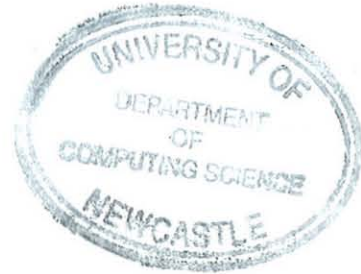
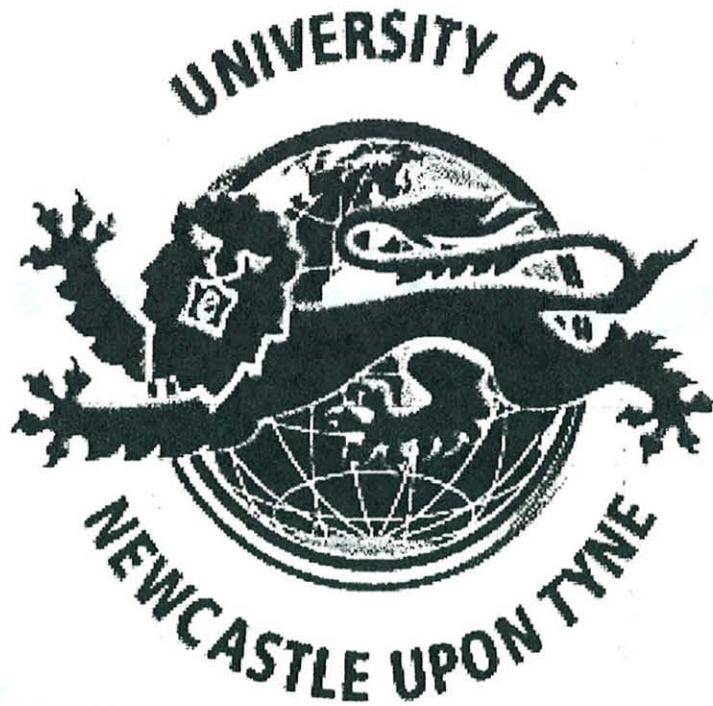


PROGRAMS, PROCESSES, PEOPLE, PERSPECTIVES
and
WHAT IS INFORMATICS?

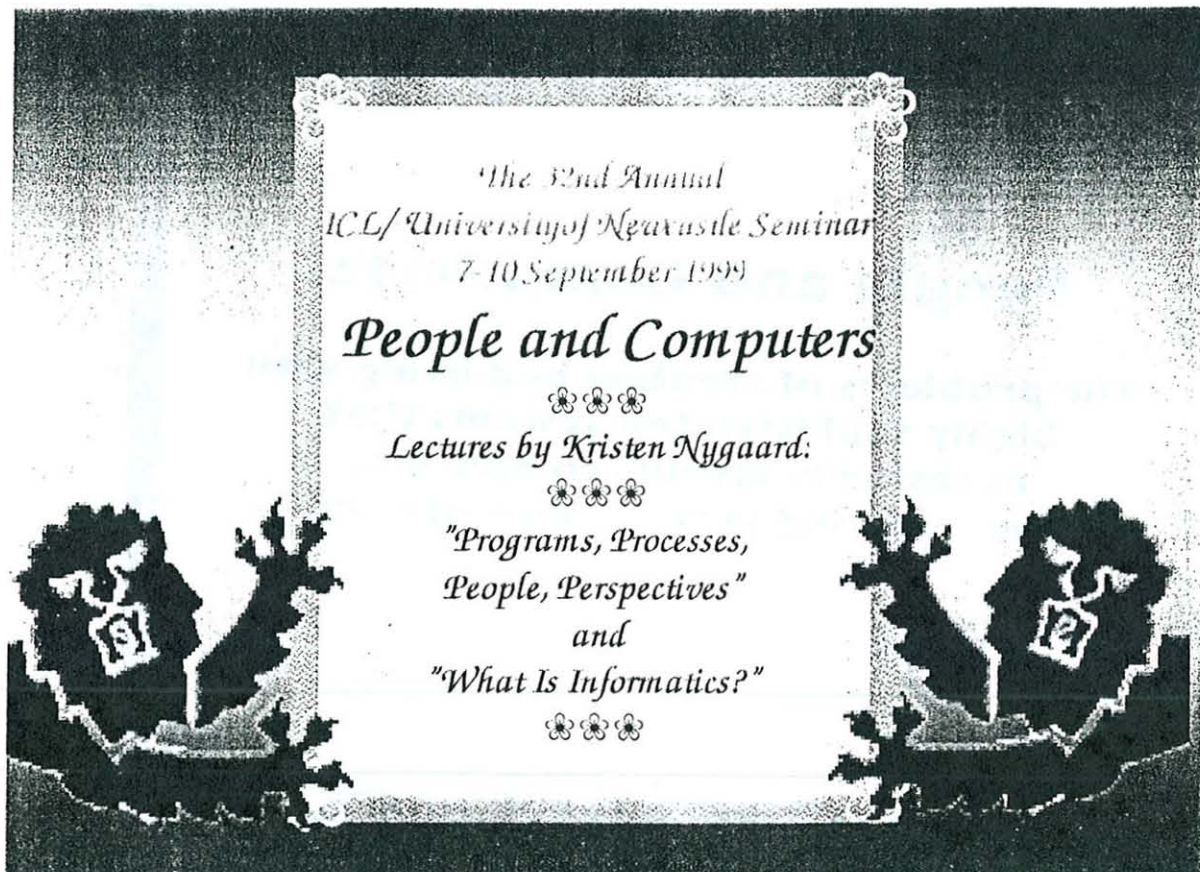
K Nygaard

Rapporteur: Neil Henderson






U. Newcastle



N **PROGRAMS, PROCESSES, PEOPLE, PERSPECTIVES**

People and Computers


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N **PROGRAMS, PROCESSES, PEOPLE, PERSPECTIVES**

People and Computers:

**The problems of creating and living with
highly sophisticated systems that
necessarily involve computers,
networks, and large groups of people**

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N **PROGRAMS, PROCESSES, PEOPLE, PERSPECTIVES**

People and Computers:

**The problems of
creating and living with
highly sophisticated systems
that necessarily involve
computers, networks, and large groups of people**

Informatics:

**The study of the
creation and operation of
systems of computers and people in networks**


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N **PROGRAMS, PROCESSES, PEOPLE, PERSPECTIVES**

Informatics

**Informatics is the science
that has as its domain
information processes
and related phenomena
in artifacts, society and nature**


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PROGRAMS, PROCESSES, PEOPLE, PERSPECTIVES	
Timetable - I	
1965-67	Growing concerns within unions in Norway. Use by employers of object-oriented programming (SIMULA) to reorganise work
1967-70	Contact between unions and scientists. Discussions, then ideas for an active strategy.
1971-73	"Iron and Metal Workers' Project". Cooperation between scientists, local and central echelons Of Norway's at that time strongest union.
1973	First course on "Computers and Society" at the University of Oslo. (Now compulsory for all students of informatics.)
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Timetable -1

