Sociotechnical Systems through a Work System Lens: A Possible Path for Reconciling System Conceptualizations, Business Realities, and Humanist Values in IS Development

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Organization

- Part 1: description of STS design
  - Are descriptions from leading journals reflected in STS practice?
  - Are basic STS concepts an obstacle to greater adoption?
- Part 2: could a work system approach help?
  - Single system with human participants
  - Assumption that typical business professionals should have a method that they can use themselves, with or without consultants and researchers
  - Would a work system approach address STS design issues?

Mumford (2006)

- “The objective of socio-technical design has always been ‘the joint optimization of the social and technical systems.” …. “Relationships between the two systems, and between them and the outside environment, must also be carefully analysed. This approach led to the development of a complex method for analysing work systems, which went through a number of stages. Unit operations, or groups of tasks that fitted logically together into a discrete work activity, were first identified. Each of these unit operations was made the responsibility of a work group. Next, variances – problem areas where what did happen deviated from what should happen – were noted as areas for improved control by the work group. … All of these were to become the responsibility of the work group.”

Stages of ETHICS Methodology

(Hirschheim and Klein, "Realizing Emancipatory Principles in IS Development, MIS Quarterly, 1994

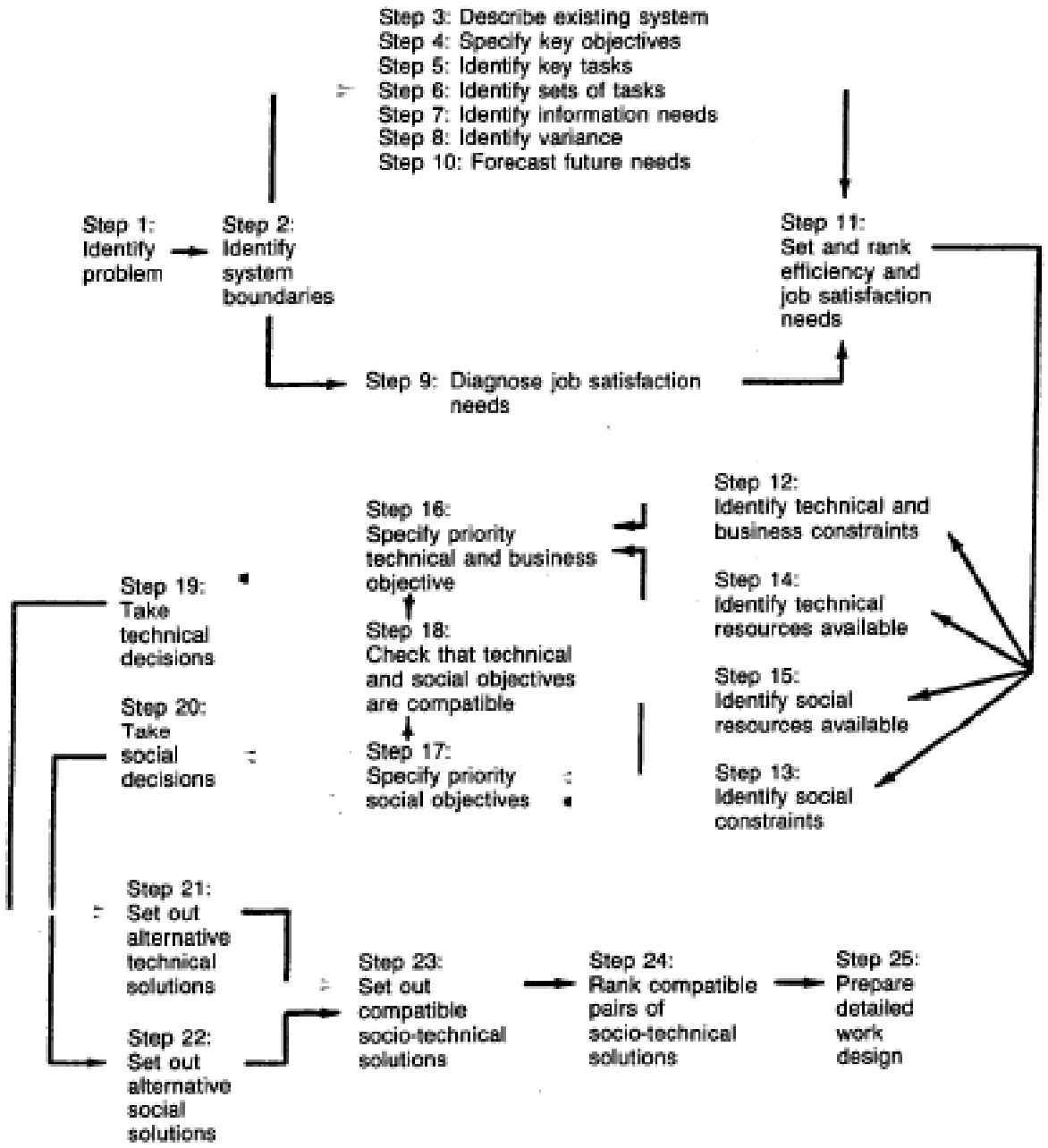


Figure 1. Schematic of the Stages of the ETHICS Methodology

Social System vs. Technical System

(Bostrom and Heinen (1977) "A Sociotechnical Perspective - Part 1: The Causes, MIS Quarterly, Sept. 1977)

