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## IOS: definition, characteristics, classifications, types and examples

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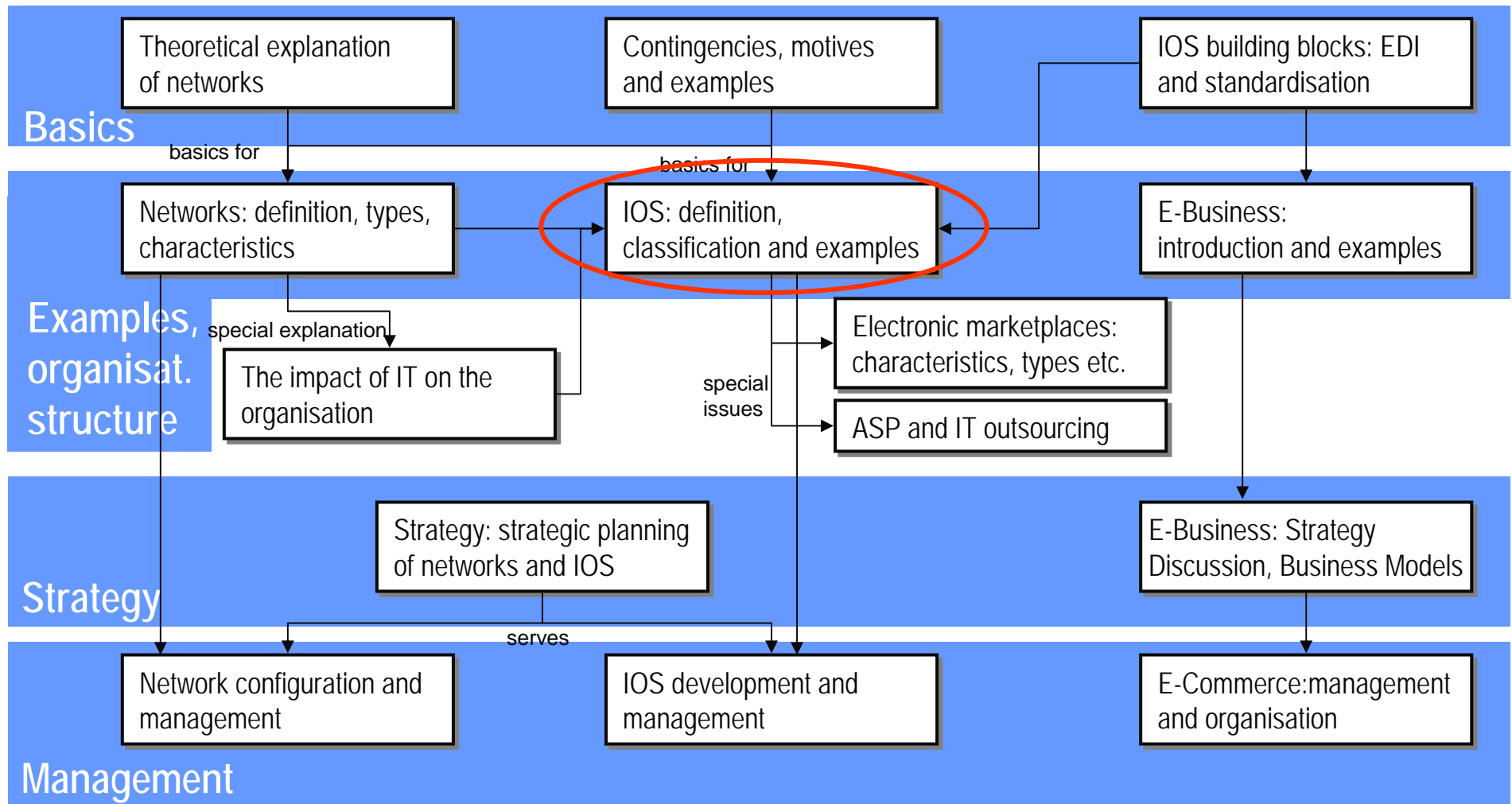


## Objectives of this module

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

# Course Outline



# Agenda

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1. IOS definition and characteristics

2. Criteria for the classification of IOS

3. IOS typologies and classifications

4. IOS examples

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## What does "IOS" mean?