PROGRAMS, PROCESSES, PEOPLE, PERSPECTIVES	
Timetable -2	
1974	First local Data(Technology) Agreement. Active interest starting in Sweden (unions and scientists) and Denmark (students).
1975	Nation-wide Data Agreements. Union Project ("Demos") started in Sweden. First Aarhus Conference bringing together unionists, scientists, students and managers.
1973-77	UNITE (Union Net for Information, Teamwork and Education) project starts the active use and development of information technology locally and centrally in unions in Norway.
1985	The second Aarhus Conference (for scientists from many countries) summing up what has been achieved and what ought to be done.
1995	The third Aarhus Conference.
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Timetable -2

N **PROGRAMS, PROCESSES, PEOPLE, PERSPECTIVES**

**The definition of "result"
in the Iron&Metal Project 1970-73:**

**"- in this project the definition of a result
is an action carried out within a trade union,
centrally or locally,
as a part of or triggered off by the project."**

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N **PROGRAMS, PROCESSES, PEOPLE, PERSPECTIVES**

System Development

- ✓ for users**
- ✓ with users**
- ✓ by users**

Tailorability

PEOPLE AND COMPUTERS **NEWCASTLE '99** 


© Kristen Nygaard, 1999 System Development for, with and by users

N **PROGRAMS, PROCESSES, PEOPLE, PERSPECTIVES**

	Conflict perspective	Harmony perspective
Observed harmony	Apparent harmony	Manifest harmony
Observed conflict	Manifest conflict	Apparent conflict

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© Kristen Nygaard, 1999 Conflict Harmony




N **PROGRAMS, PROCESSES, PEOPLE, PERSPECTIVES**

Cross Contact

**An information system is providing
 cross contact
 within a group
 when the system makes it possible:
 for this group's members
 to exchange information
 that they themselves select
 as being relevant
 to furthering their own interests**

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N PROGRAMS, PROCESSES, PEOPLE, PERSPECTIVES

Cooperation
is a social skill
which has to be
continuously
practiced
to survive

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N PROGRAMS, PROCESSES, PEOPLE, PERSPECTIVES

Notions like
conflicting values,
interests, power
cannot be properly treated by
quantitative methods

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© Kristen Nygaard, 1999 Conflicting Values etc. cannot



N**PROGRAMS, PROCESSES, PEOPLE, PERSPECTIVES**

**In social situation, notions as
value, interest, power
are unavoidable elements,
and knowledge based systems
will be manipulated by opposing
actors as tools to achieve
contested goals,
regardless of the intended
purpose of these systems**

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Manipulation of Knowledge Based Systems

**N****PROGRAMS, PROCESSES, PEOPLE, PERSPECTIVES**

CSCW

- **Computer supported cooperative work?**
- **Computer supported conflict and war?**
- **.... or both?**

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CSCW



N **PROGRAMS, PROCESSES, PEOPLE, PERSPECTIVES**


Spheres in a workstation environment

Open: Final, responsible, results
Shielded: Exploration, tentative, irresponsible, restricted
Private: secret

Spheres in a network environment

Ubiquitous computing

"Cageing"


PEOPLE AND COMPUTERS **NEWCASTLE '99** 

© Kristen Nygaard, 1999 Spheres in workstation and network environments

N **PROGRAMS, PROCESSES, PEOPLE, PERSPECTIVES**

Spheres of Visibility

- **Private**
- **Team**
- **Internal(Institution)**
- **Public**

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PROGRAMS, PROCESSES, PEOPLE, PERSPECTIVES

Does the information technology create unemployment ?

Incorrect phrasing of the question!

Correct phrasing:

How is employment influenced by the way in which information technology is being used in the economic system in our society ?

A question of economics?

A question of technology?

A question of interaction between economics and technology!

A question of a politically based assumption about how society should function

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Unemployment and Technology



PROGRAMS, PROCESSES, PEOPLE, PERSPECTIVES

Two Key Points:

- 1: Skills are being built into the production equipment by information technology**
- 2: Data communication makes remote administrative control possible.**
- But: information technology also opens up for a wider range of other alternatives for organisation of the society - and may be used in the development and support of human skills and cooperation.**

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Employment, Two Key Points



N **PROGRAMS, PROCESSES, PEOPLE, PERSPECTIVES**

**Professional
responsibility
- a cornerstone
in complex
tecnological societies**

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N **PROGRAMS, PROCESSES, PEOPLE, PERSPECTIVES**

**A Necessary Condition for
Responsibility in Skills and
Professions:**

**A person may be made
responsible
for her/his decisions**

**only if she/he may reasonably
be regarded as being
responsible
for the selection and use
of the knowledge base
involved in the decision.**

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N

PROGRAMS, PROCESSES, PEOPLE, PERSPECTIVES

Perspectives

- A carefully structured attack, resulting in a beautiful goal?
- Or an evident penalty kick?
- Or evidence of sports as an outlet for aggression?



PENALTY!

- Is the model railway a model of the real shunting yard?
- Or the device for finding the layout that the real shunting yard will be modelled after?



What is the referent and what is the model?

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Perspectives - Football - Model Train

N

PROGRAMS, PROCESSES, PEOPLE, PERSPECTIVES

Perspective

In any given situation,
a person's cognitive process
is structured by a perspective that:

- is common to a domain of situations considered similar to the given one,
- selects those properties of the situation that are being considered (and, by implication, those that are ignored), and
- provides concepts and other cognitions that are being used in the interpretation of the selected properties.

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Perspective Definition



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PROGRAMS, PROCESSES, PEOPLE, PERSPECTIVES

Perspectives When is a chair a chair?



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When is a chair a chair?



N

WHAT IS INFORMATICS?

Example of differing perspectives:

Strong typing

1. "Strong typing is fascism"
(MIT manual, allegedly written by students,
quoted by KN in a lecture at a "Fourth
Generation Language" user conference in
Garmisch.)
2. "Why is it fascism to hit hard at the keyboard?"
(The response from the audience.)

