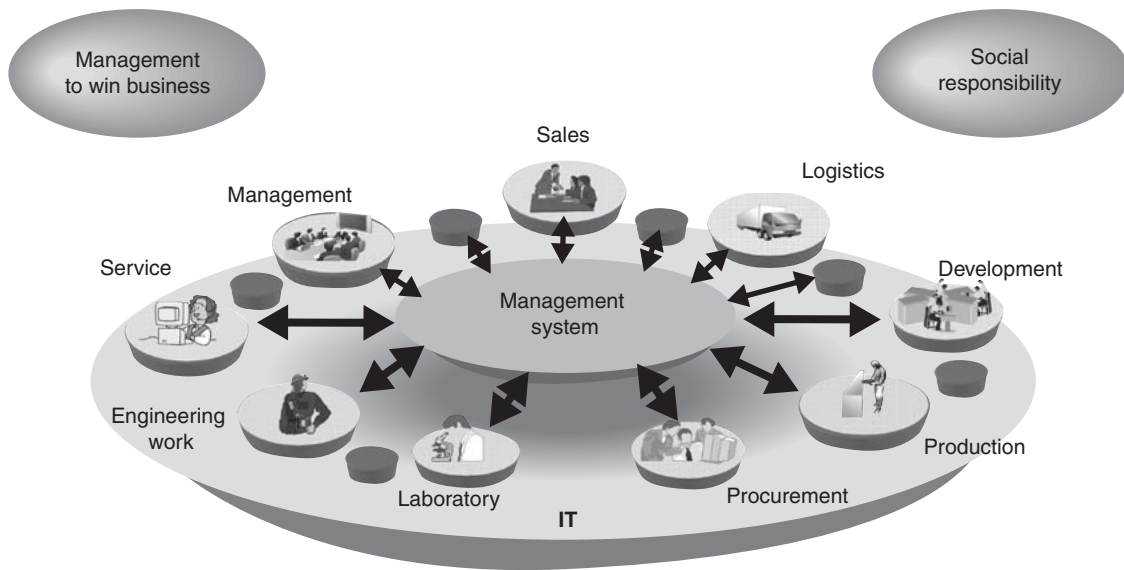


Figure 2  
How an IT system supports a customer's business.

### 3. Industrialized IT

Fujitsu has already provided TRIOLE Templates as building blocks and made much of the quality and reusability of IT infrastructures. **Figure 3** shows the TRIOLE building-block approach.

Since 2006, Fujitsu has been meeting the challenge of industrialized IT based on innovation and continuous improvements of the construction and operation process. Our main goals in this area are:

- 1) Joint achievement of value, quality, and efficiency
- 2) Promotion of reuse and standardization
- 3) Visualization of processes and costs
- 4) Joint achievement of human resource development and freedom of personnel rotation (lean organization structure)

From the proposal stage, Fujitsu works with customers to continually refine their systems in line with their needs, of which the needs for internal controls and compliance are particularly strong. By following the Fujitsu process for reaching agreements with customers, we can assure customers that we:

- 1) Keep our promises regarding time and cost

- 2) Deliver results that meet the customers' needs both now and in the future
- 3) Provide adaptability to changing business conditions
- 4) Measure and visualize the above commitments using fair and standard criteria

Generally speaking, customers' budgets are not enormous, so we always propose the best solutions in consideration of the customers' budget constraints. Moreover, we clearly identify what is possible and what is impossible and also what expansions can be accommodated in the future.

### 4. Layers of customers' business systems

Customers' business systems are composed of two layers: the business application layer and the IT infrastructure layer. In open environments, these two layers have been tightly combined into one system because open systems have been suited to rapidly changing business applications and were frequently reconfigured in the 1990s.

