New Integrated System Established with the Merger of JFE Steel†

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Abstract:

New integrated system called J-Smile (which stands for JFE Strategic Modernization & Innovation Leading System) has started up as originally planned, and resulted in a virtually trouble-free startup, although its development had a lot of challenging factors and was in a big scale. J-Smile targeted the basic concept, "Integration & Innovation." The authors will report the overview of a new integrated system from the following viewpoints. (1) Basic concept, (2) Features of a new integrated system, (3) Risk management of the project.

1. Introduction

Because system integration is a key issue for a successful merger, a system integration preparation team was created and began studying the optimal form of system integration prior to the actual merger. The basic plan decided by the team called for "a method of parallel use of the systems of the former NKK and former Kawasaki Steel (hereinafter, "former companies") as a bridge immediately after the merger" and "complete system integration within 3 years after the merger."

Based on this basic policy, a System Integration Project was launched simultaneously with the merger in April 2003, and full-scale development of the new system began. The new integrated system is called J-Smile, which is an abbreviation for JFE Strategic Modernization & Innovation Leading System.

This project rejected the idea of constructing a new system based on one former company's system as the backbone system. Rather, the goal was to redesign and integrate the business process, management indexes, and data, and to construct an entirely new system based on "Integration & Innovation" by simultaneously incorporating innovation in the system.

2. Basic Development Concepts and System Scheme

2.1 Basis Concepts

In J-Smile, the objectives were to construct a management information infrastructure and business operation infrastructure aiming at "maximizing utilization of management resources and improving customer satisfaction."

The basic concepts were the following two points:

(1) Integration and innovation in the business process and management

(2) Realization of a system capable of quick and flexible response to changes

In particular, priority was placed on continuing innovation in which the business process and management are unified with the system.

2.2 System Scheme and Development Schedule

Figure 1 shows the transition of the system as a whole. Together with the transition from two parallel systems to a single system, applications in the four fields of "Management Control," "Personnel," "Purchasing," and "Sales, Production, and Distribution" are supported by "IT infrastructure," and integrated information sharing is achieved by a newly constructed "corporate database."

As it was necessary to integrate the new personnel

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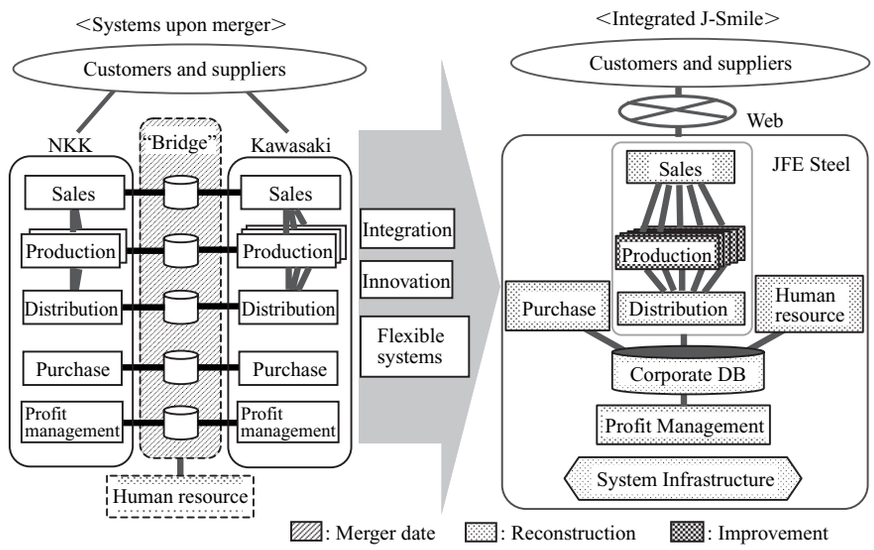

Fig. 1 Scheme of new system

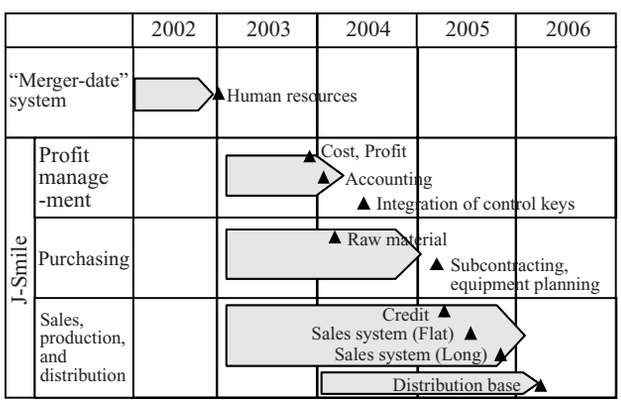

Fig. 2 Chronology of system start up

system simultaneously with the merger, the personnel system was developed in advance and put into operation at the time of the merger.

