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Abstract
We present a framework for evaluating the impact of IT-enabled radical process change on business outcomes at Japan Airlines. The framework presents a systemic view of factors that are shown to impact the firm's business outcomes. The framework identifies salient global environmental factors and business challenges the firm faces, strategic responses it makes, and management methodologies and strategic IT systems adopted to enable the firm's changes in business processes. We then discuss the radical transformation of the traditional keiretsu-based value chain at Japan Airlines, the world's third largest airline company. We apply the framework to evaluate the impact of the new information-based virtual value chain enabled by its interorganizational systems (IOS), particularly AXESS computer reservation systems (CRS) and proprietary Electronic Data Interchange (EDI), on the airlines business outcomes, which include improved customer service, increased competitiveness in a fiercely competitive market, and increased coordination and synergy with the physical value chain.

Introduction
Since the early days of computerization there has been a significant interest in 'the impact of computers on organizational structure' [e.g. 13], 'the interaction of IT and organizations' [11], 'the alignment of organizational infrastructure and IT strategy' [16], the 'organizational metamorphosis in Oticon' [3], or 'contradictory Organizational Consequences of Information Technology' [22].

To a large extent, however, the focus has been on the intra-organizational issues in the individual organization. The outside world has been treated like an exogenous given variable not to be changed or tampered with. Notable exceptions focusing on the inter-organizational issues are publications like (a) 'IT in the 1990s: Managing Organizational Interdependence'[23], which is one of the first articles where Inter-Organizational Systems (IOS) was discussed, (b) 'The IT Induced Business Reconfiguration' [24], where IOS are explicitly seen as a significant enabler (Business Network Redesign), and (c) 'The Role of IT in Organizational Design' [15] where different types of new organizational forms including virtual, negotiated, and vertically integrated conglomerates in different ways explicitly are using IT in organizational transformation.

There is growing consensus that IOS will have significant impact on value chain management as well as on the relationships within the value chain [4, 12,19]. Yet, it is not clear how an IOS impacts the

core firm's cooperative efforts with the network of firms in the value chain. Furthermore, relatively little is known whether the IOS-enabled transformation of the inter-organizational value chain actually increases the core firm's business outcomes. The purpose of this paper is to elucidate how IOS can be utilized in conjunction with management methodologies such as Quality Circle (QC)/Total Quality Management (TQM), business process reengineering (BPR) and organizational learning to effect organizational transformation, in order to evaluate the impact of IT-enabled process changes on the core firm's business outcomes.

The paper will apply a framework for the role of IT in enabling organizational transformation for the 21st century [2] to analyze the radical transformation of Japan Airlines (JAL). JAL, the world's third largest airlines, was radically transformed after the privatization in 1987. Its strategic use of IT, particularly AXESS Computer Reservation Systems (CRS) and Electronic Data Interchange (EDI), radically transformed its traditional keiretsu-based value chains into an information-based virtual value chains, which made nonlinear information exchange and sharing between JAL and the value chains much more efficient and effective in creating and extracting value from the relationships.

JAL Company Background

Since 1953, under the Japan Air Lines Company Limited Law ("the JAL Law"), JAL was granted a special corporate status to operate international air services as the Japanese flag carrier. The company, as a semi-private corporation, had the Japanese government as its largest stockholder. Its normal operations received detailed scrutiny from government, ranging from the Transport Minister's approval required to increase capital, issue bonds or take out long-term loans to the operational guidelines suggesting what food could be served to first class passengers.

With the Japanese government's long-held protectionism policy, it was not too difficult for JAL to become complacent and non-competitive in customer service and cost structure. The company viewed its mission as a provider of air transport for passengers and cargo, rather than a provider of customer service. Given its mission, it was hardly surprising that the company was not customer oriented. The company's customer service vis-à-vis that of domestic competitors was rated as bureaucratic and unfriendly among the domestic travelers surveyed in 1986 [25]. On the other hand, JAL sustained its position as a market leader in engineering, safety standards and information technology. JAL attracted high quality university graduates who were trained in engineering, computer sciences, operations research, economics, and finance at Japan's best universities because of its prestigious status as the Japanese flag carrier.