However, since 2000, as open systems have come to be used for mission-critical applications in the social and business spheres, there has

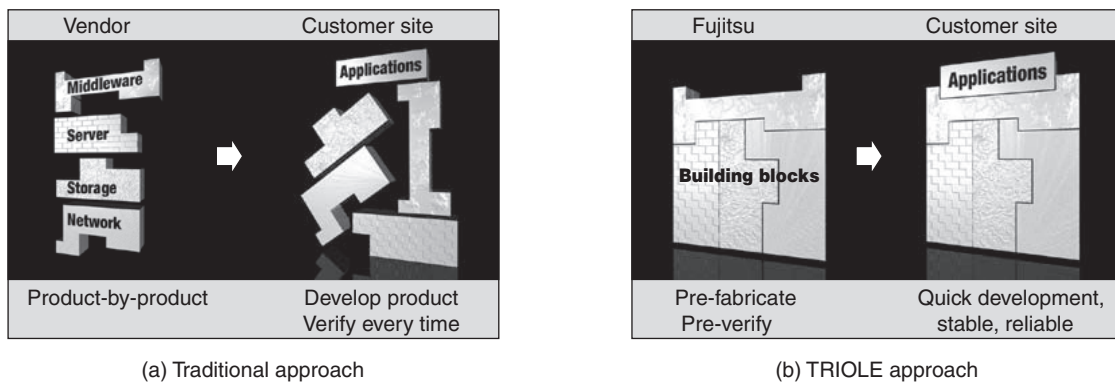


Figure 3  
TRIOLE approach based on building blocks.

been a growing need for such systems to support long-term operation. For example, the business systems used for accounting in a bank or for inventory control in a manufacturing company must be capable of being used continuously for at least 10 years. However, at the same time, the IT infrastructures of these enterprises have changed dramatically every three to five years in order to adopt the latest technology. This difference in the life-cycles of business applications and IT infrastructure has been a major problem.

In order to ensure that customers' business systems can be constructed and operated in open environments while minimizing the effects of this life-cycle difference, Fujitsu has developed a two-layer approach in which systems are built around middleware (**Figure 4**).

1) Business applications

From the mid-1990s, programming languages that are component oriented and independent of the hardware architecture, for example Java and C#, have become popular. In addition, because Web services and other mechanisms for communicating messages between application programs are becoming standardized, communication between different systems is becoming much easier.

In the future, business applications will be capable of long-term use and flexible linkages because they will be compliant with standards such as Service Oriented Architecture (SOA).

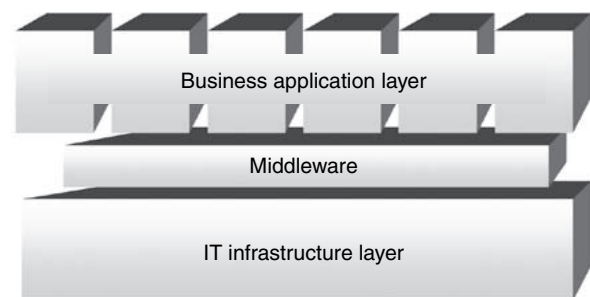


Figure 4  
Fujitsu's two-layer approach to building systems.

2) IT infrastructure

At the same time, because of CPU advances, IT infrastructure is proceeding in the direction of achieving the following:

- The reliability to generalize redundant technology and provisioning using blade servers because of falling CPU costs
- The flexibility to separate a single CPU into several virtual CPUs, making it possible to integrate operations that previously required several servers into a single server with a higher CPU speed.

3) Middleware

An important function of middleware is the ability to absorb life-cycle differences between business applications and IT infrastructure. This function has been provided by Fujitsu middleware such as Interstage and Systemwalker. By using this middleware, customers can:

- Ensure long-term use and compatibility of their business applications through standardized application interfaces
- Use the latest hardware and OS functions to achieve cutting-edge reliability and flexibility in their IT infrastructure.

Because this middleware responds rapidly to support changes in IT infrastructure, it allows business applications to be operated optimally in line with these changes.