The remaining three fields were implemented collectively in the J-Smile Project. In the initial stage of the project, development began by designing the frameworks of the three fields as a whole from the viewpoint of management information. The "Management Control" field was started up at the end of the first year, as this function is linked directly to management decision-making, followed by "Purchasing" at the end of the second year and "Sales, Purchasing, and Distribution," which is the largest field, at the end of the third year (**Fig. 2**).

2.3 System Scale

The completed J-Smile system has a program scale of approximately 20 million steps in the newly-constructed Head Office region alone. As a distinctive feature of order information at JFE Steel, customer requirement specifications are detailed and include an extremely large number of items. The number of defined data items is approximately 90 000, and the data volume reaches 10 terabytes. How to cope with this large scale and data complexity became a key point in this project.

3. Features of J-Smile

3.1 Sales, Production, and Distribution Field

This field comprises the three blocks "Sales," "Production," and "Distribution" and is the core of JFE Steel's steel business. The Head Office "Sales" and "Distribution" blocks were completely reconstructed and integrated, while the steel works "Production" block was limited to the level of improvement from the viewpoint of integration of sales, production, and distribution. In the business aspect, J-Smile has the following two features.

(1) Integration of the Business Process and Data

The enormous data assets inherited from the two former companies were integrated. However, because data from the former companies was necessarily retained in the production control systems in the steel works, a data conversion process which assures currency in the steel works was designed and incorporated in the sales system.

(2) Business Process Innovation to Strengthen competitiveness

Innovation elements, including improvement of customer satisfaction, innovation in internal work, higher efficiency in logistics, and others, were incorporated in the integrated business process. The following four items were the main innovations.

(i) Reconstruction of sales system model

Priority was given to customer contact information, and the conventional order work-processing

model was reviewed and replaced with a 3-level model comprising discussions, specifications, and orders.

(ii) Linkage with supply chain information

Linkage with customer information was strengthened, and the capability to respond quickly and flexibly to changing supply-and-demand conditions and capability to control customer requirement specifications were improved.

(iii) Flexibility in mill operation

Restrictions on mill operation were relaxed, and a mill load simulation function was constructed to support company-wide optimum mill operation.

(iv) Shortening of production planning cycle

The conventional weekly production planning in the steel works was shortened to daily planning, improving the company's capability to respond to supply-and-demand changes and operational changes.

3.2 Management Control and Purchasing Fields

In the Management Control field, the different cost information structures used by the two former companies were unified, and new profit control keys which make it possible to grasp profitability information by product were created. This makes it possible to understand profitability in the mesh necessary for management, for example, by works, district, mill, product type, etc. Early account settlement was also realized so that information can be displayed more speedily.

In the Purchasing field, the good points of the work methods at the two former companies were incorporated in the new work system. In this field, improved overall work efficiency and improved work speed were realized by contacting business counterparts over the web, effectively utilizing the advantages of constructing an all-web system. As a result, order issuance work which formerly required 2–3 days is now completed on the same day in virtually all cases.

3.3 IT Infrastructure

IT infrastructure plays a large role in realizing a short implementation period for a "system capable of responding quickly and flexibly to changes." Therefore, the conventional IT infrastructure was evaluated and the following IT implementation policies were adopted based on a cool-headed in-depth analysis of recent trends in IT.

(1) Full Application of Open System Technology to a Large-scale Backbone System

With the aim of expanding network-based business, an all-web system was adopted in order to enhance real-time performance and convenience. Java applications conforming to standards were adopted with the aim of avoiding hardware-related restrictions. To enable sharing of Java assets, application of Java was expanded as far as batch processing.

Program structures were completely standardized, and assembly-type development using frameworks and program components was adopted in order to improve quality and development productivity.