To a large extent, as a result of competitive pressure from the US airlines, in November 1987, JAL was completely privatized with the abolishment of the JAL Law and the sale of the entire stocks held by the government. Privatization provided JAL with not only the capitalization it needed but also an opportunity to reassess the way they had done business under the government's regulation and protection for the past 34 years.

Over and above the airline itself (JAL) there is a large pool of companies in what is commonly referred to as the "JAL Group", which is a critical source of value as JAL's value chain. The JAL Group includes over 130 companies in which JAL directly or indirectly owns an average equity interest of 20%. It comprises two subgroups: firms closely linked to the air transport industry, and firms outside the industry. The first group includes management and marketing of package tours, ground handling, in-flight meal services, aircraft maintenance and fueling services, while the second includes hotels, information technology and communications services, trading companies and cultural enterprises.

Table 1 shows a comparison of JAL's business operations today vis-à-vis the year when the company was privatized. Despite the increasingly fierce competition in the international and domestic markets, JAL's core business, passenger air transport, has grown in size. The number of domestic passengers JAL carried, approximately 19.4 million in 1995, shows a significant increase 106.7% from 9.37 million in 1987. Similarly, the number of revenues from domestic and international passengers international passengers carried increased to 10.87 million in 1995, which is also a very large increase 76.2% from 6.17 million in 1987. As a result, JAL registered a substantial increase in 1995 by 35.1% over 1987. Today JAL is the world's third largest airline company behind the two US carriers based on revenues [7].

Revenue passenger-load factor is a measure of operating efficiency used in the aviation industry. Given certain fixed costs, such as flying operations costs and maintenance costs, it shows, on average, how efficiently the company manages "yields" form its available airline seats. In other words, it shows how full or empty the company's aircraft tend to fly on scheduled domestic or international routes. Domestic revenue passenger-load factor shows that JAL increased operating efficiency 3.8% in 1995 over 1987 on its domestic routes. This business outcome shows a significant improvement since the deregulation of the domesticmarket intensified the competition among three largest air carriers in Japan. In contrast, international revenue passenger-load factor shows that JAL sustained approximately the same level of operating efficiency on its international routes over the period. This business outcome is also significant given the intensified competition from foreign carriers such as the two US airline companies which earlier leveraged CRS as well as smaller Asian airlines.