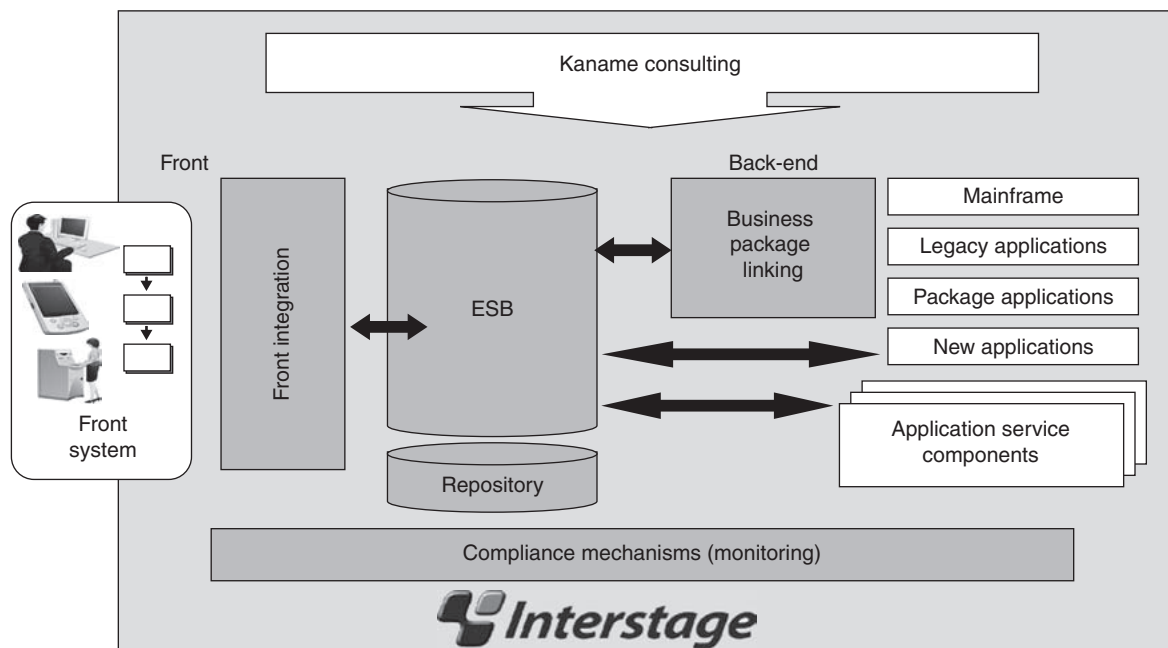
## 5. Business application integration

These days, business application development is shifting from creating new business applications to finding ways of using and linking existing applications. By using Kaname Analysis,<sup>1)</sup> which is a method of diagnosing and designing improvements to existing business processes, and by using middleware to integrate existing applications, Fujitsu has realized a

method of business application integration based on SOA and the strategic middleware Interstage.

**Figure 5** shows an overview of this method, the main components of which are as follows:

- 1) Kaname: A method of analyzing the core elements of existing business applications and improving the integration process
- 2) SOA platform: Provides basic mechanisms such as an Enterprise Service Bus (ESB) and Repository as a highly extensible and reliable platform
- 3) Compliance mechanisms: Enable visualization of businesses through functions such as monitoring, collection of data and statistics with regard to usage status, reporting, and billing
- 4) Application service components: Components based on SOA that provide business application services that free users from the burdens of construction and operation
- 5) Business package links: SOA-based linking



ESB: Enterprise Service Bus

Figure 5  
Business application integration.