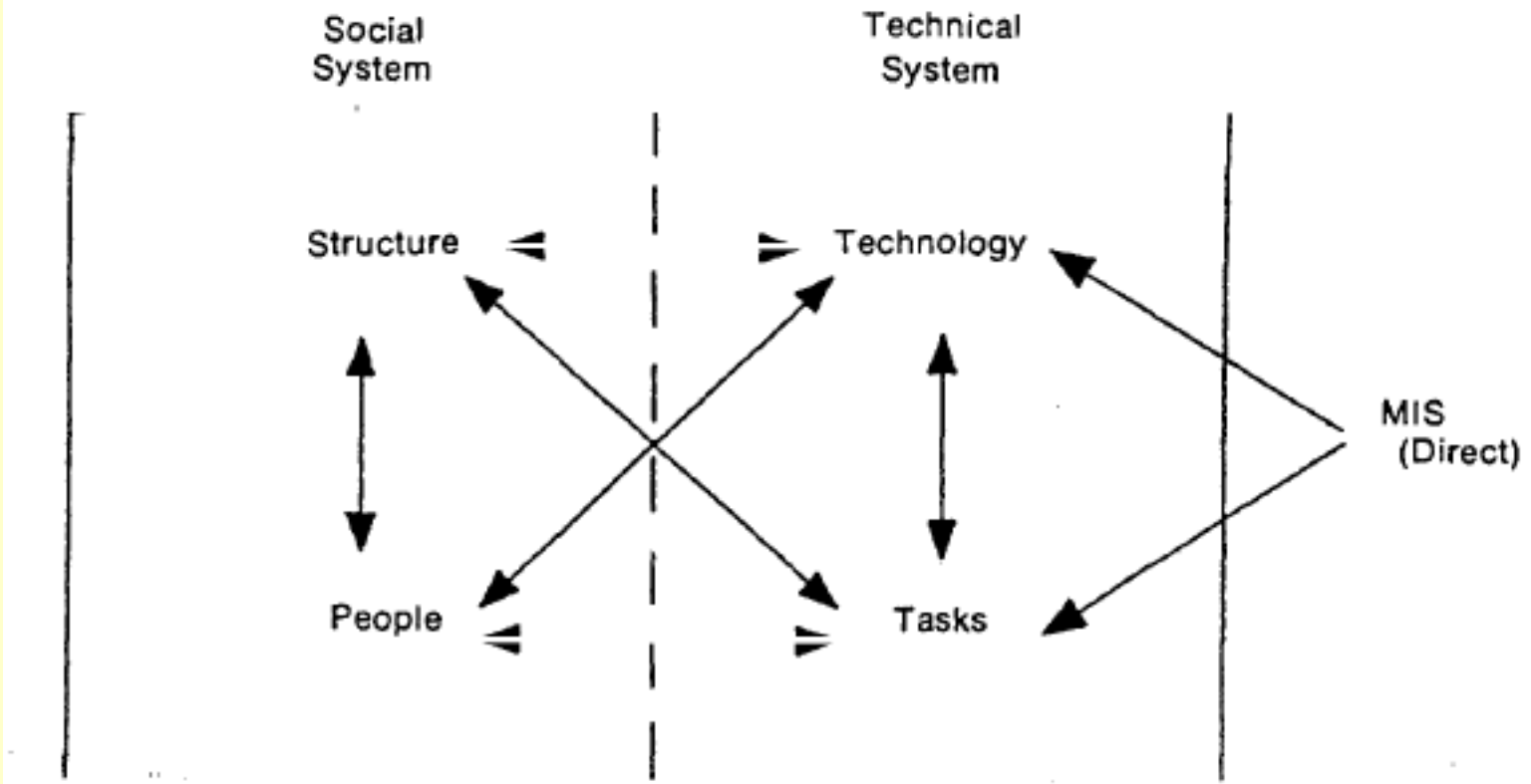


Figure 2. The Interacting Variable Classes Within a Work System

Joint optimization of the social system and technical system?

- Boundaries of the social system?
- Boundaries of the technical system?
- Meaning of joint optimization?

Is “task” social or technical?

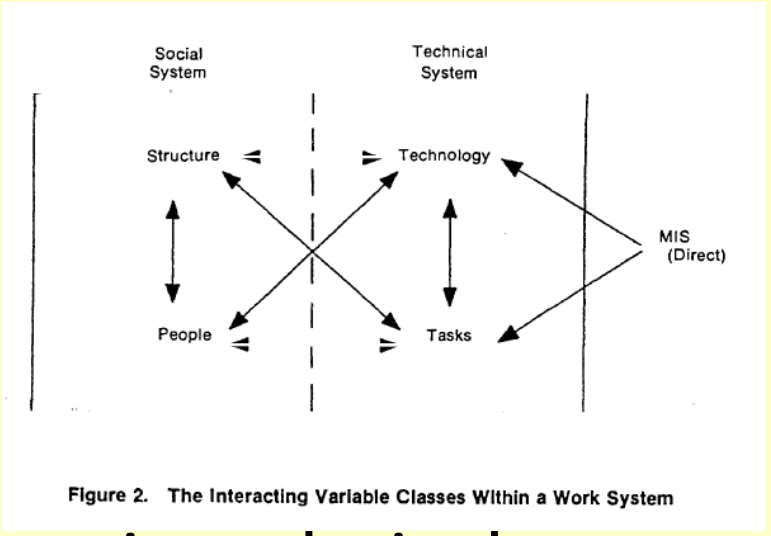


Figure 2. The Interacting Variable Classes Within a Work System

- An automated business process is technical
- What about
  - a largely manual, communication-intensive business process ?
  - a service process that requires customer participation?
  - coordination and articulation work?
  - undocumented steps?
  - improvisation and workarounds?