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

## IOS definition

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- 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 organisations, the **organisational boundary is redefined** and extended to the extent that a firm's value chain needs to be redesigned“
- An inter-organisational 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

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

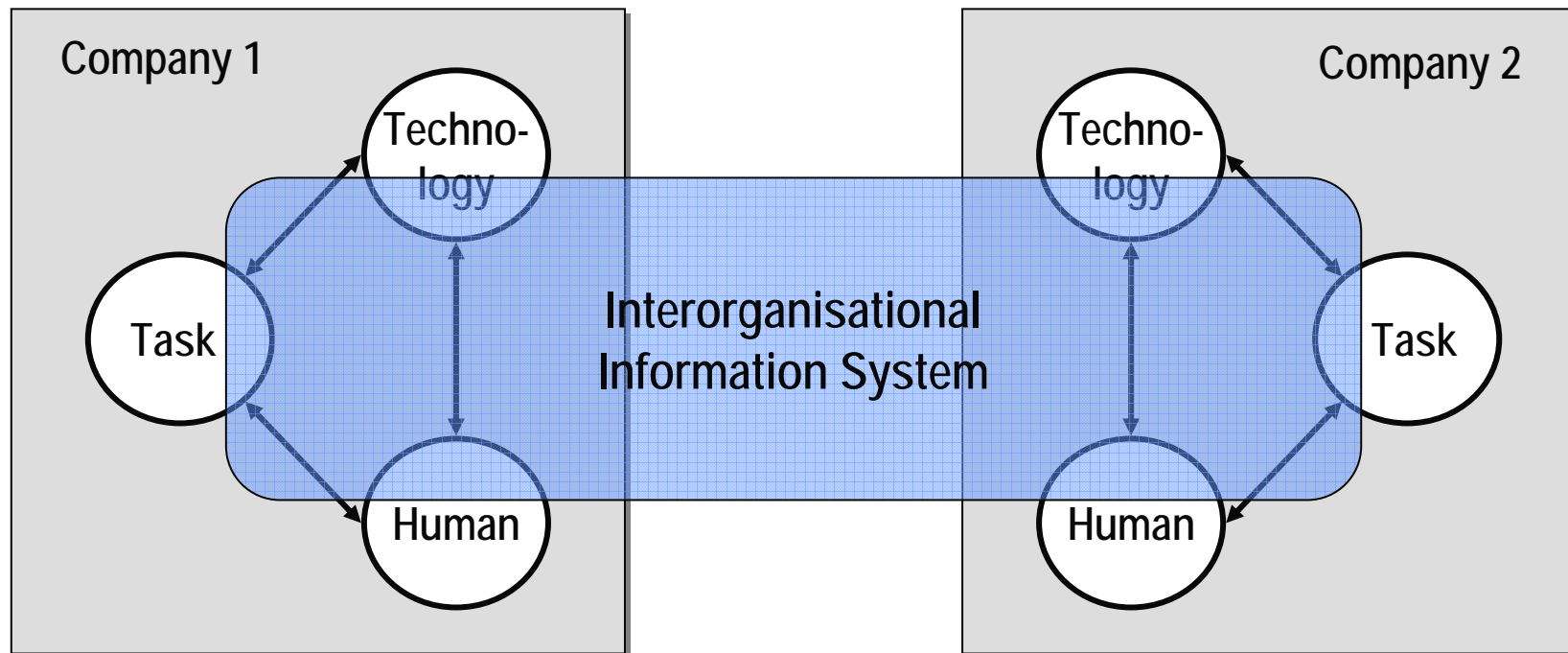
### Organizational perspective

- 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

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

## Constituting elements of IOS

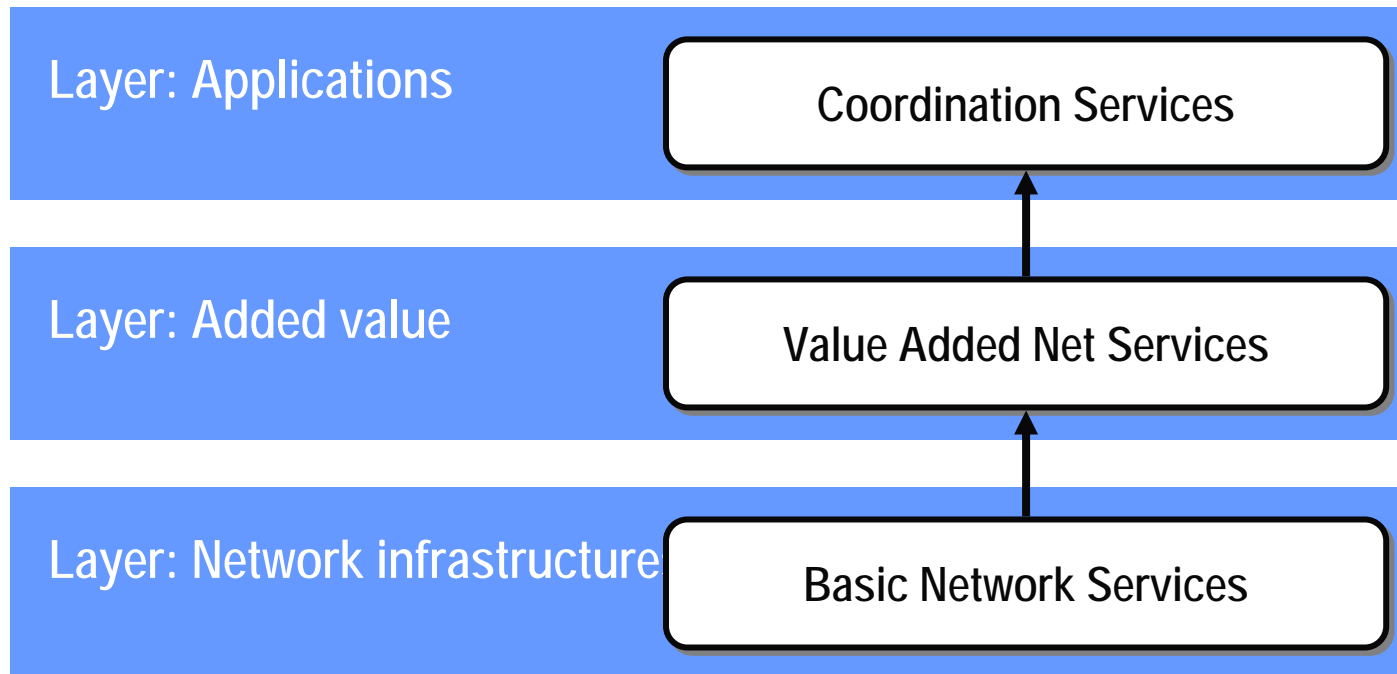
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1. Information system for the support of **value creation** coordination
  - IOS fulfill management/ administrative tasks between companies
  - e.g. support of inter-firm transactions
2. Participation of **minimum two businesses**
  - Participating 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

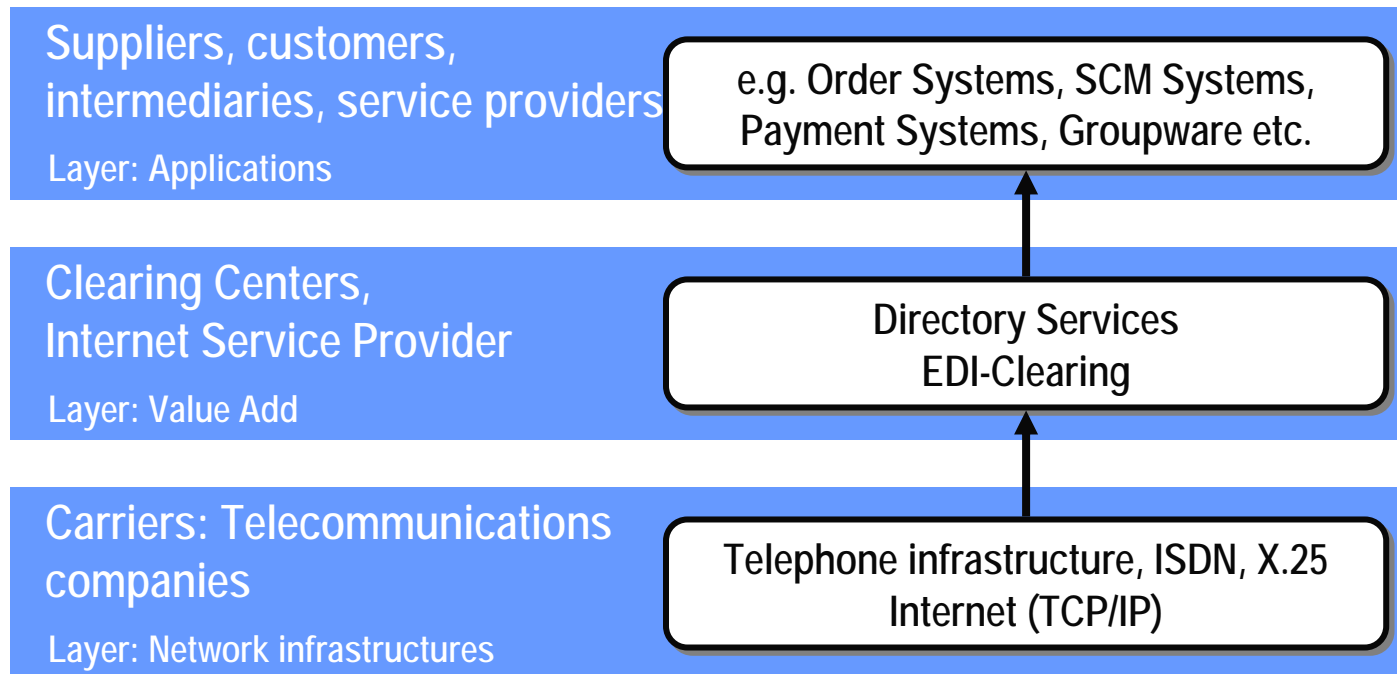
# IOS layer model

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Source: Gaugler (2000), p. 53

# IOS layer model: examples



Source: Gaugler (2000), p. 54

## The changing role of IOS

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- 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 organisational 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, outsourcable function  |
| geographical focus  | national, international   |
| industry focus  | intra- vs. intersectoral  |
| interorganisational degree of coordination/ collaboration             | Information (shared database, info partnership), Communication (EDI), Collaboration (group decision making), Coordination (automatic handling of functions, electronic trading) |
| intraorganisational integration                                       | integration of data, functions, integration among different EDI applications  |

## Classification of IOS: criteria 3/3

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| 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

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## 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

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- sharing of ICT infrastructures
  - e.g. an automatic teller machine (ATM) network (e.g. CashGroup by Deutsche Bank, Commerzbank, HypoVereinsbank, Postbank)
- 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)
- interorganisational 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

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

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

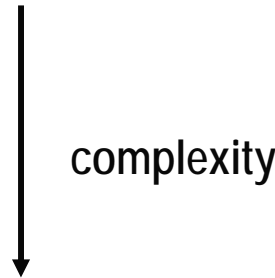
|  |  |  |  |  |
|--|--|--|--|--|
| <b>Firm infrastructure:</b><br>Web based, distributed ERP systems; Online-Investor-Relations                                   |  |  |  |  |
| <b>Human Resource Management:</b><br>Employee self-service via Extranets, E-learning & training, Online recruiting       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

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- 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  |
|---|---|--|
| <b>Coordination</b>                               | 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.             |
| <b>Collaboration (group decision making)</b>      | goals, actors, alternatives, evaluations, choices       | proposing alternatives, evaluating alternatives, making choices (e.g. by authority, consensus, voting)                     |
|   |   | Partner Selection in Virtual Organisation, Decision Support Systems, Collaborative Planning & Forecasting                  |
| <b>Communication</b>                              | senders, receivers, messages, protocols                 | establishing common protocols/languages, selecting receiver (routing), transporting message (delivering)                   |
|   |   | Electronic Data Interchange (EDI), e-Mail Communication  |
| <b>Perception of common objects (information)</b> | 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)

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|                                    |   |
|------------------------------------|---|
| 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, <b>Intent: <i>cooptive</i></b> |
| Virtual system                     | national or international standards selected by a community of market participants, example: VDA in the German auto industry<br><b>Intent: <i>collective</i></b>  |
| Industry platform                  | common platform in the industry, example: IVANS in insurance, SWIFT in the banking industry<br><b>Intent: <i>collaborative</i></b>  |
| Electronic market and access forum | third-party intermediary sets and enforces the rules of the trading environment, examples: Dutch Teleflower Auction, AUCNET<br><b>Intent: <i>competitive</i></b>  |