(2) Integrated Data-centered Design

Focusing on the fact that data tend not to change, even when business changes, data and the linkages between data were modeled, aiming at a data structure with stability against changes. System engineers working in concert with staff responsible for practical business created a conceptual data model[1] from the viewpoint of total optimization, and this was linked to theoretical and physical database design.

A system structure in which changes in application requirements do not affect databases was realized by separating the business logic and data access.

To give concrete form to these policies, the IT infrastructure was implemented by an Infrastructure Team in a form that preceded application system development. In the system development stage, unified development and control of frameworks and data access parts was carried out by the Infrastructure Team, and the application group was strongly controlled to ensure that the concepts of data models, component assembly-type development, and related items were observed.

4. Risk Management in the Development Project

4.1 Main Risk Factors and Related Measures

Because this project involved a large-scale system, it also contained numerous potential risk factors. The measures taken for the principal risk factors identified in the project as a whole are as enumerated below:

(1) Development Organization
- Early integration of human resources by exchanges of core members in the Preparation Team
- Securing of full time work staff and 800 SEs

(2) Development Scale
- Minimization of steel works system improvement by data assurance
- Construction of an "existing new existing" data conversion verification system

(3) Transition Design
- Shortening of downtime for changeover by adopting a phased transition method (i.e. step-by-step transition), and prevention of critical problems

(4) Development Methodology
- Control of the design, implementation, and test stages by the Infrastructure Team

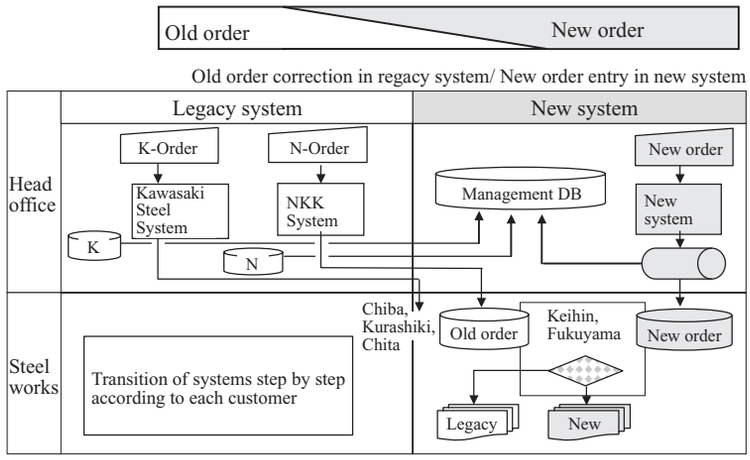

Fig. 3 Phased transition (step-by-step transition)

・Observance of the total conceptual data model

(5) Training

・Thoroughgoing training for future system users (Total of 650 courses for 9 000 employees)

The largest risk in the project was the transition design. Because a system stop would result directly in a production stop, a transition design which would not affect production lines was indispensable. This included minimizing downtime for changeovers, minimizing the risk of critical trouble, and the like.

4.2 Risk Control during Transition

If a "total changeover" is executed by completely shutting down the old system and then starting up the new system after the data in the old system have been transferred to the new system, an enormous transition system and a backup system in case of serious trouble become necessary. In order to lessen the risk of this kind of "total changeover," the aim in the design of the J-Smile architecture, from the basic design stage, was to enable a "phased transition."

Figure 3 shows a conceptual diagram of the "phased transition." The old and new systems were operated in parallel, and it was possible to input orders to either of these systems.

The first point in the design of this method was to enable the steel works production control systems to process both old and new orders. This problem was solved by implementing a new process which converts new order items to old order items in the Head Office system. For the relatively few items which could not be converted, new items were incorporated in the steel works production control systems by revamping those systems.

The second point was judgment of sales management data by the new and old systems, which were operating in parallel. This was solved by constructing a new integrated management database which converts old order items to new order items.

Adoption of this transition method enabled a "distributed risk" type phased startup by switching successively to new orders by product line, product distribution channel, and region based on system functions/data accuracy verifiability and judgment of the level of new work learning.

5. Conclusion

A system development project involving a high degree of difficulty was completed, simultaneously realizing "Integration" and "Innovation." This system has created a new management information infrastructure for JFE Steel, improved management speed, reduced lead times, enabled optimal mill operation, and streamlined work. The completion of the system is the starting point for future innovations. In the future, JFE Steel will continue to expand its IT innovation activities and enhance customer satisfaction.

References

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