Table 1. Business Growth
Millions of Yen

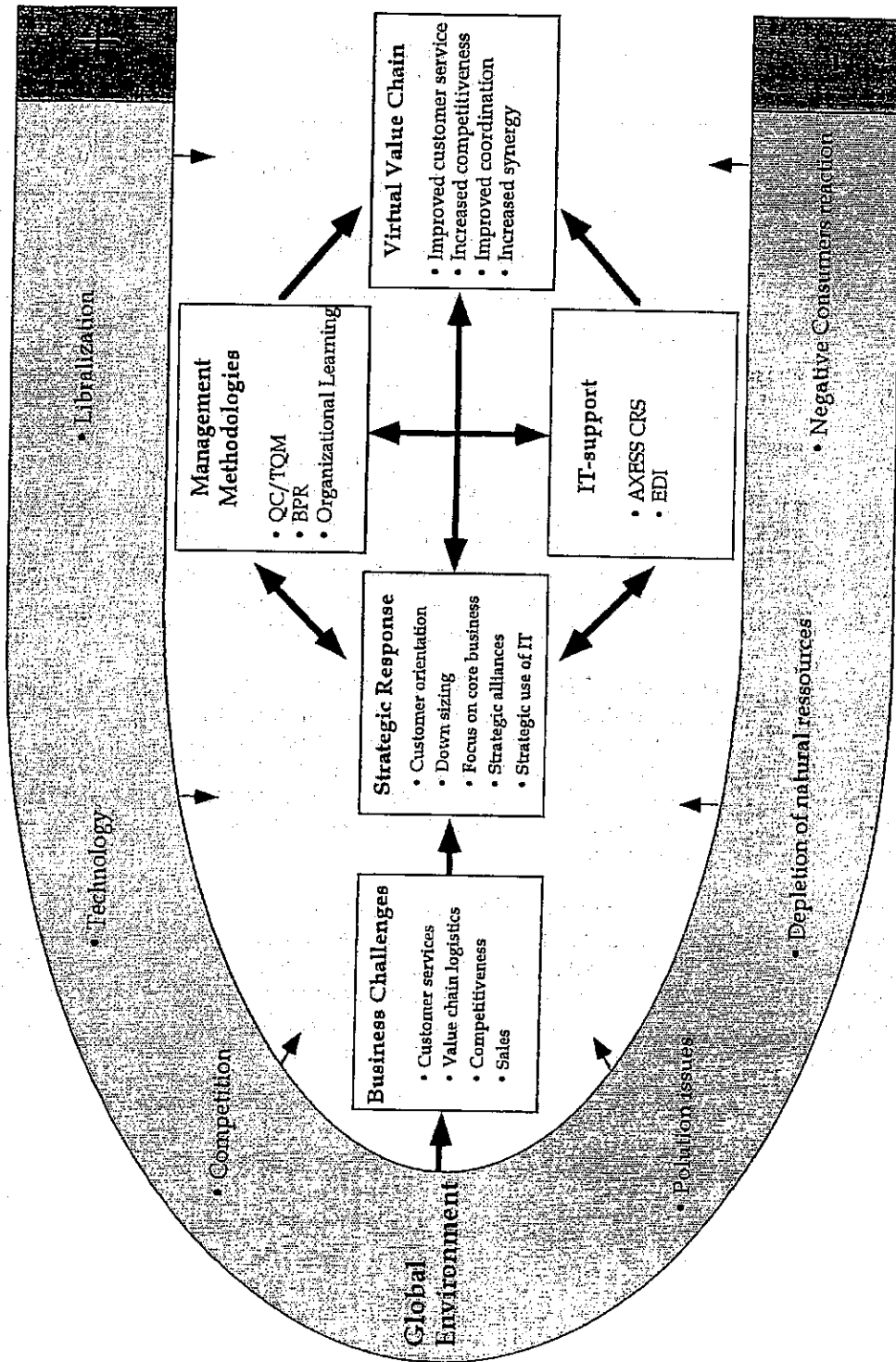| Business Outcomes	1987	1995	Change (%)
Operating Revenues: Passenger	564,052	789,786	35.1%
Cargo	155,013	145,405	-18.3%
Number of Passengers Carried: Domestic	9,379,012	19,365,867	106.7%
International	6,170,107	10,869,218	76.2%
Revenue Passenger-Load Factor: Domestic	58.2%	60.4%	3.8%
International	70.9%	70.5%	-.6%

JAL's business growth was realized over the period analyzed when JAL successfully launched the four strategic responses discussed in Section 6 when they faced the business challenges at the time of the privatization. AXESS CRS increased sales by changing the way in which sales and marketing were managed and coordinated with the JAL Group. Mr. Yamaji assessed the impact of AXESS on JAL's business: "AXESS has already had an immense impact on our operations in Japan and overseas." EDI enabled JAL to increase business competitiveness by reducing operating costs within the company and across the value chain, and improving the value chain logistics coordination.

With increased systems integration of EDI with CRS and other internal information systems, JAL could improve their value chain logistics coordination through increased information sharing. EDI supported information sharing particularly in procurement (e.g. fuel, aircraft repair parts and food), marketing (e.g. airline seats and tours), and sales (e.g. customers). JAL's EDI-enabled coordination helped the JAL Group organizations rationalize the Group's interdependent business operations. Despite a dramatic increase in sales and labor costs, JAL managed to reduce operating expenses for the JAL Group organizations since 1992.

Framework for IT-enabled Transformation of JAL & Value Chain
The framework used in this paper is based on the generic framework developed for analyzing the role of IT in developing the 21st century organization [2]. This framework has been developed to explain the relationships between the global environment, business challenges, strategic responses, strategic IT support and management methodologies which enable changes in business processes, and the impact of radical organizational transformation on the firm's business outcomes.

Figure 1 presents the framework as it applies to Japan Airlines; and each of the elements in the framework will be presented below.