Is “structure” social or technical?

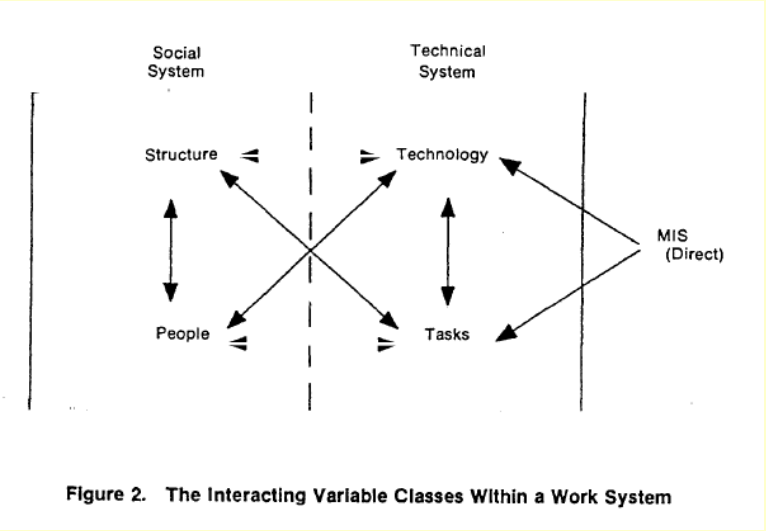


Figure 2. The Interacting Variable Classes Within a Work System

- “Structure-in-practice” is a reflection of tasks (which are viewed as technical)
- More than boxes in an organization chart
- Increasingly constrained and even controlled by capabilities and limitations of technologies such as ERP and networks.

Are “people” social or technical?

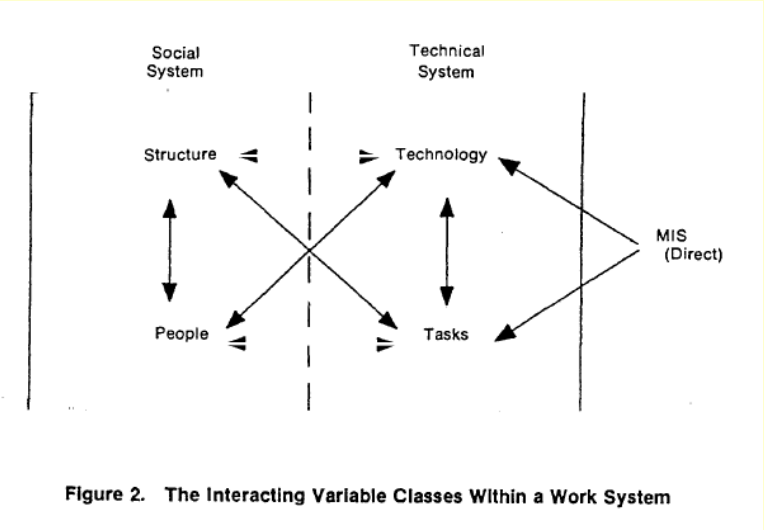


Figure 2. The Interacting Variable Classes Within a Work System

- Longstanding problems with poor communication and collaboration between business professionals and IT specialists

Is “technology” social or technical?

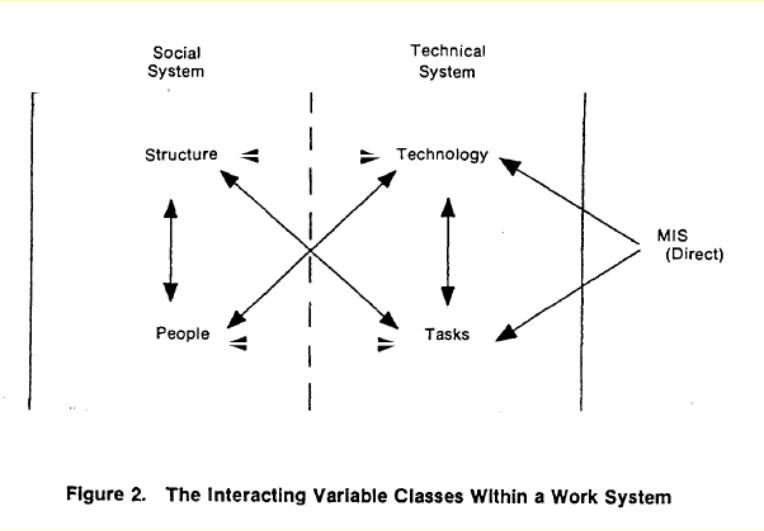


Figure 2. The Interacting Variable Classes Within a Work System

- Social aspects of smart phone technology and other collaboration/ coordiantion technologies
- Social aspects of acceptance and use of new hardware/software configurations
- BYOD (bring your own device): social or technical?

Is "information" social or technical?

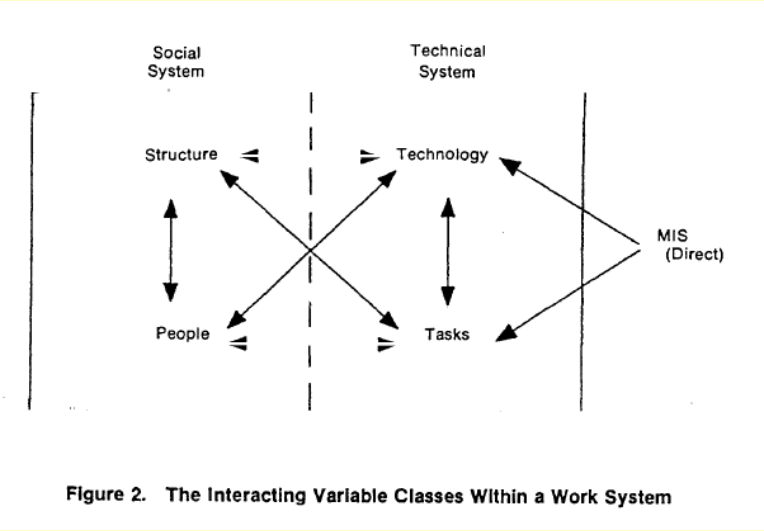


Figure 2. The Interacting Variable Classes Within a Work System

- Information stored in computerized databases may seem technical
- Other information is highly social: commitments, conversations, organizational memory, culture, etc.

Are “product/services” social or technical?

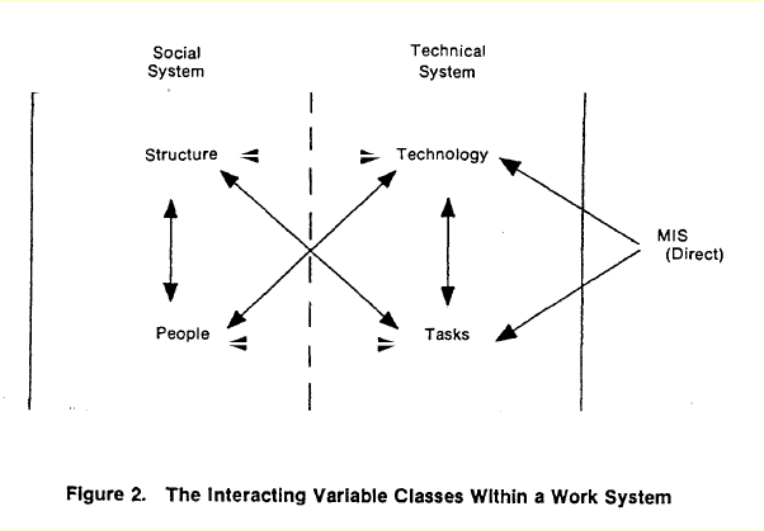


Figure 2. The Interacting Variable Classes Within a Work System

- Many services are largely social.
- Some products seem largely technical
- Many product/services combine social and technical aspects

Joint optimization of social system and technical system?

- Social and technical systems overlap substantially.
- It is difficult to separate the social from the technical.
- Does the term joint optimization mean anything under those circumstances?
  - If so, what is the definition of joint optimization under those circumstances?

Questions for STS Practitioners

- Reality and understandability of the separation between the social system and technical system?
- Reality and understandability of joint optimization?
  - Different from “satisficing” (Simon) ?
  - Different from negotiations and /or negotiated truce?
- Relevance in green field situations, major reorganizations with new participants?
- Relevance as “agile methods” are increasingly accepted?
- Relevance for implementations of enterprise software (ERP) that addresses corporate-level issues, not necessarily local issues?
- Ability to teach real STS design to typical business professionals?

Examples of Work Systems

(from analyses by employed MBA students)

Calculating rates for insurance renewals	Managing software development projects	Acquiring clients at a professional service firm
Receiving materials at a large warehouse	Approving real estate loan applications	Planning and dispatching trucking services
Performing pre-employment background checks	Performing financial planning for wealthy individuals	Scheduling and tracking health service appointments
Operating an engineering call center	Purchasing advertising services	Determining salary increases
Collecting and reporting sales data for a wholesaler	Planning for outages in key real time information systems	Invoicing for construction work

Work System Theory (WST)

- Basically: Look at situations as though the topic is a work system that needs to be improved.

- Definition of work system
- Work system framework
- Work system life cycle model

Definition of Work System

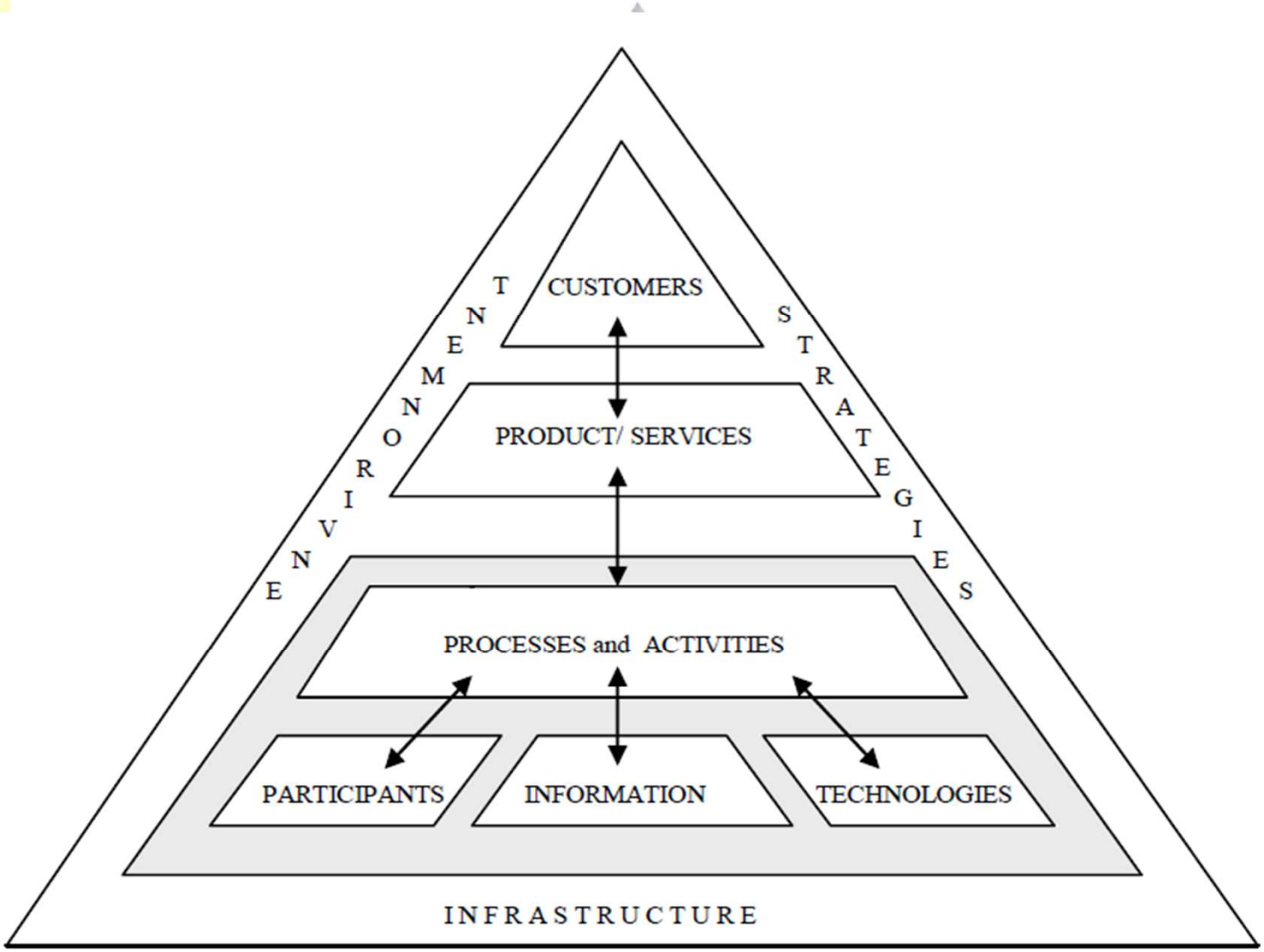
- A system in which human participants **and/or** machines perform processes and activities using information, technology, and other resources to produce products/services for internal or external customers.
- Sociotechnical by default, but may be totally automated.
- Typically uses IT but is not an IT system.
- More than just a business process.

Special Cases of Work System

- Information system
- Project
- Supply chain
- E-commerce
- Service system
- Totally automated work system

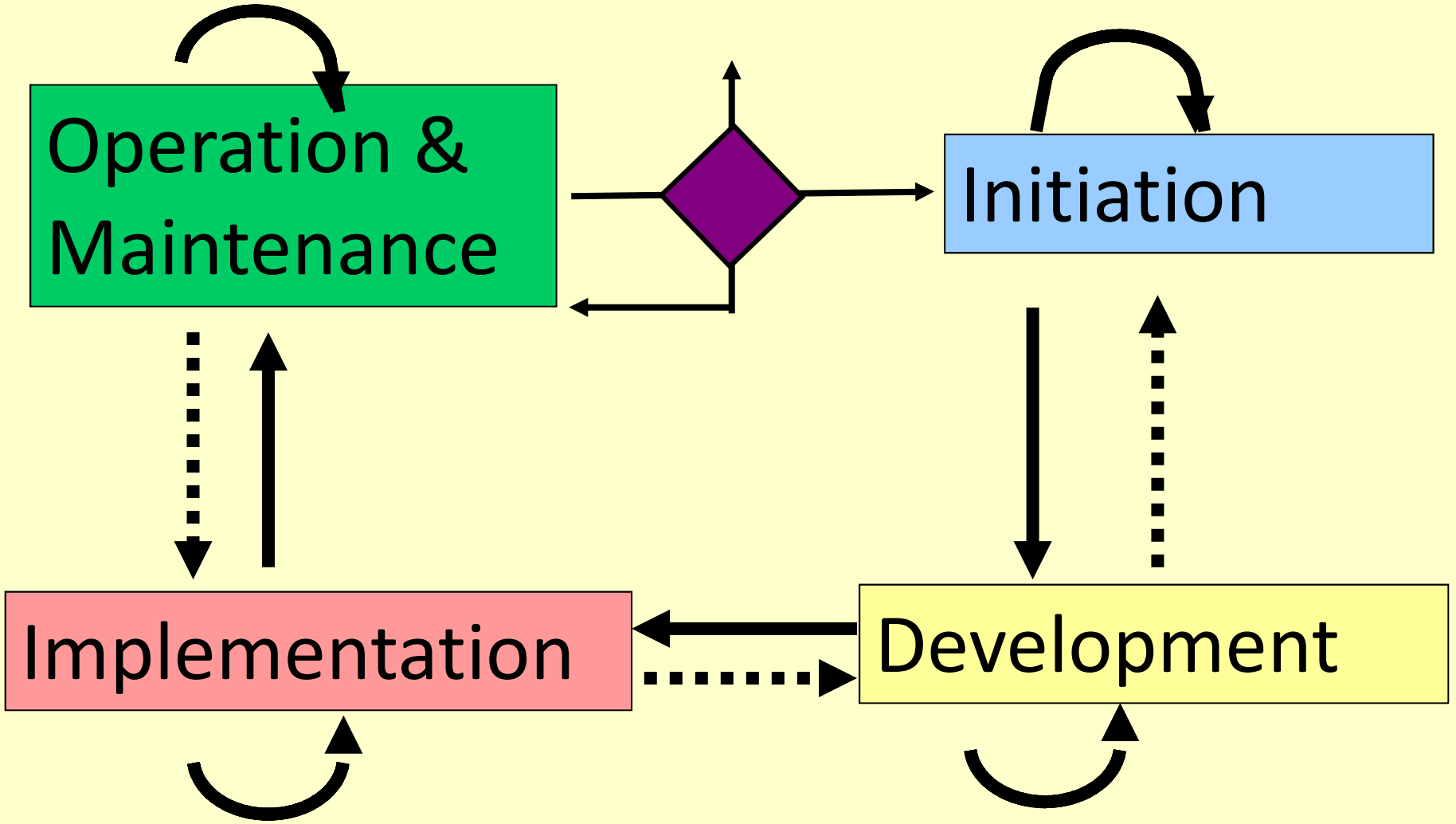
Work System Framework

(static view – assuming some on-going adaptation)



Work System Life Cycle Model

(iterations include planned and emergent change)



Work System Method

- Apply WST
  - Identify the smallest work system that presents an important problem or opportunity
  - Summarize and evaluate the “as is” work system
  - Analyze structure and performance as deeply as appropriate
  - Recommend a “to be” work system
  - Explain advantages of the improved version.
- Different versions for different purposes
- Include any aspects of Six Sigma or other tools that are useful in the situation.

Work System Snapshot – a Basic Tool

Customers	Products & Services
• Hiring manager • Larger organization (which will have the applicant as a colleague • HR manager (who will analyze the nature of applications)	• Applications (which may be used for subsequent analysis) • Job offers • Rejection letters • Hiring of the applicant

Major Activities and Processes	
• **Hiring manager** submits request for new hire within existing budget • **Staffing coordinator** defines the parameters of the new position. • **Staffing coordinator** publicizes the position. • **Applicants** submit job applications. • **Staffing coordinator** selects shortlisted applicants. • **Hiring manager** identifies applicants to interview. • **Staffing coordinator** sets up interviews.	• **Hiring manager** and **other interviewers** perform interviews. • **Hiring manager** and **other interviewers** provide feedback from the interviews. • **Hiring manager** makes hiring decisions. • **Staffing assistant** sends offer letters or rejections. • Successful **applicant** accepts or rejects job offer or negotiates further.

Participants	Information		Technologies
• Hiring managers • Staffing coordinator • Applicants • Staffing assistant • Other employees who perform interviews	• Job requisition • Job description • Advertisements • Job applications • Cover letters • Applicant resumes	• Short list of applicants • Information and impressions from the interviews • Job offers • Rejection letters	• New HR portal that is being built • Word processor • Telephones • Email

Relevant Extensions of WST

- Work system principles
- Work system design spaces
  - Various sets of typical design variables and design criteria
- Work system metamodel
  - Work system framework in more detail
- Theory of workarounds
  - Focusing on a key source of emergent change in the work system life cycle
- Operational view of service systems
  - Seeing work systems as service systems

Table 1. 24 work system principles

Customers	Products/Services
• #1: Please the customers. • #2: Balance priorities of different customers.	
Processes and Activities	
• #3: Match process flexibility with product variability • #4: Perform the work efficiently. • #5: Encourage appropriate use of judgment. • #6: Control problems at their source. • #7: Monitor the quality and timing of both inputs and outputs. • #8: Boundaries between steps should facilitate control. • #9: Match the work practices with the participants.	

Participants	Information	Technologies
• #10: Serve the participants. • #11: Align participant incentives with system goals. • #12: Operate with clear roles and responsibilities.	• #13: Provide information where it will affect action. • #14: Protect information from inappropriate use.	• #15. Use cost/effective technology. • #16: Minimize effort consumed by technology.

Infrastructure	• #17: Take full advantage of infrastructure.
Environment	• #18: Minimize unnecessary conflict with the external environment
Strategies	• #19: Support the firm's strategy
Work System as a Whole	• #20: Maintain compatibility and coordination with other work systems. • #21: Incorporate goals, measurement, evaluation, and feedback. • #22: Minimize unnecessary risks. • #23: Maintain balance between work system elements. • #24: Maintain the ability to adapt, change, and grow.

Work System Design Spaces

- Work system principles
- Possibilities for change in a work system
- Work system characteristics
- Generic subsystem types within a work system
- Typical risks and obstacles
- Interactions with other work systems
- Locations for information and knowledge
- Design dimensions for products/services

Possibilities for Change

Table 2. Design space identifying possibilities for changing components, subsystems, and interactions

Customers	Products/ Services
Add or eliminate customer groups. Change customer expectations. Change the nature of the customer relationship. Change the customer experience.	Change information content. Change physical content. Change service content. Increase or decrease customization. Change controllability or adaptability by the customer. Change customer/ participant relationships Provide different intangibles. Change by-products.

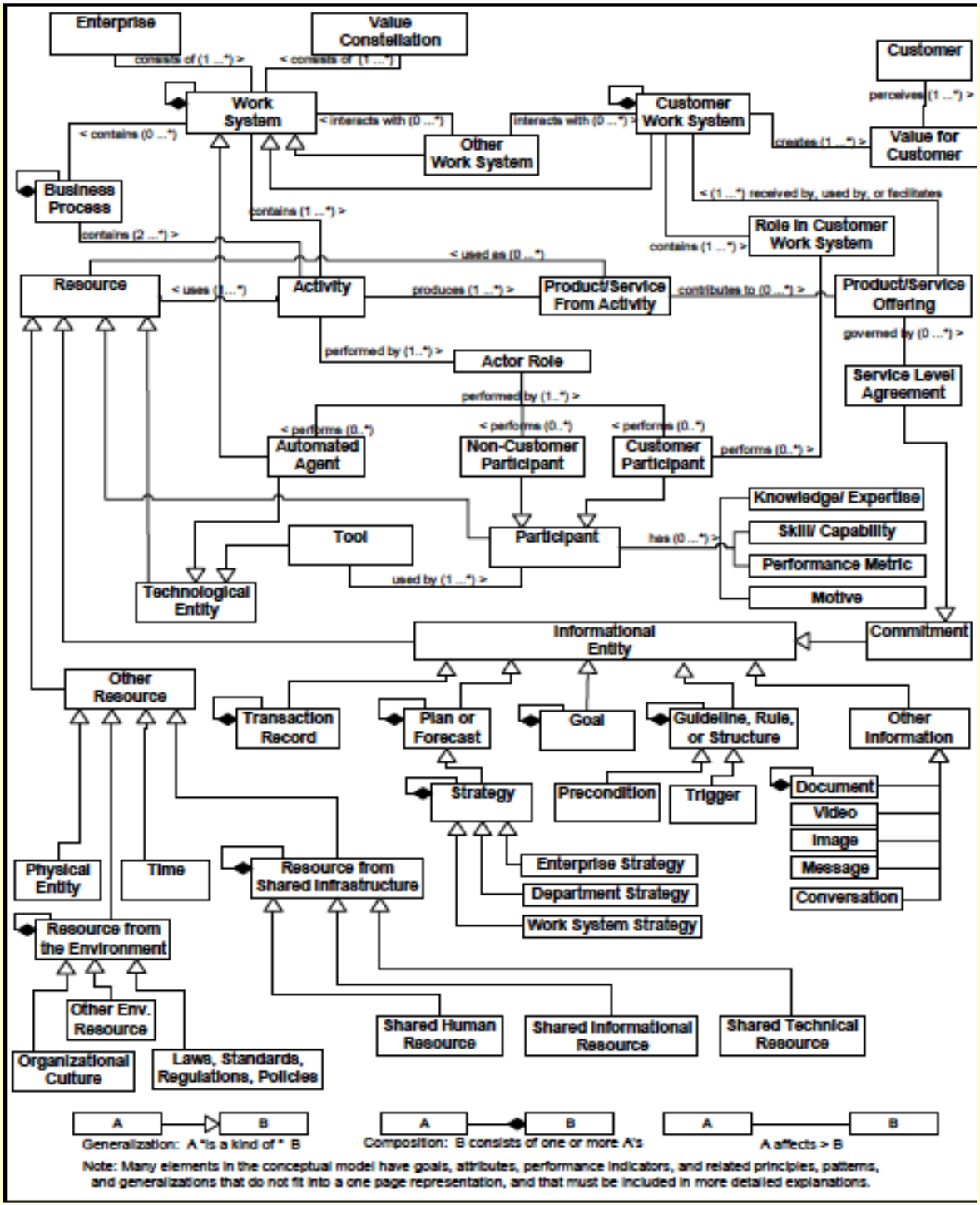
Processes and Activities	
Change roles and division of labor. Improve processes and activities by adding, combining, or eliminating steps, changing sequences, or changing methods used within steps. Change business rules and policies Eliminate built-in obstacles and delays. Add new functions not currently performed.	Improve coordination between steps. Improve decision making practices. Improve communication practices. Improve the processing of information (capture, transmission, retrieval, storage, manipulation, display) Change practices related to physical things (creation, movement, storage, modification, usage, protection)

Participants	Information	Technologies
Change the participants. Provide training. Provide resources needed for doing work. Change incentives. Change organizational structure. Change the social relations within the work system. Change the degree of interdependence in doing work. Change the amount of pressure felt by participants. Assure understanding of details of tasks and use of appropriate information and knowledge. Assure that participants understand the meaning and significance of their work.	Provide different information or codified knowledge. Use different rules for coding information. Codify currently uncodified information. Eliminate some information. Organize information so it can be used more effectively. Improve information quality Make it easier to manipulate information. Make it easier to display information effectively. Protect information more effectively. Provide access to knowledgeable people.	Upgrade software and/or hardware to a newer version. Incorporate a new type of technology. Reconfigure existing software and/or hardware. Make technology easier to use. Improve maintenance of software and/or hardware. Improve uptime of software and/or hardware. Reduce the cost of ownership of technology.

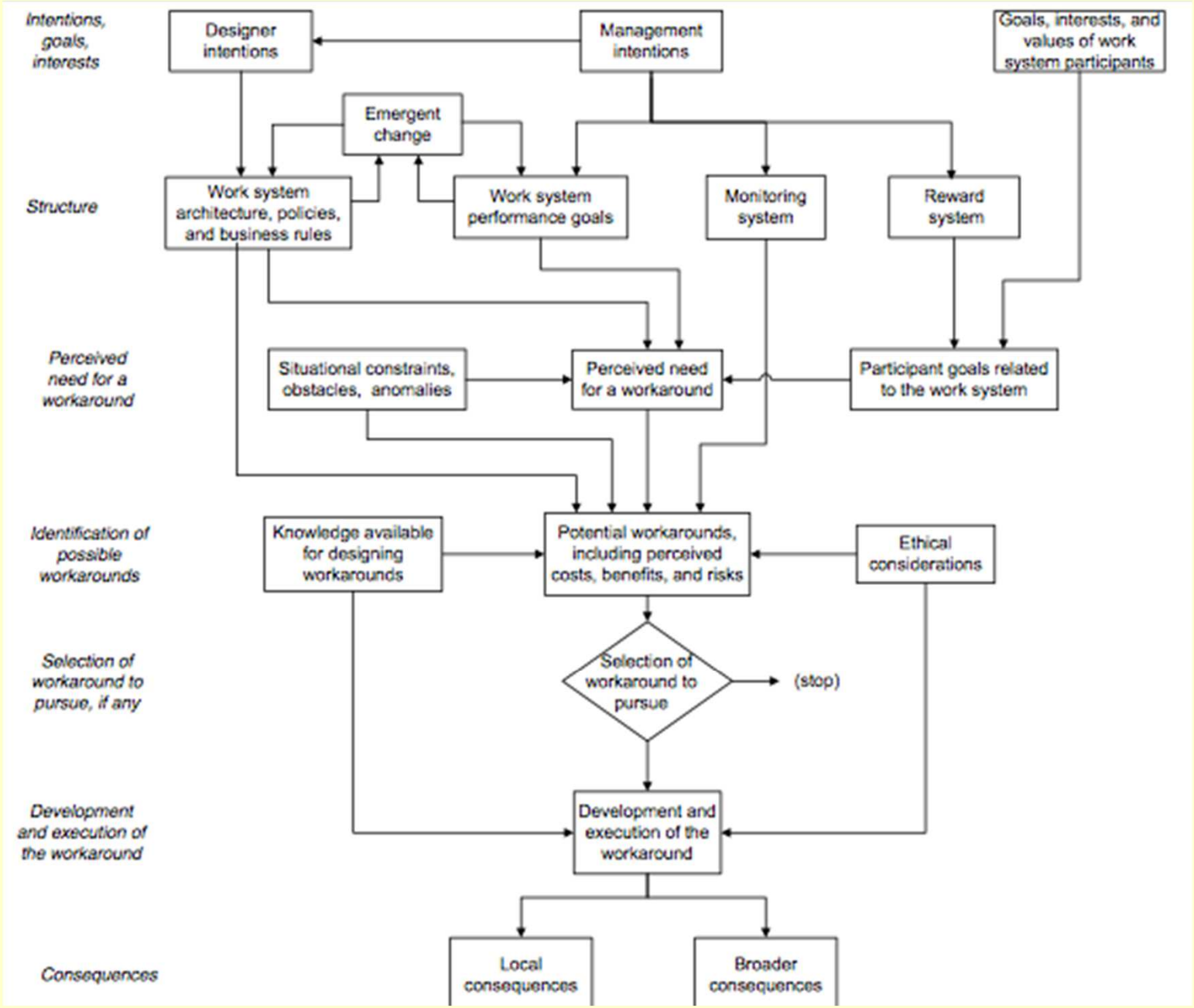
Infrastructure	Make better use of human infrastructure. Make better use of information infrastructure. Make better use of technical infrastructure.
Environment	Improve fit with organizational policies and procedures (related to confidentiality, privacy, working conditions, worker's rights, use of company resources, etc.). Improve fit with organizational culture. Respond to expectations and support from external stakeholders. Improve fit with organizational politics. Respond to competitive pressures. Improve conformance to regulatory requirements and industry standards.
Strategies	Improve alignment with the organization's strategy. Change the work system's overall strategy. Improve characteristics related to specific work system elements
Work System as a Whole	Reduce imbalances between elements. Improve problematic relationships with other work systems. Conform to work system principles.

Work System Metamodel

(reinterprets and extends concepts in the work system framework)



Theory of Workarounds



Possible benefits of seeing sociotechnical systems through a work system lens

- Sociotechnical work systems will be more understandable.
- Systems analysis and design is more likely to reflect business realities
- Humanist values are more likely to be recognized in IS development

Sociotechnical work systems will be more understandable.

- More practical model
  - one system to be improved
  - instead of two overlapping systems to be optimized jointly
- Organized approach to business topics
  - Internal and external issues
- Possible use without consultants or researchers

Systems analysis and design is more likely to reflect business realities.

- Customers – at the top of the work system framework, may be participants
- Service systems, co-production of services
- Product/services are part of the picture
- Trans-organizational work systems
- Transience and organizational flux
- Processes and activities – partially automated or controlled by software
- Outsourcing
- Workarounds and noncompliance
- Participants – part of the work system

Humanist values are more likely to be recognized in IS development.

- "Empowerment" of anyone to think about work systems in an organized way
  - Not just consultants and IT specialists
- A step toward communication and collaboration – because anyone can use the approach