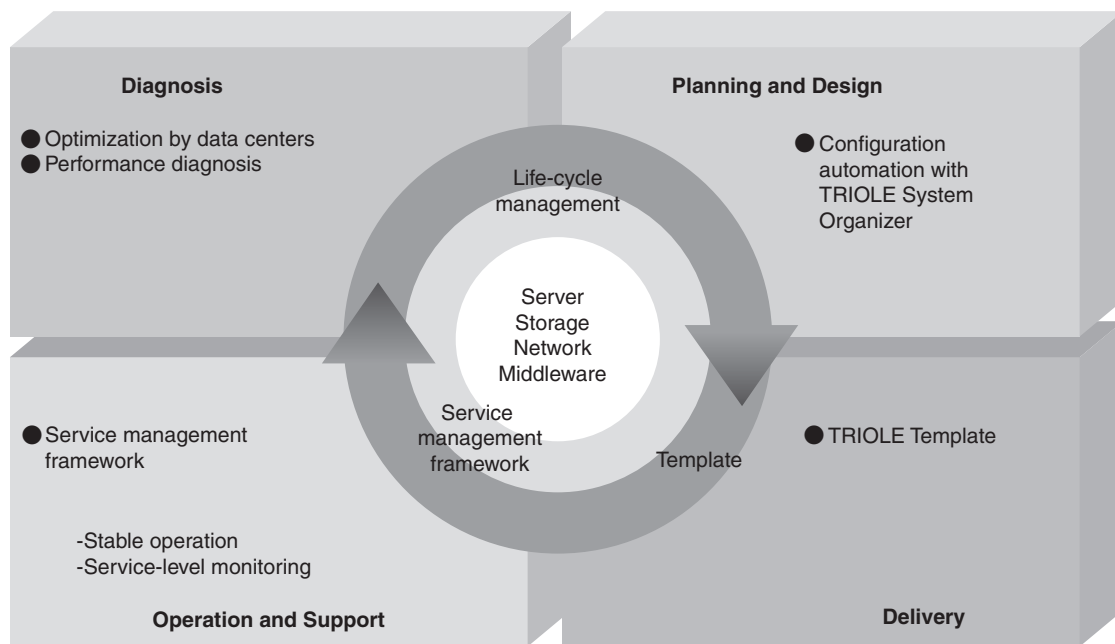


Figure 6  
IT Infrastructure life-cycle.

mechanisms for handling legacy applications and partner business packages as application service components

## 6. Life-cycle management of IT infrastructures

Fujitsu has been and will be working to model IT infrastructures through TRIOLE Template. At first, Fujitsu's primary objective was more efficient construction, but now we are broadening our perspective to include life-cycle management — from evaluating operation, maintenance, and IT infrastructure in terms of optimization to creating improvement plans. **Figure 6** shows the TRIOLE model of the IT infrastructure life-cycle. The model breaks the life-cycle into the following stages

1) **Planning and Design:** Fujitsu's TRIOLE System Organizer simplifies design using TRIOLE Template. TRIOLE System Organizer is being upgraded to ensure efficient, secure, and reliable operation and also to assist in the planning of improvements to

IT infrastructure based on diagnosis and evaluation.

- 2) **Delivery:** To further improve the efficient delivery achieved through the use of TRIOLE Template, Fujitsu makes it possible for TRIOLE Template to be linked with a configuration management database (CMDB) to share system management information between the operation and support stages and also offers on-site construction by a dedicated team and Build to Order (BTO) in a factory.
- 3) **Operation and Support:** Fujitsu achieves efficiency, reliability, and security through operation designs based on TRIOLE Template. The change history and information about operating issues are collected in conjunction with a CMDB.
- 4) **Diagnosis:** Fujitsu evaluates IT infrastructure from the standpoint of operation and performs diagnoses for the purpose of improvement.

A customer's business system is meaningful

only when it is operated optimally. Fujitsu provides managed services for managing not only IT infrastructures but also business applications.

These services control processes based on ITIL and are composed of operational elements such as incident, problem, change, release, and configuration management. Systemwalker is a strategic middleware for managed services.

## 7. Conclusion

Fujitsu is pursuing the industrialization of IT based on TRIOLE as a means of helping customers use IT systems to meet their business challenges. Fujitsu uses IT industrialization

to construct systems that make the most of the life-cycle characteristics of both IT infrastructures and business applications and provides managed services that achieve efficiency, reliability, and security.

In addition, Fujitsu is continuing to develop TRIOLE so as to optimize the business processes of its customers.

## Reference

- 1) I. Morita: Toward Realization of Service-Oriented Architecture (SOA). *FUJITSU Sci. Tech. J.*, **42**, 3, p.306-315 (2006).



**Ryuichi Tanaka**, *Fujitsu Ltd.*

Mr. Tanaka received the B.S. and M.S. degrees in Mechanical Engineering from Waseda University, Tokyo, Japan in 1974 and 1976, respectively. He joined Fujitsu Ltd., Tokyo, Japan in 1976, where he has been engaged in development of basic software products.