Global Environment

- Liberalization
- Technology
- Competition
- Pollution issues
- Depletion of natural resources
- Negative Consumers reaction

Business Challenges
- Customer services
- Value chain logistics
- Competitiveness
- Sales

Strategic Response
- Customer orientation
- Down sizing
- Focus on core business
- Strategic alliances
- Strategic use of IT

Management Methodologies
- QC/TQM
- BPR
- Organizational Learning

IT-support
- AXESS CRS
- EDI

Virtual Value Chain
- Improved customer service
- Increased competitiveness
- Improved coordination
- Increased synergy

Global Environment

The last two decade has brought dramatic changes in the global environment of almost any organization and especially the airline industry in the direction of increased globalization. To a large extent this is a result of a deliberate policy of liberalization within almost all sectors of the economy, in trade, financial markets, and foreign investments. Most dramatically this is taking place within the large trading blocks (European Union, NAFTA, and the AFTA/APEC), but the Uruguay Round and the continuation of these multilateral trade negotiations on bilateral levels (e.g. EU and US) as well as on the GATT and G7 level is slowly but surely leading to dramatic reductions and removal of the traditional exclusive rights of airlines to certain routes. The US airline industry was liberalized in 1978, in 1986 a major deregulation of the Japanese market took place domestically as well as internationally, and the European airline industry is to be liberalized in 1997. Very few observers inside the industry doubt that the liberalization will eventually span the globe for all major routes.

Technological progress especially within the aircraft (better fuel economy and safety features), in navigation and not the least in telecommunication are the main reasons why the liberalization (and removal of trade barriers) are having this large effect. It is obvious that the world is getting smaller by the day.

However, liberalization and technological progress would not have a significant effect on the airline industry if it had not been for the increased competition. Nobody knows how many airlines there are today, and the figures change all the time as low cost airlines come and go taking substantial parts of the market from the former well established airlines. We could say that it is the competition that guarantees that the technological progress is utilized under a framework of liberalization.

While the three factors above all contribute to the feeling of continued expansion, there are at least three factors which act as inhibitors or barriers to the 'unlimited Ikaros line' of continued growth. We have grouped these into the three categories pollution, depletion of resources, and negative consumer reactions, which will be dealt with below.

Pollution issues are playing an increasingly larger role in the airline industry. The main concern is the environmental problem related to the burning of fossil fuels (destroying the ozone layer through the emission of CO^2), and even though substantial improvements in fuel economy has been achieved, it is a major cause for concern how to reduce the amount of fossil fuel.

Strongly related to the pollution issues are the issues related to the depletion of resources. It is almost 20 years ago that Meadows & Meadows [18] wrote the famous book 'The limits to growth' spelling out the risks on the unrestrained growth. History over the last 20 years has shown inaccuracies in most of the details in their work, but the general message still remains as severe as ever. As an example, the oil price in Western Europe is at its lowest level since the fist oil crises in 1973. Some of the main reasons are the wars in the Middle East. And for the next few years to come it is likely that the build-up of the Iraq economy will force it to flood the oil markets with major quantities of oil in order to re-build. So for some years to come it is likely that we and the airlines can still enjoy very low oil prices. However, confidential scenarios from major oil organizations operate with a doubling of the oil prices early in the next century. And if we reflect on the devastating effect of the previous oil-crises it is clear that a major increase in fuel prices will dramatically influence JAL.

Both the increased pollution and the concerns around the depletion of resources are contribution to negative consumer reactions seen more and more in different areas especially in Western economies. One problem facing most airlines including JAL are the noise (limiting airlines the possibility of flying at all times especially during the night). Another problem are the very violent general protests against the building of the Narita Airport. A third problem relates to the critique of lack of accuracy (due to congestion) and the safety records which are constantly brought up every time there is an airline crash. The increased level of information strongly exacerbated by mass media can in a few days totally change the competitive environment and ruin an otherwise prosperous company like JAL.

Business Challenges for Japan Airlines

All of the factors above, but especially the deregulation of the Japanese airline industry in 1986 and the proliferation of CRSs world-wide in the 1980s intensified competitive pressures from foreign carriers and governments who demanded greater access to major international gateways in Japan. In 1986, United Airlines, the largest air carrier at the time, inaugurated flights on Pacific routes, while

The top management team decided that corporate organizational restructuring was a competitive necessity which had to be started immediately, but would take place over a large number of years. Restructuring was to simplify JAL's complex operational procedures and downsize the company. Operational procedures were simplified by outsourcing a large number of service functions and by reducing the amount of paper-based transactions. Downsizing reduced the number of administrative as well as reservations and sales office personnel, which enabled the company to reduce operating costs, including labor costs, the second highest fixed costs in the aviation industry.

With a new organizational structure, top management decided to broaden its corporate earning base, by promoting greater diversity and synergy with its interorganizational value chains through establishing strategic alliances. They began with the JAL Group, but later on they gradually increased the cooperative efforts initially with other suppliers in the value chains.

However, in order to compete in the deregulated market, JAL had to become more customer oriented. The most profitable customers were not prepared to put up with the 'monopoly type service' and several measures were taken in order to meet the demand of increasingly sophisticated business travelers. The dedicated workforce would have to be trained to provide this kind of service, something which obviously is not achieved over night.

Finally, as we shall come back to later, top management in JAL recognized very early that it was necessary to use IT strategically. The value of the reservation systems of US airlines were clearly recognized in the industry, and JAL management launched a costly but necessary road to develop its own reservation system as well as inter-organizational systems in order to facilitate the strategic alliances.

IOS

Table 1 shows IOS support at JAL. The two most important IOS identified are Electronic Data Interchange (EDI) and Computer Reservation Systems (CRS).

EDI for Value Chain Logistics Coordination
The network of the JAL Group firms have long-term relationships with JAL either as suppliers on the value chain, outsourcing vendors or joint venture partners. A proprietary EDI, which is supported by Multi Japan Network, JAL owned and operated value-added network (VAN) since 1986, has been used by JAL and the JAL Group to coordinate their large-scale interdependent business activities and communications required by the various relationships: supplier value chain logistics for procurement and just-in-time delivery, outsourcing service functions, and joint venture operations.

EDI provides JAL and the value chain with timely and accurate information (i.e., flight schedules, routes, purchase orders, cost structures) which is essential for JAL to manage its complex value chain logistics required by flying operations, such as procurement and just-in-time delivery of aircraft fuel, aircraft repair parts, cabin food catering as well as other customer requirements. In addition, EDI provides JAL and outsourcing vendors overseas with timely and accurate maintenance records. Furthermore, systems integration of EDI and CRS enables JAL and joint venture partners to share business information required for optimal scheduling and high-yield operations of integrated tour packages, and efficient handling of domestic and international cargo transport.

EDI for Cost Reduction
In the fiercely competitive aviation industry, costs of flying operations, such as fuel costs, present the largest percent of total operating expenses. Because fuel costs represent very high costs of flying operations, profitability is critically dependent on the company's strategy to search fuel sources globally and procure bulk fuel at competitive costs. Furthermore, profitability is also impacted by the ability to manage complex logistics of distributing fuel from the company's own fuel supply facilities, such as those in Los Angeles, to airports world-wide in a just-in-time manner.

JAL's business grew in size over the past eight years. While the number of passengers carried, frequency of flights and number of routes all increased significantly, JAL is required to deliver timely and efficient aircraft maintenance. EDI facilitates the timely procurement and just-in-time delivery of repair parts required by aircraft maintenance teams. In addition, EDI provides world-wide maintenance teams with timely and accurate information on safety standards, aircraft maintenance requirement specifications, and aircraft maintenance history.

CRS for Sales

In 1987 JAL developed AXESS, one of the most advanced and comprehensive CRS. AXESS was clearly viewed as a key enabler for restructuring JAL for the business challenges it faced with the privatization and managerial independence. Competition on international routes became more intense after the mid 80s. The AXESS project, initially promoted as a marketing initiative, received top management support and a high level of initial investment in capital (approximately 130 billion yen—US 1 billion) and human resources, which was needed for its timely completion.