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Strong typing is fascism




PROGRAMS, PROCESSES, PEOPLE, PERSPECTIVES
**Functions, Content,
Methods**

- ✓ **Functions that are intended to be carried out through the system development process and its sub-processes.**
- ✓ **Content of a given system development process.**
- ✓ **Methods that propose a structure to be imposed upon the system development process.**

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Functions/Content/Methods


PROGRAMS, PROCESSES, PEOPLE, PERSPECTIVES
**Functions in
System Development**

- ✓ **Investigation**
- ✓ **Construction**
- ✓ **Implementation**
- ✓ **Decision**
- ✓ **Communication**
- ✓ **(Coordination ?)**

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Functions in System Development





PROGRAMS, PROCESSES, PEOPLE, PERSPECTIVES

The “User” Concept

**Functional role
representatives**

**Interest group
representatives**

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PROGRAMS, PROCESSES, PEOPLE, PERSPECTIVES

Functional Roles in System Development and Use

- ✓ **Rulers**
- ✓ **Managers**
- ✓ **Operators**
- ✓ **Customers**
- ✓ **Bystanders**
- ✓ **Designers**
- ✓ **Programmers**
- ✓ **Teachers**

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PROGRAMS, PROCESSES, PEOPLE, PERSPECTIVES

Group Interests in Systems

- ✓ Which economic benefits will we (the group and its members) gain from the system (as employees, middle management, top management, owners or shareholders) ?
- ✓ To what extent will we be able to exercise control over the system?
- ✓ How will the system influence our physical and psychological work environment?
- ✓ How will the system influence the content of jobs?
- ✓ Will the interhuman contact net be changed to our advantage or disadvantage ?
- ✓ What are the interrelationships between the purpose of the system and our preferred societal objectives?

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Group Interests in Systems



PROGRAMS, PROCESSES, PEOPLE, PERSPECTIVES

Process-structure Levels.

- 1 Process:** The information process (e.g. program executions, data processing by people and machinery in offices, etc.).
- 2 Structure:** The limitations imposed upon this process by computer programs, machine hardware properties, written and unwritten rules of human behaviour etc.
- 3 Process:** The system development process, including programming as a partial process, that has the structure of the information process (or modification of its structure) as its product.
- 4 Structure:** The limitations imposed upon system development by organisation, existing knowledge, available resources etc.
- 5 Process:** The process of learning within organisations, the research process, the adaptation of organisations to a changed environment.

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Process structure levels

N**PROGRAMS, PROCESSES, PEOPLE, PERSPECTIVES****System Development Methods**

1. An area of application: A type of system to be produced, a type of development organisation.
2. A perspective, consisting of assumptions about the nature of systems, organisations, the surrounding society and the purpose of the local organisation.
3. Principles for organising the development process, splitting it into partial tasks, assigning resources.
4. Techniques of work used in the partial tasks.
5. Tools used in the applications of the techniques.

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System Development Methods

**N****PROGRAMS, PROCESSES, PEOPLE, PERSPECTIVES**

**The properties of
the implemented system
are not independent of
the method used
in its implementation**

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The properties of the implemented system...



N

PROGRAMS, PROCESSES, PEOPLE, PERSPECTIVES

**No single perspective is
sufficient
when relating to
the development and use
of an information system**

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N

PROGRAMS, PROCESSES, PEOPLE, PERSPECTIVES

**" Decision processes using expert
systems should always allow for
the incorporation of reasoning
according to alternative relevant
perspectives."**

**Renate Wenzlaff,
Humboldt Universität, Berlin**

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Exp Systems Altern Perspectives



N

PROGRAMS, PROCESSES, PEOPLE, PERSPECTIVES

Social and Professional Responsibility and AI

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Social and Professional Responsibility and AI



N

PROGRAMS, PROCESSES, PEOPLE, PERSPECTIVES

Turing's Criterion for Machine Intelligence

(rephrased):

**An electronic information system
is intelligent if a human being
in remote communication with the
system
is not capable of deciding
whether the communication partner
is human or machine.**

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Turing's Criterion





PROGRAMS, PROCESSES, PEOPLE, PERSPECTIVES

Alternative Criterion:

**An electronic information system
has expert capability in a domain
according to a reference group
if members of that group
consider the system to
perform equally well as a recognised
human expert in the domain.**

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Alternative Criterion



PROGRAMS, PROCESSES, PEOPLE, PERSPECTIVES

**The useful introduction of AI
tools and techniques would be
easier if it was accepted that
AI deals with**

**machine representable
knowledge**

**Then one could establish a new
battle line:**

**"What is machine
representable?"**

**accepting that this is an open
issue.**

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AI Deals with "Machine Representable Knowledge"




PROGRAMS, PROCESSES, PEOPLE, PERSPECTIVES
Experts, Knowledge and Machines

**Knowledge based systems =
(Machine representable) knowledge based
systems.**

**Expert systems =
Knowledge based systems that are intended
to :**

- **Contain a large knowledge base
constituting the machine representable
parts of the knowledge of an expert in
some domain.**
- **Operationalise this knowledge through
an inferencing algorithm.**

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Experts Knowledge Machines


PROGRAMS, PROCESSES, PEOPLE, PERSPECTIVES
Knowledge and Machines

Definition:

**Machine representable
knowledge consists of:**

- **quantifiable facts.**
- **formalisable rules and
relations.**

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Knowledge and Machines





PROGRAMS, PROCESSES, PEOPLE, PERSPECTIVES

What is informatics?

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What Is Informatics?



WHAT IS INFORMATICS?

The "Scandinavian" School/Approach Background

**Operational Research (Conflicting actors,
conflicting values and world models obviously
had to be considered)**

**SIMULA's success (Employees' interests not
considered. Trade Union contacts)**

Political neutrality of technology contested

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The Scandinavian School - Background





WHAT IS INFORMATICS?

The "Scandinavian" School/Approach The "Iron and Metal Project", Trade Unions

Alternative world view to that of capital

**Users dominant (Participating in setting
objectives, evaluation, and design)**

**Building user strength (knowledge,
agreements, laws)**

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The Scandinavian School - The "Iron and Metal Project"



WHAT IS INFORMATICS?

The "Scandinavian" School/Approach Information system research

Empirical informatics

(Cases: What did really happen?)

Multiperspective reflection essential

**(Always identify all relevant actors and
perspectives)**

Users

(System development for, with, by users)

Multidisciplinary research

**(Organisation theory, sociology, psychology,
philosophy, anthropology, ...)**

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The Scandinavian School - Information system research



N

PROGRAMS, PROCESSES, PEOPLE, PERSPECTIVES

**Informatics should be defined like
most other sciences
(and unlike mathematics) as:**

**The study by scientific methods of
a domain of phenomena
and a perspective
selecting a set of characteristics
of those phenomena**

**That is, like physics, chemistry,
botany, sociology, political science**

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Definition of a science



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PROGRAMS, PROCESSES, PEOPLE, PERSPECTIVES

Informatics

**Informatics is the science
that has as its domain
information processes
and related phenomena
in artifacts, society and nature**

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Informatics



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PROGRAMS, PROCESSES, PEOPLE, PERSPECTIVES

Aspects of Sciences

1. **Observation:** The empirical study of the phenomena - their identification, observed properties and behaviour. (Tycho Brahe in astronomy, Carl von Linné in botany.)
2. **Analysis:** Comprehension and explanation of phenomena in terms of an underlying theory. Identification of important properties and concepts, relations between properties and concepts, description and predictions of behaviour. (Isaac Newton in astronomy, Charles Robert Darwin in biology.)
3. **Synthesis, construction, technology:** Knowledge organized for the purpose of designing, generating or modifying phenomena. (Edward Teller in nuclear physics.)
4. **Multiperspective reflection:** The concurrent or alternating use of several perspectives in the consideration of phenomena, from within the same science (light: as waves - Christiaan Huygens, as particles - Isaac Newton), or from different sciences (civilisations: Karl Marx in economy, Talcott Parsons in sociology).
The study of how changes introduced according to one viewpoint affect properties of the phenomena when regarded from another viewpoint.

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Aspects of Sciences



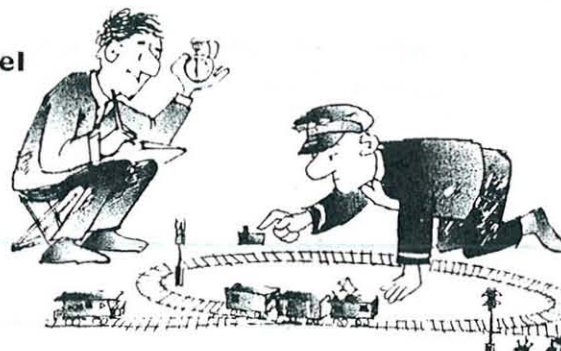
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WHAT IS INFORMATICS?

Perspectives

- A carefully structured attack, resulting in a beautiful goal?
 - Or an evident penalty kick?
 - Or evidence of sports as an outlet for aggression?
-
- Is the model railway a model of the real shunting yard?
 - Or the device for finding the layout that the real shunting yard will be modelled after?

What is the referent and what is the model?



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Perspectives - Examples

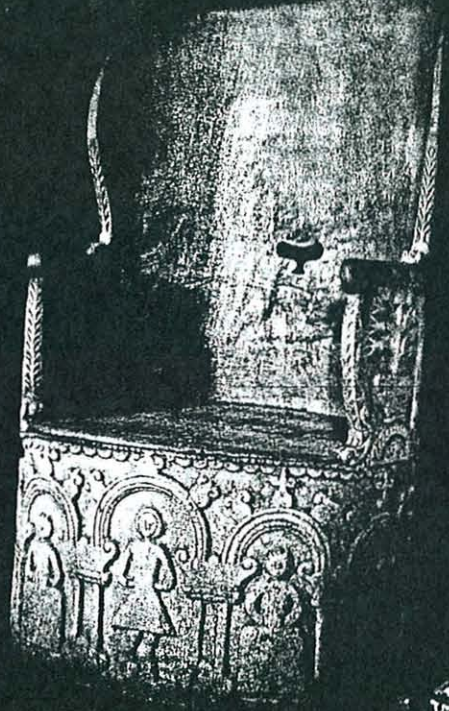


N

WHAT IS INFORMATICS?

Perspectives

When is a chair a chair?



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When is a chair a chair?



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WHAT IS INFORMATICS?

Perspective

In any given situation,
a person's cognitive process
is structured by a perspective that:

- is common to a domain of situations considered similar to the given one,
- selects those properties of the situation that are being considered (and, by implication, those that are ignored), and
- provides concepts and other cognitions that are being used in the interpretation of the selected properties.

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Perspective





Model

"A phenomenon M is a model of a phenomenon R, according to some perspective P,

if a person regards M and R as similar according to P.

We will call R the referent phenomenon (or simply referent) and M the model phenomenon (or simply model).

We will call P the perspective of the model M."

(Lindsjörn and Sjöberg, 1987)



Processes (I)

- 1. The economic development of Norway in the years 1992-1998**
- 2. "Ms. Brown recovered after an exhausting disease"**
- 3. The operation of a restaurant**
- 4. The design and operation of the harbour at an oil refinery**



Processes (2)

5. The chain of events (and changes of state) in an office, in a hospital.
6. The execution of a computer program.
7. The operation of a database.
8. Thinking (cognitive processes in the minds of people).



Process

A process is a phenomenon that we choose to regard as a development of a part of the world through transformations during a time interval called its life span.

The basic qualities of a process are

- its substance,
- its states,
- its transitions, and
- its structure.



**WHAT IS INFORMATICS?****Substance, physical matter**

- ✓ **Characterised by volume and a unique location in time and space**
- ✓ **Examples: Mozart, a table, a computer memory location**

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Substance

**WHAT IS INFORMATICS?****Measurable properties of substance**

- ✓ **Properties of substance can be measured**
- ✓ **The results of measurements can be compared and described by values, types and relations**
- ✓ **Examples: the weight of a person, the blood pressure of a person, the state of a memory cell**

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Measurable properties



**WHAT IS INFORMATICS?**

Transformations of substance

- ✓ **Partially ordered sequence of actions changing the (measurable properties of) some substance**
- ✓ **Examples: pushing a button, drilling a hole, eating, changing the state of a memory cell**

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Transformations

**WHAT IS INFORMATICS?**

Structure

**Structure of a process is
limitations of its set of
possible states and
of transitions
between these states.**

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Structure





Structures

- ✓ Written and unwritten rules being obeyed
- ✓ An enforced budget cut in a project
- ✓ The effect of programs
- ✓ An enforced state (e.g. initialisation)
- ✓ Perspectives

**Closed and open structures
Transient and persistent
structures**



Information process

**A process is regarded as
an information process
when the qualities considered are:**

- ✓ its substance, the physical matter that it transforms,
- ✓ the state of its substance, in terms of measurable properties, the results of measurements represented by values,
- ✓ its transitions, the transformations of its substance and thus of its state.





WHAT IS INFORMATICS?

System

A system is a part of the world

- ✓ that is regarded as a whole,
- ✓ its substance consisting of components,
- ✓ each component's state characterised by properties that are selected as being relevant, and by
- ✓ state transitions relating to these properties and to other components and their properties.

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System



WHAT IS INFORMATICS?

**Object
Oriented
Programming**

**System
Oriented
Programming**

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OOP = System OP



Object Oriented Programming

- In object oriented programming an information process (program execution) is regarded as a system developing through transformations of its state
- The substance of the system is organised as objects, building the system's components
- All attributes of the substance are properties of objects
- Transitions - transformations of state - are regarded as being the result of actions of objects



The abstraction of the three basic qualities of information processes (and information systems)

- ✓ **substance** : the class declaration (records, files)
- ✓ **state** - measurable properties with values : the type declaration (quantities, integer and real variables, etc.)
- ✓ **transition** - transformation, action: the procedure declaration.





WHAT IS INFORMATICS?

Main language categories

- Substance oriented languages
- State oriented languages
- Transition oriented languages

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Main language categories



WHAT IS INFORMATICS?

Substance oriented languages and constructs

- The substance of the system is organised as objects, building the system's components
- A measurable property of the substance is a property of an object
- Transformations of state are regarded as being the result of actions of objects
- In object oriented programming an information process (program execution) is regarded as a system developing through transformations of its state

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Object Oriented Programming





WHAT IS INFORMATICS?

State oriented languages and constructs

- **Constraints**
- **Feasibility sets**
- **Inferencing, about a state or about feasibility sets in operation at a given stage**
- **Manoeuvring**

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State oriented languages



WHAT IS INFORMATICS?

"Under-specification" leads to less robust systems

More complete specification:
A larger part of our knowledge about a system is incorporated in its structure specification

Needed:
Constraints, since important parts of our knowledge about a system most naturally is expressed by relations.

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Underspecification leads to less robust systems



**WHAT IS INFORMATICS?**

Transition oriented languages and constructs

- **"Transition" emphasises the movement from one state to another**
- **(Alternative: "enforcement" of a new state, by the evaluation of an expression, the evaluation being conceptually regarded as "motionless")**
- **Applicative languages**
- **Functional languages**
- **Evaluation of expressions**

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Transition oriented languages

**WHAT IS INFORMATICS?**

**None of these perspectives are
"going to take over"**

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No perspective is going to take over





WHAT IS INFORMATICS?

Language and work

- ✓ Application oriented languages
- ✓ Job oriented languages
- ✓ Profession oriented languages

Language about work

Language in work



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Language and work



WHAT IS INFORMATICS?

•Manoeuvre

- n. [Fr. *manoeuvre*, orig., hand labour < L. *manu operare*, to work by hand] ...
- 3. any movement or procedure intended as a skillful or shrewd step toward some objective.
- - vi., vt. ...
- 3. to move, lead, get, put, make, compel, etc. (a person or thing) by some stratagem or scheme.
- (Webster, New World Dictionary, 1984)



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Manoeuvre

WHAT IS INFORMATICS?

**From
transient and closed processes
to
persistent and open processes,
manoeuvred by enforcement
of states and transient
structures**

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From transient to persistent processes

**WHAT IS INFORMATICS?**

DELTA extended the notion of actions :

**"The actions of a component (object)
may be divided into the categories:**

**time consuming actions,
as, e.g. the heating of ore
to the melting point within a furnace,
or the traversing of a crane from one point to another,
or discussing which decision alternative to choose, all
being executed during a time interval.**

**instantaneous actions,
as, e.g., the leaving of a queue,
or the selection of which ship
in a queue of waiting ships should be allowed
to occupy an empty quay position in a busy harbour,
considered as initiated, executed and completed
at a discrete point in time."**

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Time consuming and instantaneous actions





WHAT IS INFORMATICS?

WHILE {temperature \leq melting point} **LET** {temperature = start-temperature + F(Energy-supply(time))};

WHILE{time < delivery time} **LET** {candidates work, each in isolation, on their written exam};

LET {Evaluation of exam} **DEFINE** passed, mark;

LET {x ** + y ** \leq r **} **DEFINE** x, y;

LET {Position of cardinals be inside conclave}; **WHILE** {no pope is elected} **LET** {Negotiations go on. Emit black smoke after each indecisive vote}; **WHILE** {Voting slips are burning} **LET** {White smoke be emitted};

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Examples of property descriptors



WHAT IS INFORMATICS?

Actors and roles

**The relation between the
program executions
(the information processes)
and the components
(men and machines)
carrying out the actions
(in the information processes)**

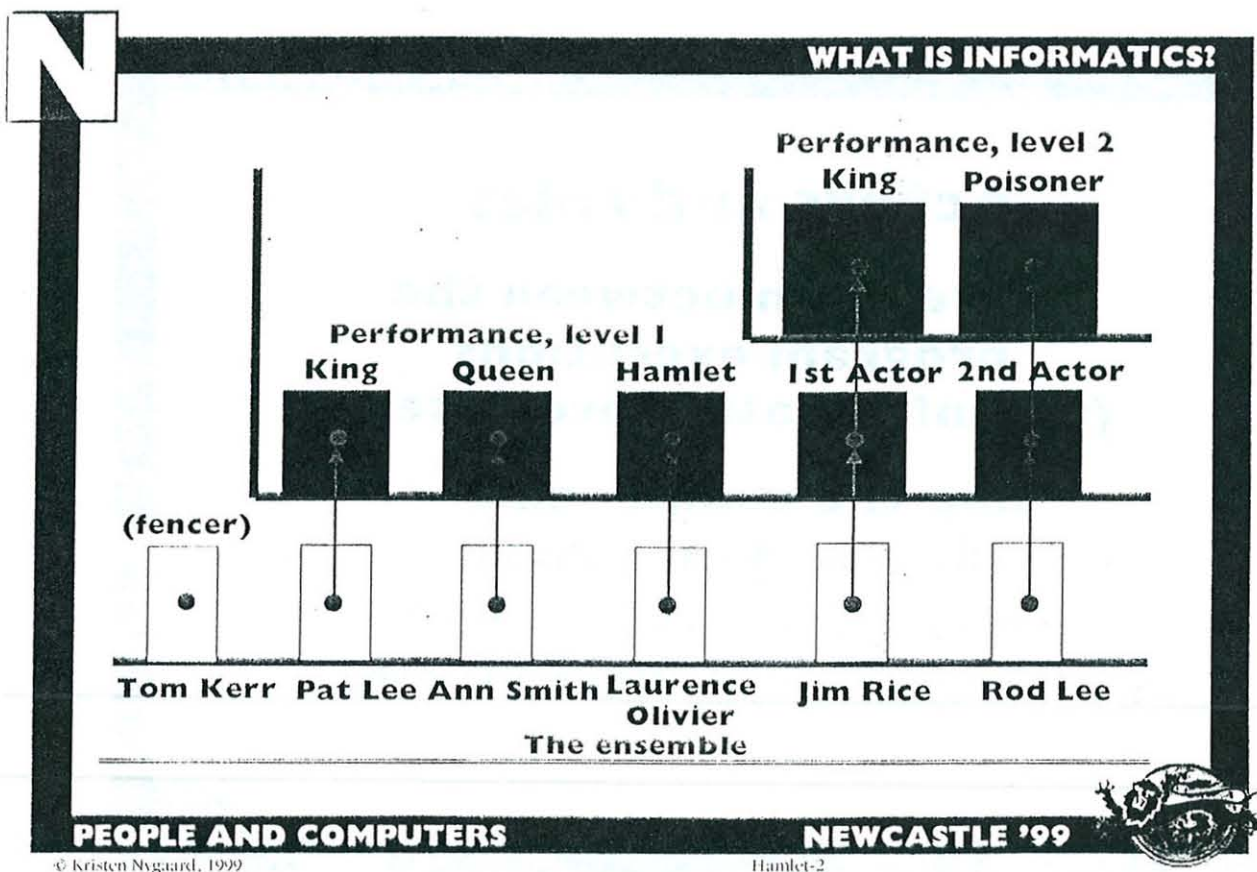
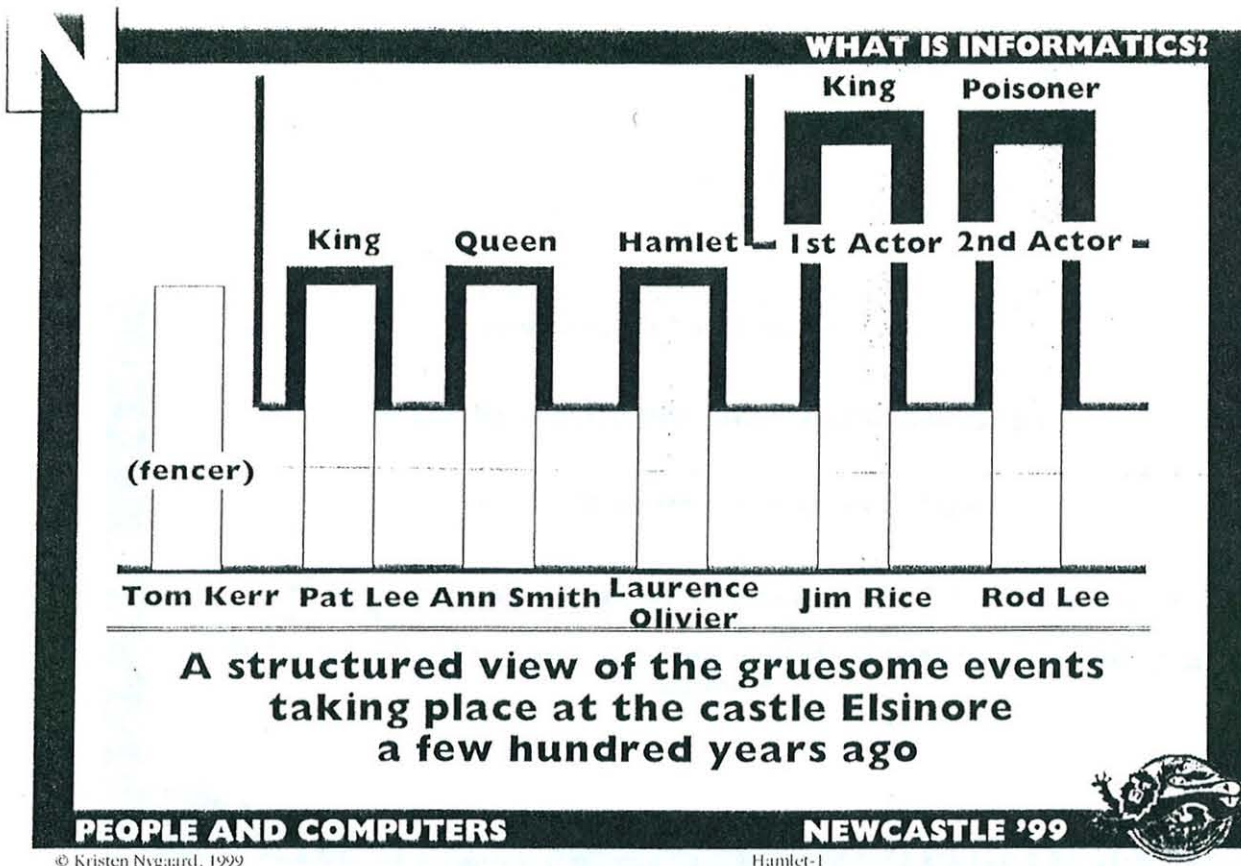
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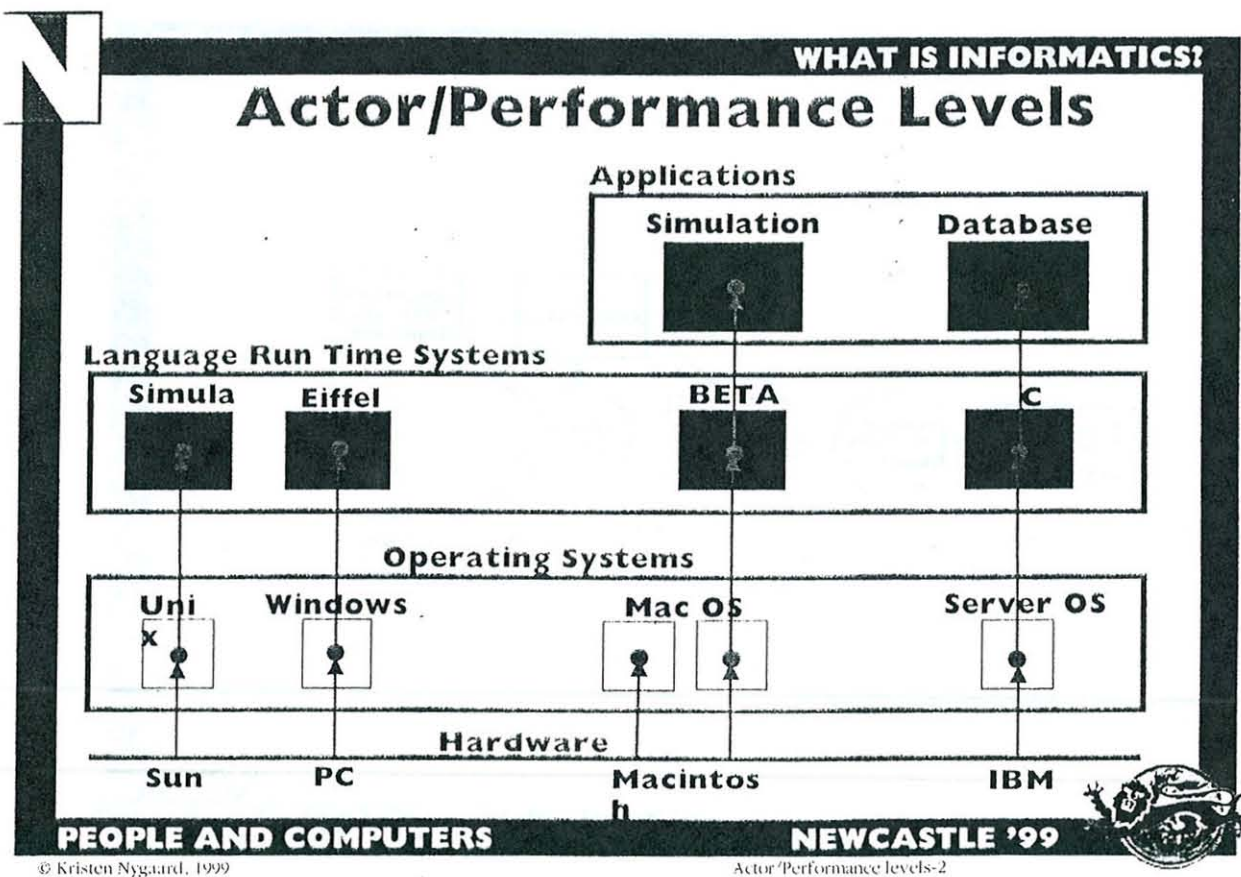
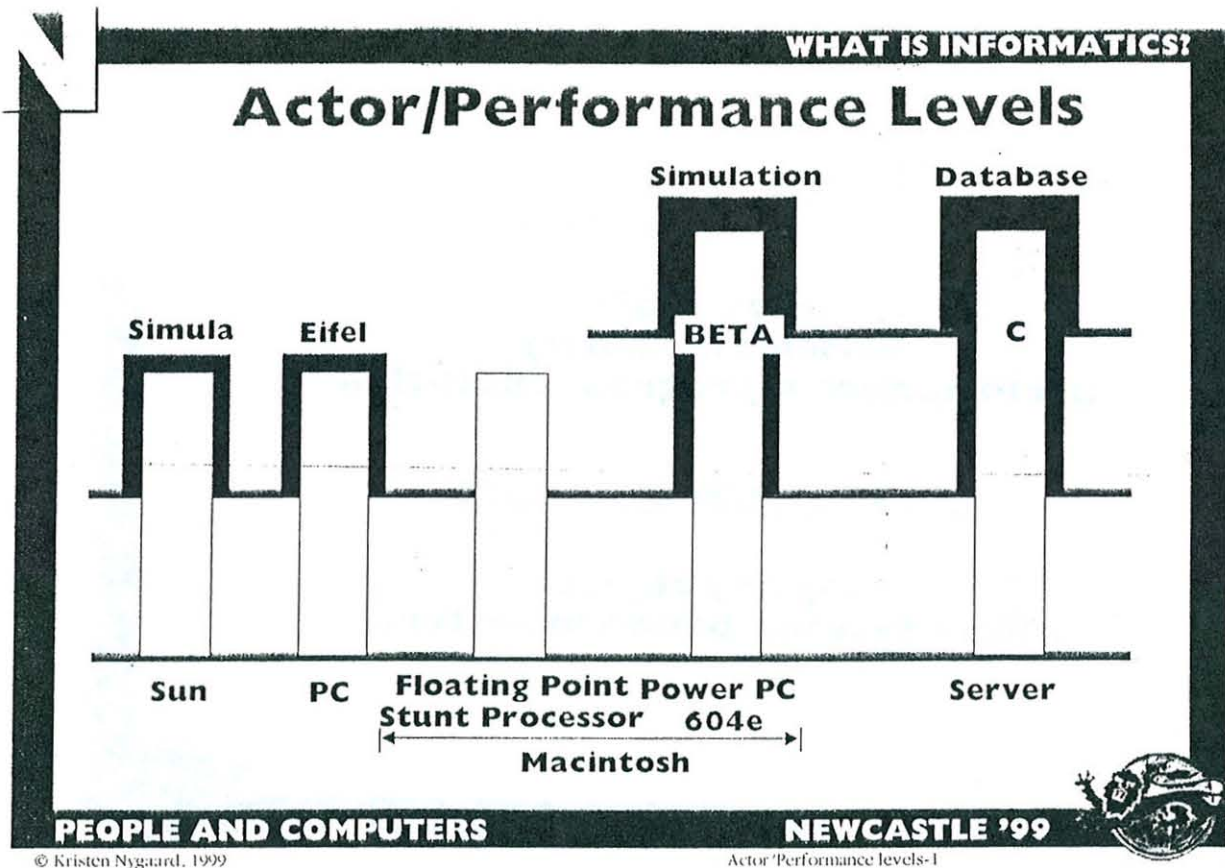
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Actor and roles









WHAT IS INFORMATICS?

Interpretation

actor / role
(ensemble / roles)
performance = program execution

Communication

object / object
within system, between systems

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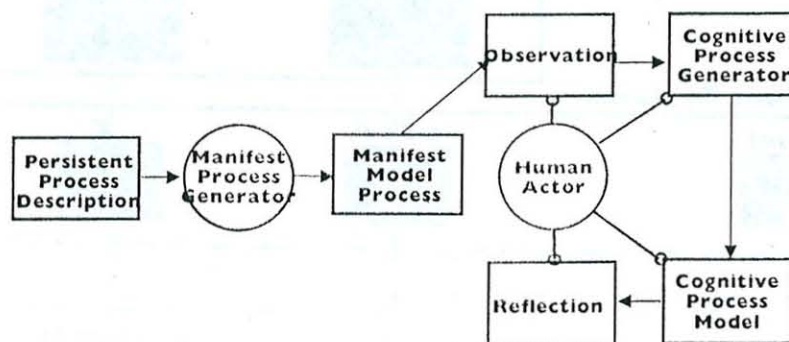
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Interpretation / Communication



WHAT IS INFORMATICS?



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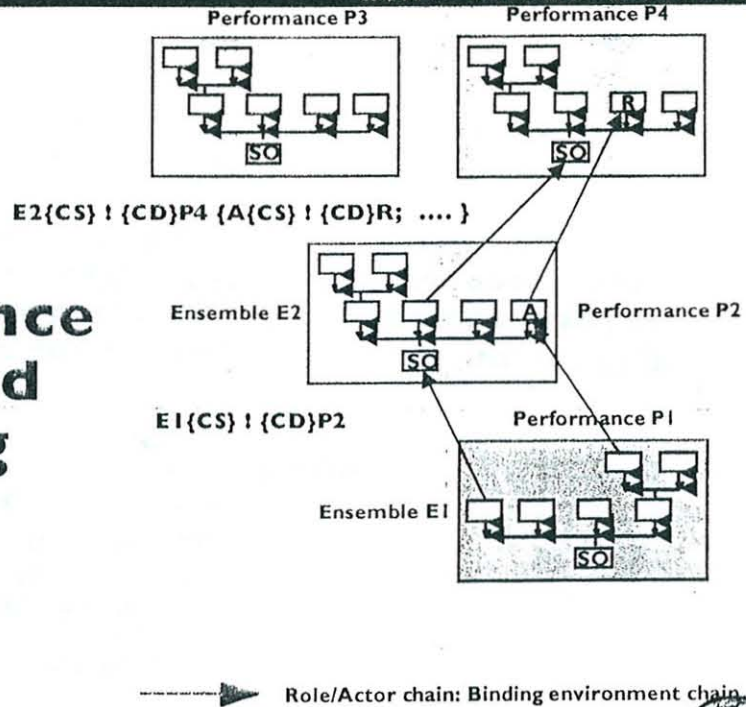
Process Description - Computer - Model - Human Actor



N

WHAT IS INFORMATICS?

Performance levels and binding



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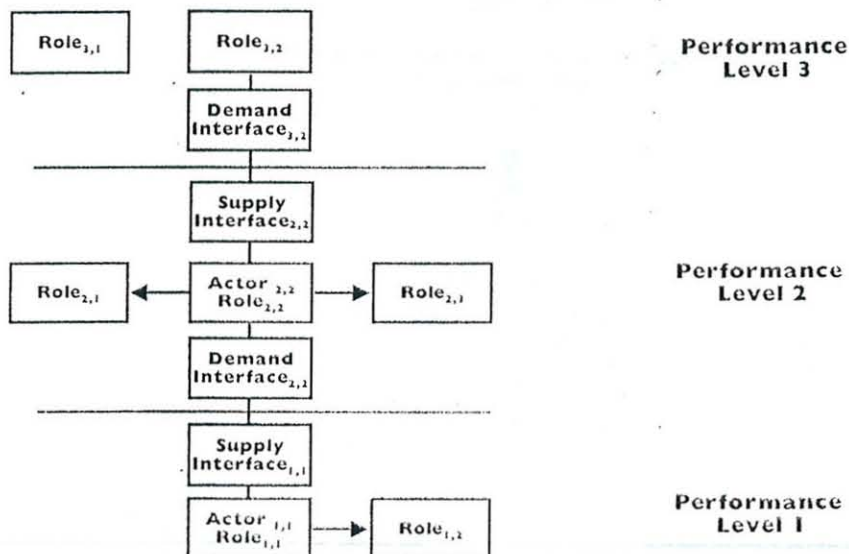
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Performance layers and binding

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WHAT IS INFORMATICS?



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Performance Levels - Contextual Supply and Demand

N**WHAT IS INFORMATICS?****Theatre and operating system functions**

Stage	Man/machine system
Ensemble	People and hardware
Performance	Program execution
Actors, props etc.	People, objects
Stage director	Operating system
Artistic director	Site manager
Playwright	Programmer
Play	Program
Play->script adaptation	Compilation
Stage directions	Program's OS demand
Staging	OS activities:
	Link, Load, Run, Interrupt,
	I/O File handling,
	Communication
	Exception handling

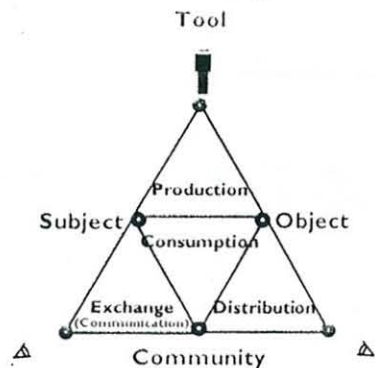
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Theatre and operating system functions

**N****PROGRAMS, PROCESSES, PEOPLE, PERSPECTIVES****The three interacting perspectives of activity theory**

The production of the outcome of the activity,
like a service or goods



Medium
The exchange (flow) of messages
necessary to produce

Organisation
Aspects of the collective work done
in order to realise production

According to Ole Smørdal's Ph.D.-Thesis (May 1999)

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Activity theory





WHAT IS INFORMATICS?

Informatics

**Informatics is the science
that has as its domain
information processes
and related phenomena
in artifacts, society and nature**

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Informatics



WHAT IS INFORMATICS?

Three traditions in informatics

1. The Sciences

**Scientific calculations. Algorithms. Languages.
Correctness. Provability.
Emerging from Departments of Mathematics**

2. Construction

**Digital electronics. Engineering calculations.
Packages. Case tools. Software engineering.
Emerging from Departments of engineering.**

3. Administration

**Accounting. Databases. Management information
systems. Organisation. Decision support.
Emerging from Schools of business administration**

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Three traditions in informatics



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WHAT IS INFORMATICS?

**Professional and/or personal
perspectives, values, decisions**

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Professional and/or personal ...



N

PROGRAMS, PROCESSES, PEOPLE, PERSPECTIVES

**The proper name for our science is
“informatics”
not “computer science”**

**Both computing equipment
and people are actors
in informations systems**

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The proper name is “informatics”



DISCUSSION

Rapporteur: Neil Henderson

Lecture One

Professor Nygaard talked about the challenges of creating and living with sophisticated computer systems, such as the impact on employment and the requirement for proper training. He also pointed out that, in general, there is conflict between at least two parties when a new system is implemented, for example between an employer who may wish to automate a process to reduce costs and the users who may lose their jobs as a result of the automation. Also when a system is used to achieve a particular goal often there is conflict, for example when a system is used to determine where budget cuts should occur between different departments in an organisation, and it is the party that can use it best that wins.

There is an issue of whether the records on a system should be open, for example to see if a doctor's diagnosis for a patient was correct. Obviously there are implications for the patient whose medical records were accessed, but also they could be used to assess the ability of individual doctors to see if they were making correct diagnoses. Dr Davis pointed out that an incorrect diagnosis may not be the doctor's fault - it may be affected by incorrect answers by the patient to questions asked by the doctor during the consultation.

The speaker then introduced the notion of "cages" for information and accepted Professor Martin's point that it is not necessarily just information that needed to be "caged".

The talk concluded with the notion that an individual's view of a system is very much influenced by the perspective that they are viewing it from. A company wants the best system, but at an acceptable price, whereas a user wants a system that is easy to use. Professor Martin hypothesised that science is generally outside of a problem looking in and the speaker had provided some very convincing arguments that computing professionals were inside the problem. Professor Nygaard agreed that this was an issue and that the social perspective needed to be taken into account.

Lecture Two

Professor Nygaard propounded that the properties of information systems are dependent on the processes used to develop them. He defined a process as a phenomenon that we choose to regard as a development of part of the world through transformations throughout its lifetime - that a process consists of substance, state, transitions and instructions. Professor Mamdami asked if he considered a process only to be dynamic and Professor Malek stated that by this definition a state machine is not a process, but is the execution of a process. The speaker agreed that a process was dynamic and indicated he felt a static process was meaningless. Professor Cockton added that he felt these questions about Professor Nygaard's definition were an issue of perspective - that computer scientists tend to stick to a sub set of language and have their own definitions of the world based on that restricted perspective. They do not feel happy with wider definitions and that he found this point of view strange, as someone coming from other disciplinary perspectives.

Mr Yapp then added that processes do not always produce the same output and it is necessary to know whether the different outputs are as a result of something within the system or because of external influences, and the results therefore need to be analysed from a statistical perspective. The variability of outputs impact on people and technology and cannot be ignored. Professor Nygaard agreed that these influences were important and they should always be considered.

Professor Mamdami asked if a process always had to have substance and Dr Davis added that sometimes it is not possible to measure everything concerned with a process. