



Universität Münster
Institut für Wirtschaftsinformatik

Lehrstuhl für Wirtschaftsinformatik
und Interorganisationssysteme
Prof. Dr. Stefan Klein

www.wi-ios.de
mail@wi-ios.de

IOS: definition, characteristics, classifications, types and examples



Objectives of this module

- ... defining what IOS are,
- ... discussing the relation between technological developments and organizational responses,
- ... classifying types of IOS by giving illustrating examples

Agenda

- | |
|---|
| 1. IOS definition and characteristics |
| 2. Criteria for the classification of IOS |
| 3. IOS typologies and classifications |
| 4. IOS examples |

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1. IOS definition and characteristics

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What does "IOS" mean?

- Interorganizational and external **integration of data processing** (MERTENS 1966a, b; PETRI 1989),
- Inter-Organizational **Data Systems** (KAUFMANN 1966, STERN; CRAIG 1971),
- Inter-Organization **Information Sharing Systems** (BARRETT; KONSYNSKI 1982), they refer to an automated IS shared by two or more organizations
- Inter-Organizational **System** (CASH; KONSYNSKI 1985),
- Inter-Organizational **Information Systems** (JOHNSTON; VITALE 1988),
- Information/ **Value-Adding Partnerships** (JOHNSTON 1988; JOHNSTON; LAWRENCE 1988, KONSYNSKI; MCFARLAN 1990),
- **Infrastructures** for information sharing (KUBICEK 1991, 1992a).

IOS definition

- Today, the term is used in a broader sense (e.g. Hong 2002):
 - „An IOS is defined as a **network-based IS that extends beyond traditional enterprise boundaries**.
 - With IOS permitting information access to other organizations, the **organizational boundary is redefined** and extended to the extent that a firm's value chain needs to be redesigned“
- An inter-organizational Information Systems (IOS) is a Information System (IS)
 - „is a“ relation
 - an information system is a socio-technical system with human and machine components to fulfill economic tasks
 - ergo: IOS are socio-technical systems

The two perspectives on IOS

"Advances in information technology provide opportunities for dramatically increased connectivity, enabling new forms of interorganizational relationships and enhanced group productivity." (Madnick 1991, p. 29)

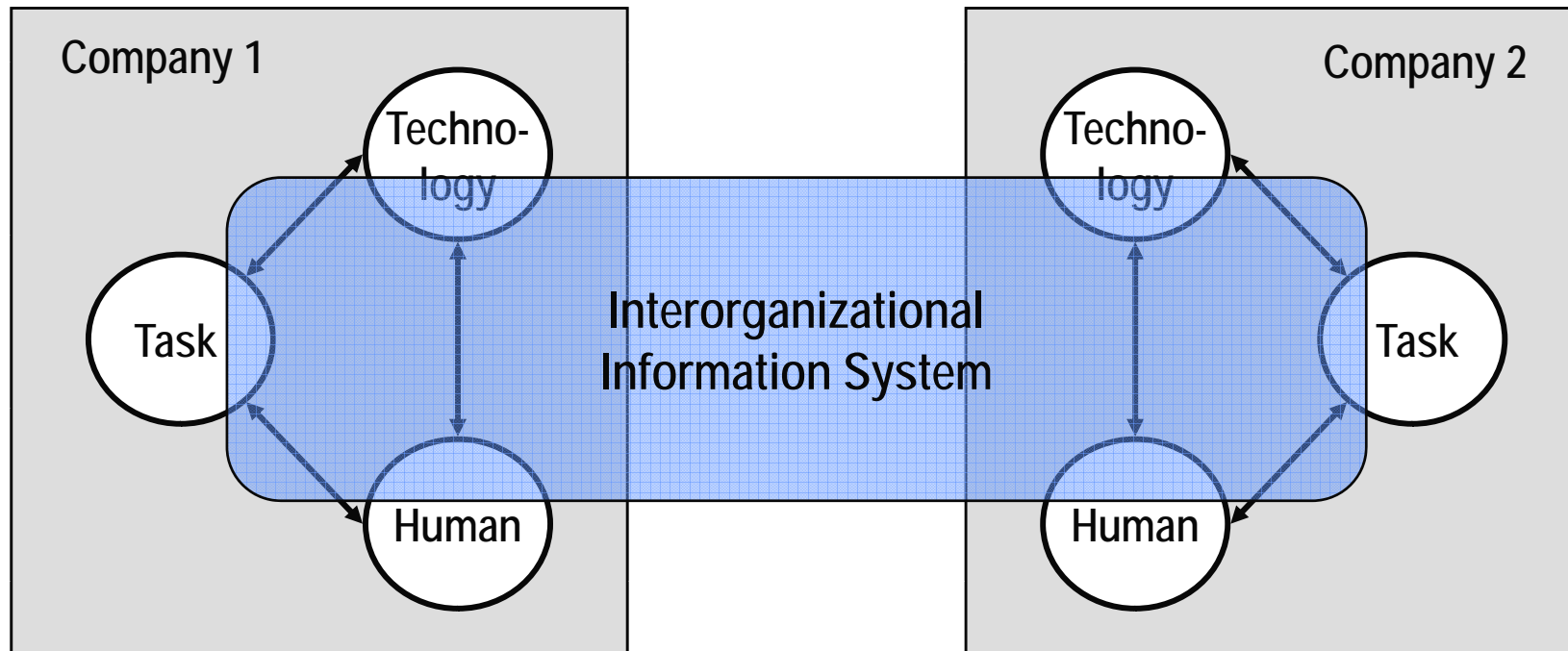
Organizational perspective

- IOS allow/enable/drive new organizational forms
- IOS fulfill certain tasks in the inter-firm context
 - Businesses collaborate on the basis of information technology, e.g. to divide labor or to improve processes within the value chain.

Technical perspective

- IOS use modern telecommunications infrastructures and open networks (e.g. the Internet)
- IOS can connect the firms' internal information systems or provide a shared databases and special functions

IOS as socio-technical systems



Humans: fulfill tasks in different business functions, design information systems, use and maintain them.
Tasks: business tasks within business functions to be fulfilled by humans with the support of technology.
Technology: Information Technology (IT), which supports humans in fulfilling their tasks.

Types of communication

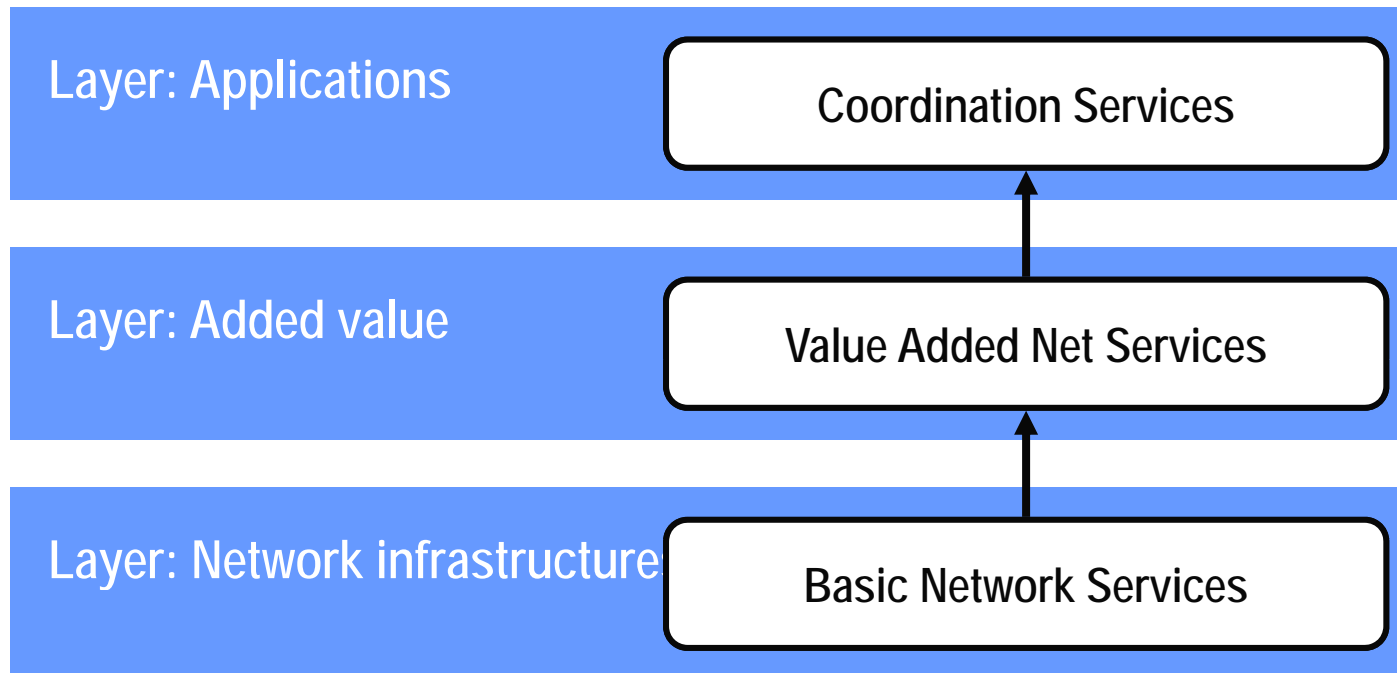
<i>from \ to</i>	<i>human</i>	<i>computer/ application</i>
<i>human</i>	<i>E-Mail (File Transfer)</i>	<i>interactive applications, on-line systems (CRS, on-line data bases, electronic trading systems), E-forms</i>
<i>computer/ applica- tion</i>	<i>computer based control systems, automated E-mail</i>	<i>EDI EFT/ Financial EDI File Transfer</i>

Constituting elements of IOS

1. Information system for the support of **value creation** coordination
 - IOS fulfill management/ administrative tasks between companies
 - e.g. support of inter-firm transactions
2. Participation of **minimum two businesses**
 - Participating companies are independent
 - In case of affiliations or subsidiaries, each entity can decide autonomously
3. Usage of **communication networks**
 - communication networks are the basic infrastructure of IOS for collaborative data or application usage

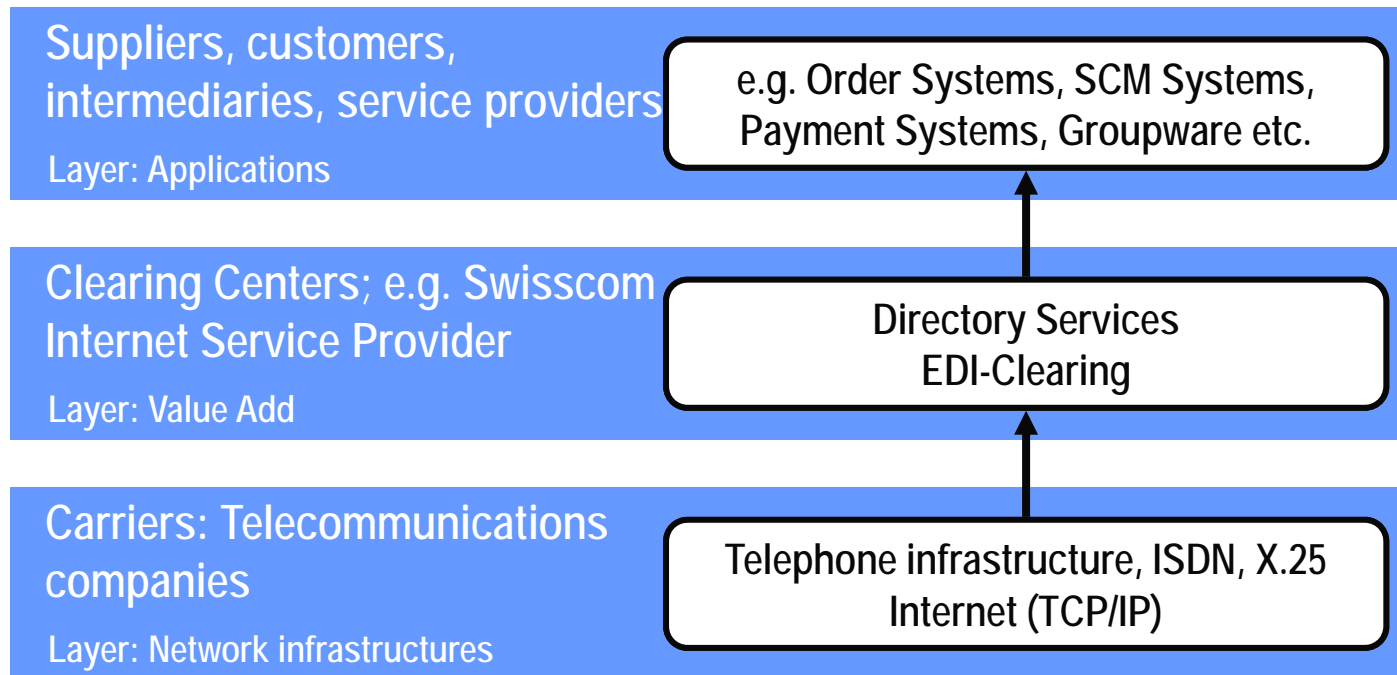
Source: Gaugler (2000), p. 55

IOS layer model



Source: Gaugler (2000), p. 53

IOS layer model: examples



Source: Gaugler (2000), p. 54

The changing role of IOS

- Traditionally, the common purpose of an IOS was to support firms' value chains
 - operational dimension
 - goal: increase competitive advantage in the market
- Nowadays, IOS **shift towards an enabler of cooperations** among businesses
 - establish electronic links with competitors/ rivals to gain a competitive advantage collaboratively
 - IOS is used to enable cooperations rather than competition among firms
- **„IOS-enabled partnerships make it possible to seek business opportunities via new organizational and market relationships“** (Hong 2000, 262)

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Classification of IOS: criteria 1/3

Participants and operators	
partner	suppliers, customers, service providers, competitors etc.
no. of participants	2 - n
diffusion	% of players in a market are participants, % of transactions (for each participant) covered by IOS
openness	closed user group, defined access rules, open market ...
operator of the platform (third party, intermediary)	supplier, customer, intermediary or third party, combinations of several parties
ownership	single (sponsor) vs. multiple (shared)
ratio customers : suppliers	1:m, n:1, n:m, n:1:m
direction of business relation	vertical, chain, diagonal, horizontal
structure of relations	bilateral, hub-spoke, clearing center, electronic trading platform
governance structure	hierarchy, network, market
power, dependency	pooled, sequential, reciprocal relationship
trading mechanism	offer/accept, extended matching, auction, etc.

Classification of IOS: criteria 2/3

Area of application and integration	
supported trading phases	information, negotiation, settlement (logistics, payment), after sales
area of application	functional areas: e.g. procurement, sales, distribution, operations, R&D
no. of application areas	1 - n
competitive advantage/ potential of application for different parties	core business, outsourceable function
geographical focus	national, international
industry focus	intra- vs. intersectoral
interorganizational degree of coordination/ collaboration	Information (shared database, info partnership), Communication (EDI), Collaboration (group decision making), Coordination (automatic handling of functions, electronic trading)
intraorganizational integration	integration of data, functions, integration among different EDI applications

Classification of IOS: criteria 3/3

Technical aspects	
technical link	host-terminal link, client-server system, EDI, Web
application architecture	central EDI application, EDI part/module of various functional application such as procurement, sales etc.
standard	proprietary, open

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Overview IOS classifications

1. **Functional** classification

- what are the participating parties sharing?

2. Classification regarding **integration level**

- which coordination tasks can be fulfilled by IOS?

3. Classification by **transaction phases**

- what are potential uses of IOS in a buyer-seller transaction?

4. Classification by IOS **role**

- what role does the IOS play for an inter-firm collaboration?

5. Bivariate classification by **direction** of collaboration and **strategic relevance**

- who collaborates with whom for which purpose?

(1) Functional classification of IOS: examples

- sharing of ICT infrastructures
 - e.g. an automatic teller machine (ATM) network (e.g. CashGroup by Deutsche Bank, Commerzbank, HypoVereinsbank, Post Bank)
- electronic data interchange/ electronic document flow
 - business messages, technical data
- information sharing, information partnerships
 - e.g. customer information (Airline industry: passenger name record: PNR for global passenger routing)
- interorganizational integration of applications: new forms of division of labor, automatic processing
 - e.g. logistics, supply chain management: e.g. i2 solutions

(1) Functional classification of IOS: classification regarding integration level

Levels of integration	Instruments/ examples
Data integration	Electronic data interchange, Shared databases, WWW
Process integration	<i>Organizational view (re-allocation and coordination of tasks):</i> shared functions, automatic handling of functions, platform for electronic trading, EDI, SAP ALE, WFMS ...
Application integration	shared applications or infrastructures, Web services: Web services flow language (WSFL)

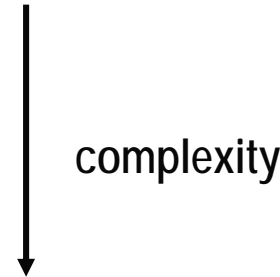
(1) Functional classification: IOS usage within the firm's value chain

Firm infrastructure: Web based, distributed ERP systems; Online-Investor-Relations				
Human Resource Management: Employee self-service via Extranets, E-learning & training, Online recruiting				
Technology Development: Distributed collaboration platforms and project management, Groupware, Knowledge Directories				
Procurement: E-Procurement-platforms, internet-based collaborative planning and forecasting				
Inbound logistics: Process integration, EDI, Supply chain management solutions	Operations: Supplier integration into production (Just-in-Time solutions), Real-time information provision for suppliers and customers	Outbound logistics: Collaborative planning and forecasting with customers, Shared Information pools with customer partners	Marketing and Sales: Web site, Online shop, Dynamic pricing, Online consultancy, Online product configuration facilities, Mass customization, Push advertising, Entertainment, personalization	After-Sales: Tracking & Tracing, After-Sales-Consultancy via Internet, Communities, Customer Self-Service-Systems, FAQs etc.

Source: Porter (2001, 75).

(2) IOS for inter-firm coordination: classification regarding integration level

- An important goal of IOS is the support of coordination tasks in inter-firm settings.
- Coordination means „managing dependencies between activities“ (Malone, Crowston (1994), p. 90)
- IOS can be classified according to coordination tasks:
 - information systems
 - communication systems
 - collaboration systems
 - coordination systems
- The more complex systems contain (or use) functions of the less complex systems



(2) IOS classification regarding the complexity of fulfilled inter-firm coordination tasks

Process level	Components	Examples of generic processes
Coordination	goals, activities, actors, resources, interdependencies	identifying goals, prioritizing activities, assigning activities to actors, allocating resources, synchronizing activities
		Workflow Management Systems (in supply-chains, e.g. i2 solutions), Electronic Trading Platforms, Project Mgmt.
Collaboration (group decision making)	goals, actors, alternatives, evaluations, choices	proposing alternatives, evaluating alternatives, making choices (e.g. by authority, consensus, voting)
		Partner Selection in Virtual Organization, Decision Support Systems, Collaborative Planning & Forecasting
Communication	senders, receivers, messages, protocols	establishing common protocols/languages, selecting receiver (routing), transporting message (delivering)
		Electronic Data Interchange (EDI), e-Mail Communication
Perception of common objects (information)	actors, objects	seeing same physical or virtual objects, accessing shared databases
		shared documents, shared information resources

Source: Malone, Crowston 1990, p. 365

(2) Coordination and institutional setting Konsynski (1993)

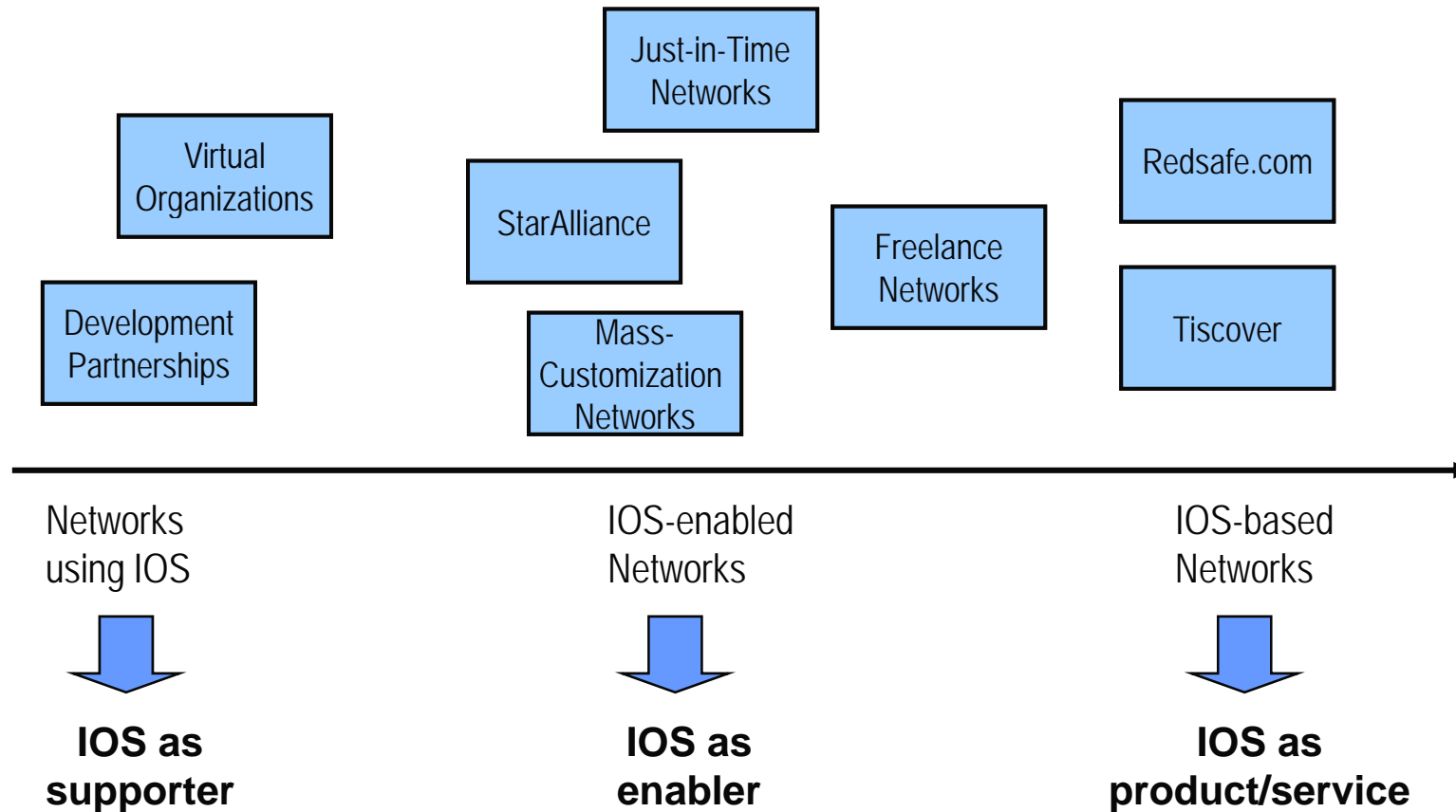
Marketing and logistics systems	bilateral linkage of buyers and suppliers, often using proprietary protocols. Systems of product or service differentiation or influence inventory and ordering. Example: FordNet, LeviLink, Intent: <i>cooptive</i>
Virtual system	national or international standards selected by a community of market participants, example: VDA in the German auto industry Intent: <i>collective</i>
Industry platform	common platform in the industry, example: IVANS in insurance, SWIFT in the banking industry Intent: <i>collaborative</i>
Electronic market and access forum	third-party intermediary sets and enforces the rules of the trading environment, examples: Dutch Teleflower Auction, AUCNET Intent: <i>competitive</i>

(3) IOS classification by transaction phases: B2B e-Commerce transactions

	information	negotiation	settlement, fulfillment
Customer perspective	<ul style="list-style-type: none"> • Demand specification • Inform about products • Choose products • Inform about suppliers • Choose suppliers 	<ul style="list-style-type: none"> • Get offerings • Negotiation with supplier • Negotiate logistics and payment conditions • Place order • Cancel negotiation 	<ul style="list-style-type: none"> • Monitoring of order processing • Receive order • Quality checks • Payments
Supplier perspective	<ul style="list-style-type: none"> • Establish product catalogue • Supply products and services 	<ul style="list-style-type: none"> • Publish offerings • Negotiate with customer • Adjust offerings • Confirm order • Accept canceling 	<ul style="list-style-type: none"> • Publish order tracking • Send notifications • Configure and send products • Invoicing • Handle Payments
IOS	<ul style="list-style-type: none"> • Yellow pages • Partner databases • Electronic product catalogues • Customer Decision Support Systems 	<ul style="list-style-type: none"> • Electronic product configuration • Electronic negotiation systems (agents) • Auctions, Trading platforms • Shop solutions 	<ul style="list-style-type: none"> • Systems for order management • Electr. Tracking/Tracing • Electr. Payment • Workflow management

Source: Gaugler (2000, 51)

(4) Classification by IOS role: Interdependencies between IOS and networks



(5) Framework for classification of IOS by Hong

A two dimensional framework:

1. Role linkage (direction of cooperation):

- horizontal:
 - interconnection between firms performing common activities
 - IOS connects homogeneous group of organizations
- vertical:
 - this linkage involves different roles of participating organizations
 - typically along a value chain: buyer/seller relationships

2. System support level (IOS relevance):

- strategic:
 - IOS with strategic dimension: linking primary activities
 - share information, share risks, collaborate for market access etc.
- operational:
 - support routine operations: day-to-day business
 - transform business processes

(5) Framework for classification of IOS by Hong

Role linkage	horizontal	Operational Cooperation <ul style="list-style-type: none"> - Joint databases (information sharing) - Improved customer service - agree with rivals about collaboration 	Resource Pooling <ul style="list-style-type: none"> - joint IT construction (cost/risk sharing) - market coalition, expand markets - agree with rivals about collaboration - achieve together virtual size
	vertical	Operational Coordination <ul style="list-style-type: none"> - Value/supply chain support - Buyer/Seller relationships - interconnect differing roles played by firms - increase operational efficiency 	Complementary cooperation <ul style="list-style-type: none"> - integrated products/services - joint marketing - enlarge virtual resources - connect different competencies - integrate different services
		operational support	strategic support
System support level			

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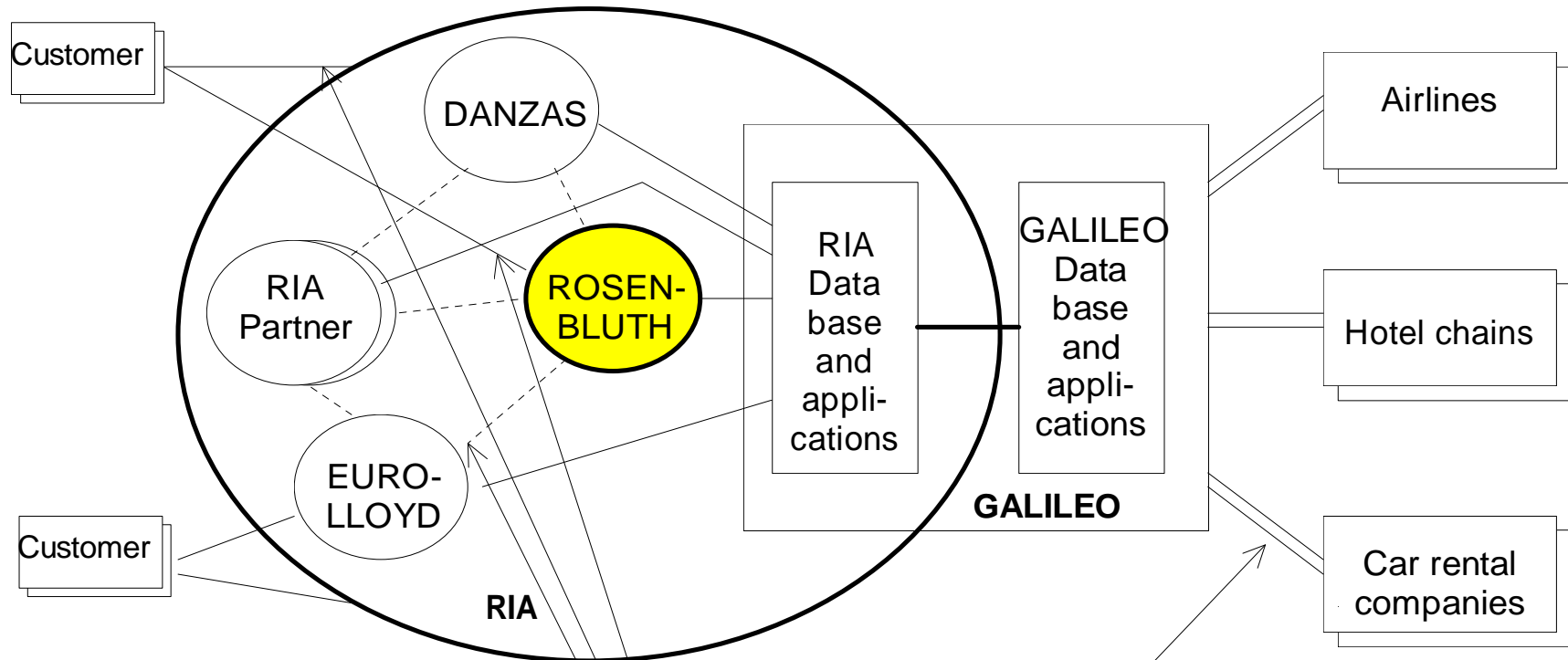
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IOS examples: operational cooperation

Rosenbluth International Alliance (RIA):

- operational cooperation of travel agencies via shared information databases (connection of operational systems)
- Connection of Airline reservation systems (CRS/GDS)
- global routing of passengers
- **AutoNetwork:**
 - cooperation platform for used part suppliers (auto dismantlers)
 - exchange of product information, create a virtual warehouse
 - quicker turnaround times, revenue increase, better service

RIA: Global Alliance



- Market relationships, goal: stable customer relations
- After-Sales Service
- Cooperation
- Market relationship

IOS examples: operational coordination

2	

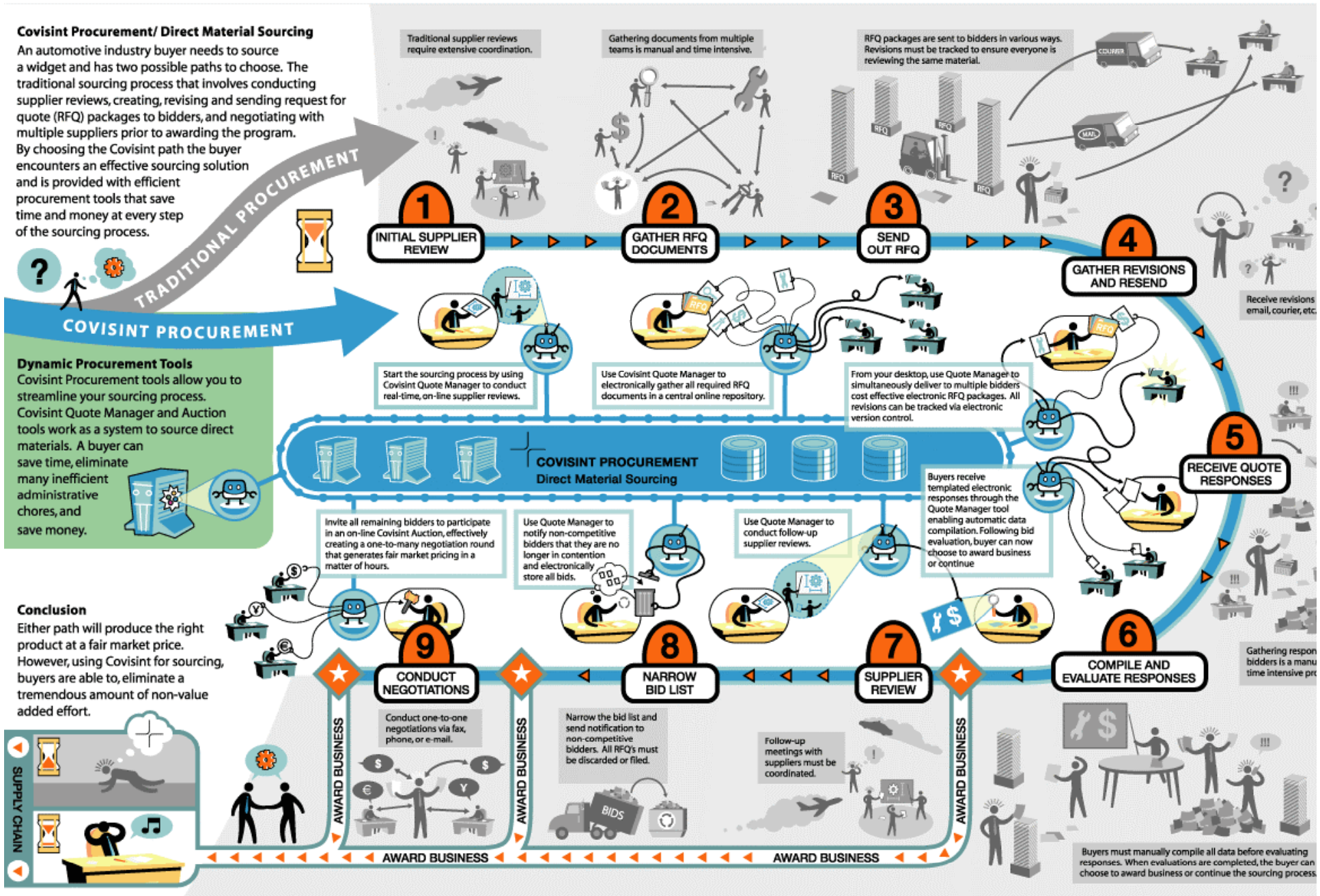
- Nike Inc.:
 - IOS to connect with production contractors in Asia (outsourcing)
 - manage the virtually disintegrated value chain (monitors each production stage), established in the 1980s
 - to link US designers with Asian contractors via a CAD/CAM system
- **SCM solutions: I2 solutions' standard software / Covisint SCM solution:**
 - operational coordination of supply chains:
 - collaborative planning and forecasting systems
 - coordination of processes and inter-firm logistics operations
- **Yield management system by TUI:**
 - day-by-day monitoring, controlling and optimizing of the entire tourism value chain (hotel, flight, tour bookings)
 - connects the own, but also external service providers

Covisint Procurement/ Direct Material Sourcing

An automotive industry buyer needs to source a widget and has two possible paths to choose. The traditional sourcing process that involves conducting supplier reviews, creating, revising and sending request for quote (RFQ) packages to bidders, and negotiating with multiple suppliers prior to awarding the program. By choosing the Covisint path the buyer encounters an effective sourcing solution and is provided with efficient procurement tools that save time and money at every step of the sourcing process.

Dynamic Procurement Tools
Covisint Procurement tools allow you to streamline your sourcing process. Covisint Quote Manager and Auction tools work as a system to source direct materials. A buyer can save time, eliminate many inefficient administrative chores, and save money.

Conclusion
Either path will produce the right product at a fair market price. However, using Covisint for sourcing, buyers are able to, eliminate a tremendous amount of non-value added effort.



	3

IOS examples: resource pooling

- **IVANS** (insurance value added network services) by ACORD:
 - group of independent insurance companies with thousands of agents form larger virtual company to compete with large firms
 - agents across the US can access insurance companies for policy issuance, price quotation etc.
- **Freelance Networks** (e.g. <http://www.freelancers.net>)
 - Internet platform to pool freelancer's resources and to establish projects (joint marketing)
- **Fleurop.com**:
 - connects 57.000 flower shops worldwide: joint distribution system
 - pool resources of flower shops to respond to end consumers' needs
- **Tiscover.com**:
 - joint marketing and distribution of tourism service providers

Fleurop.com

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Flower Shop *Customer Services*

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Flower Shop *Customer Services* *About Us* *My Fleurop* *Affiliates* You

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Ordering and delivery	<p>Fleurop-Interflora is the world market leader and best known flower ordering service, supported by 57,000 carefully selected flower shops in over 150 countries. For over 75 years, our trademark "Mercury" has been recognized for the finest quality in floral products and excellence in customer service.</p> <p>The foundations of Fleurop and its world-wide distribution system were established in 1926. In 1946, Florist Transworld Delivery (covering the USA), Interflora British Group (covering the Commonwealth) and Fleurop (covering Europe, Africa and Asia) joined forces to form a new Organisation with the goal to distribute flowers around the globe. Today, Fleurop-Interflora processes over 30 million orders each year.</p> <p>The Fleurop-Interflora Organisation is linked to the most advanced telecommunications technology. Looking back to 1910 it was the telegraph that actually made flower ordering possible and today it is the computer aided information processing and the Internet that are the driving forces behind Fleurop-Interflora's fast development. Technical improvements finally made it possible to replace the slogan 'flowers around the world' by 'flowers within hours worldwide'.</p>
Contact us	
Holidays & business hours	
Guarantee	
Privacy policy	
Frequently Asked Questions (FAQ)	

Flower Shop
12 April
5 May
9 May

IOS examples: complementary cooperation

	4

- **Travelocity.com** (by Sabre)
 - Internet platform for distribution of tourism products/services comprising the entire tourism value chain
- **Reuters holding PLC** has:
 - connected its worldwide news agency network to collect and market information of high value
 - built the Reuters Monitor Service (RMS) to offer commodities and financial information
 - constructed an integrated data network (IDN) to permit trades around the globe
- **Onvista AG**:
 - integrates several online information services from third providers to market it as an integrated solution (syndication)

Travelocity



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Travelocity empfiehlt



Summary

- IOS: IS crossing the boundaries of the firm.
- Organizationally (integration, coordination) and technologically versatile instrument, hence the emphasis on the strategic intent.
- Enabling role of technology, however embedded in organizational/ institutional settings.
- Technology as a facilitator of organizational innovation.

Literature

- Hong, Ilyoo B. (2002): A new framework for interorganizational systems based on the linkage of participants' roles, in: Information & Management, 39 (2002), pp. 261-270.