Top management understood Sabre as a key enabler for American Airlines' increased competitiveness, and regarded AXESS as "the most strategically crucial system" for JAL's competitiveness, particularly to gain a competitive advantage in the international market. Mr. Yamaji articulated his strategic intent: "With privatization just around the corner, a new program to consolidate our sales network will play an important role. We must offer new and improved services that are more receptive to the needs of the traveling public and of travel agents. These services must compete with the Apollo reservations and sales systems, adopted by United Airlines and with the Sabre system offered by American Airlines [10]."

AXESS was an on-line, main frame based, integrated travel information and reservations system, with links to hotel chains world-wide, as well as links to foreign carriers' CSS. As an advanced fare quotation and reservations systems, it had a database storage capacity of 300,000 city pairs and over 8 million different types of data. The use of AXESS effectively reduced airline ticket processing time from 15 minutes to 5 seconds at the time of implementation. Besides the increased efficiency, the new CRS had the innovative features, such as the first Japanese language database as well as information retrieval in either Japanese or English displayed on color split windows. When AXESS was marketed to travel agents in 1988, these innovative features clearly provided JAL with the first mover advantage in locking them in.

CRS for Customer Services

Figure 2 shows AXESS CRS's comprehensive functional capabilities. AXESS CRS was integrated with internal IT at JAL. They provide travel agents with an on-line access to Japanese language package tours information retrieval and reservation systems, and the passenger information management system for better customer services. JAL's implementation of Japanese-language databases enabled travel agents to access an enormous amount of travel information for their Japanese business and leisure travelers. To further improve travel agents' productivity, JAL added functional enhancements: travel agent back office accounting system and travel agent customer profile management system.

Table 2.   Strategic Use of IOS at JAL

Business Challenges	IOS Types	Users	Business Processes
Improve customer services	CRS	Travel agents, corporate travel centers, leisure travelers using AXESS Mini-terminals located at train stations & convenient stores etc.	Provide information for travel planning & make reservations of airlines, tours & hotels
	CRS	JAL	Provide travel agents with customer profile for better customer services & make reservations of airlines, tours & hotels
Improve value chain logistics coordination	EDI	JAL, the JAL Group & others in the value chains	Coordinate the value chain for procurement & just-in-time delivery of: aircraft fuel, aircraft repair parts, cabin food & beverage etc.
	EDI	JAL, the JAL Group & others in the value chains	Coordinate the value chain for outsourcing aircraft maintenance services
	CRS + EDI	JAL, the JAL Group & others in the value chains	Coordinate the value chain for scheduling & operations of: integrated tour packages & cargo transport
Increase competitiveness	EDI	JAL, the JAL Group & others in the value chains	Reduce operating costs through less paper-based transactions & reduction of administrative staff & reduce transaction costs, especially search & coordination costs
	CRS + Yield Management System	JAL	Create new business value
Increase sales	CRS	JAL & Travel agents	Make sales
	CRS	JAL	Manage marketing channels & provide training for travel agents