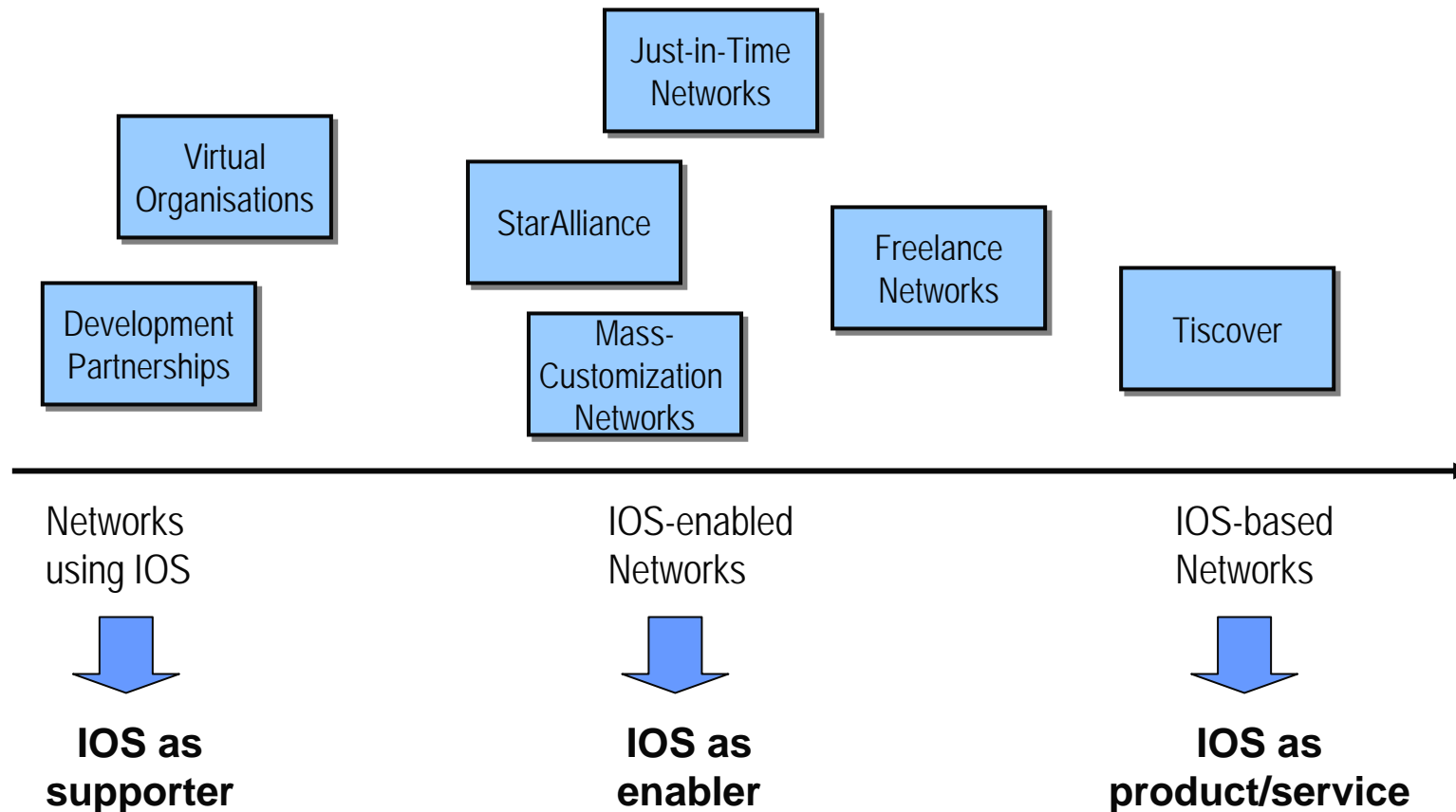
### (3) IOS classification by transaction phases: B2B e-Commerce transactions

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

Source: Gaugler (2000, 51)

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

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## (5) Framework for classification of IOS by Hong

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A two dimensional framework:

### 1. Role linkage (direction of cooperation):

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

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## IOS examples: operational cooperation

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- **Covisint eProcurement:**
  - horizontal coalition of rivals to pool demand in procurement
  - decrease prices, increase efficiency
- **Rosenbluth International Alliance (RIA) (now Amex):**
  - 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

|   |  |
|---|--|
|   |  |
| 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

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## IOS examples: resource pooling

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- **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

**FLEUROP.COM INTERFLORA** Login / Privacy / Contact / Language

*Flower Shop* *Customer Services*

Say it with roses  
Buy now

Join our...  
Member login  
Become a member

**FLEUROP.COM INTERFLORA** Login / Privacy / Contact

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

## Fleurop-Interflora - About Us

**Ordering and delivery**

**Contact us**

**Holidays & business hours**

**Guarantee**

**Privacy policy**

**Frequently Asked Questions (FAQ)**

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.

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.

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'.

## IOS examples: complementary cooperation

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|--|---|
|  |   |
|  | 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)

## Summary

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

## Literature

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- 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.