Figure 2. AXESS CRS Functions

JAL, value chain & travel agents
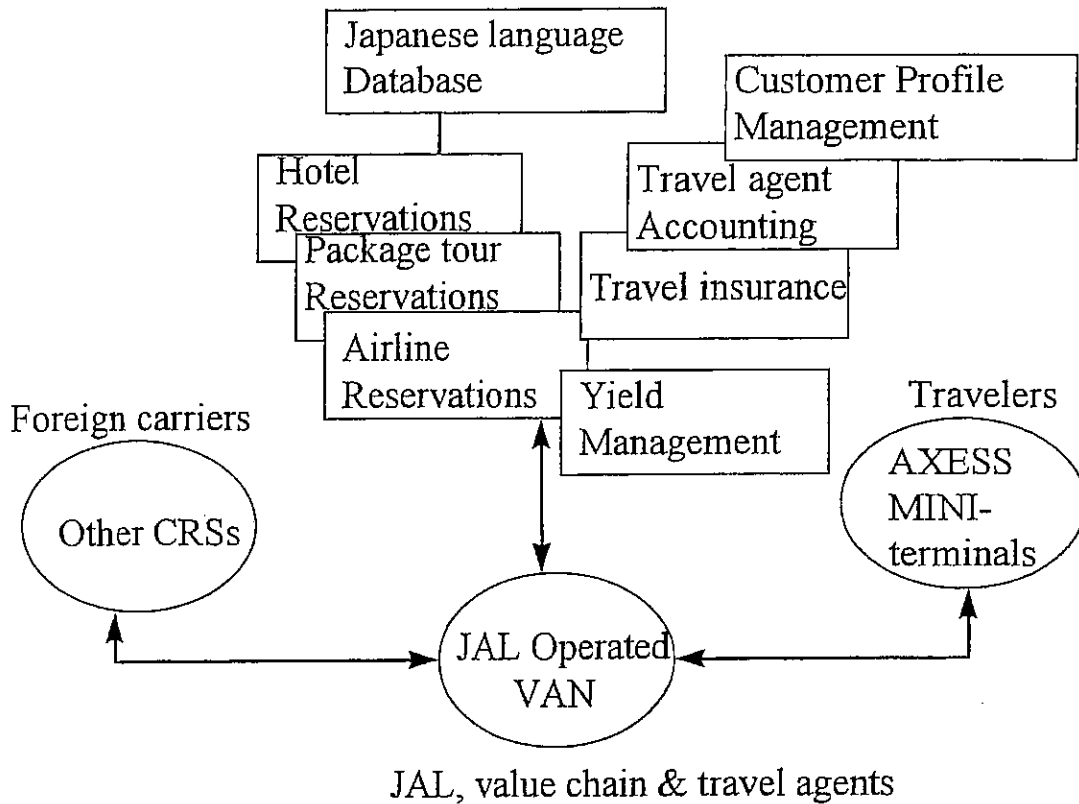
Management Methodologies

As discussed in the JAL company background section, JAL was a semi-private special status company with the Japanese government as the largest shareholder. This background cultivated the bureaucratic and unfriendly attitudes throughout the organization. Faced with the new business challenges, top management supported the application of Quality Circle/Total Quality Management philosophy [6] in order to radically change the attitude of their employees including middle-level managers. This was viewed as a critical success factor for JAL to become more "customer oriented". All employees were mandated to participate in various QC activities, and the impacts of these activities on employee attitudes and service improvement were published in internal newsletters. TQM staff regularly surveyed the travelers and analyzed the questionnaire data, and provided QC groups with customer reaction to JAL services encompassing telephone operators, JAL reservations, airport ticketing, cabin services. As part of TQM JAL implemented a specialized customer call-in line, "Hello Line" to directly monitor customer reaction. The customer reaction trend was continuously fed back to all QC groups.

JAL adopted Business Process Reengineering as a cost-cutting initiative, not long after restructuring the company and gradually downsizing through outsourcing and reduction of employees, especially administrative staff. As discussed in the JAL company background section, top management had a clear strategic vision to meet the business challenges. The company streamlined their core business processes by eliminating the redundant divisions and sections. The nature of the changes was radical and was intended to support the strategic responses JAL was to make. This radical transformation of JAL was not labeled as BPR at the time, but management did not consider it as kaizen or the concept of "continuous improvement" which is now widely known through the pioneering work at Toyota.

The substantial cost reduction provided evidence of the core firm's success in radically transforming core internal business processes. JAL extended, over time, its BPR to the value chain management. The concept of Organizational learning has been around for a number of years [14]. Huber [8] and a number of others are classifying organizational learning into the four constructs/processes: Knowledge acquisition, information distribution, information interpretation and organizational memory. At JAL and across the value chain, IOS discussed in the IOS section of this paper supported the four processes of organizational learning, which made information sharing much faster

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and easier among the networked value chain firms. Organizational learning shared across the value chain enabled JAL to augment synergy with the JAL Group and the new value chain provided a new source of value for JAL since they reduced time to design and marketing of new products and share information on customer reaction.

Transformation of the Value Chain

At JAL the two key IOS discussed in this paper became centrally embedded in their core business processes with the value chain and played an important role for JAL's radical transformation. JAL's BPR leveraging EDI enabled the company to simplify interorganizational business transactions and to significantly reduce paper-based transactions, hence further effecting the reduction of administrative staff and the reduction in labor cost. Furthermore, through the rationalization of the core interorganizational business processes, JAL and the JAL Group firms reduced transaction costs and improved value chain logistics coordination to add a new source of competitiveness for JAL.

Because the transformation of the value chain became an important source of JAL's business growth and increased competitiveness, we discuss the old value chain and the new value chain. Table 3 shows the salient characteristics of the new value chain vis-à-vis the traditional keiretsu-based value chain.

Table 3 Transformation of JAL's Value Chain

Characteristics	Old Value Chain	New Value Chain
Optimization	Within JAL	Across Value Chain
Structure	Centralized	Networked
Business Value Creation	Keiretsu-based	Information-based
Communications	Linear	Nonlinear
Coordination	Inefficient	Efficient

Like the traditional Japanese value chains, JAL's old value chains generally optimized business within the company, while the new IOS-enabled virtual value chain gave rise to a new source of competitiveness. It enabled JAL to optimize business across the JAL Group, the strategically most important value chain for the company. The transformation of the value chain is most notable in the four areas: structure, business value creation, communications and coordination. The old value chain was structured with JAL at the center, while the new value chain is more networked in structure. Because of the centralized structure, JAL's business value creation relied on JAL's initiative and its long-term keiretsu-based relations for implementation. The new value chain is more information-based in that IOS enabled all networked firms to access and use digital information many times once it is created by any firm. In other words, IOS enabled to expand the ability for JAL to create business value by increased synergy within the networked value chain firms. Communications of the old value chain were linear and sequential in processing, while those of the new value chain are more nonlinear and simultaneous. Because of much improved communications, coordination of the networked firms is more efficient than that of the old value chain.

Conclusions

The paper took a starting point in a generic framework for understanding the role of IT in organizational transformation and applied it to the specific case environment of Japan Airlines.
In the case we have taken a longitudinal perspective and followed JAL from the global environment changes leading to JAL's privatization in 1986 and especially focused on the radical organizational transformation necessary to cope with the new business challenges.

Contrary to most case studies, our focus has been on the impact of inter-organizational systems on business outcomes. Only by studying IOS is it possible to understand the full implications of the dynamic changes. The main effect has been on the transformation of the physical value chain including the core firm (JAL) and its network partners. In this process a virtual value chain is developed, which is information-based and beyond the confines of the traditional keiretsu-based information exchange. This virtual value chain gives rise to JAL's improved customer services, improved value chain logistics coordination, increased competitiveness, and increased sales.

The two major IT enablers were the CRS and EDI. These systems were developed with a clear strategic vision to support JAL in meeting the business challenges. These IOS also enabled BPR to proceed in an incremental fashion starting with transformation of JAL itself and moved on to the JAL Group and other partners in the physical value chain.

The organizational transformations have been very successful, and have contributed to making JAL the third largest airline in the world.

One of the key findings is the transformation from the traditional top-down, hierarchical, keiretsu-based inter-organizational type of collaboration which has been competitive advantage of Japanese industries (Porter 1990). It is clear that this type of collaboration has been very effective in the past, but today it is not fast enough to rely on this exclusively. This type of inter-organizational cooperation has to be augmented with IT-based interorganizational systems creating virtual value-chains facilitating non-hierarchical communication.

Wider implications of the case study for management may be identified as the following:

IOS can potentially play a significant role in providing the core company (the sponsor of the IOS such as EDI) as well as the network of its partners with an ability of much more accurately timing and more accurate information on the status in the physical value chain which is critical for coordinating cooperative efforts. In this way the core company and its partners create and recreate the virtual value chains.

Furthermore, IOS provide increased transparency and in this way enhance trust among the core company and the network of firms it cooperates with. In this way IOS can contribute to a lowering of the agency costs involved in sharing business processes with other companies as a result of outsourcing.

Finally, IOS has the potential to lower transaction costs in the physical value chain for all partners, but it is likely that it is necessary to critically evaluate the business processes. In business relationships between two parties the same functions are typically "mirrored" in order to make sure that all contractual relationships are fulfilled. With increased information, transparency and trust, many of these inter-organizational business processes and should be reengineered using management methodologies like QC/TQM, BPR and Organizational learning.

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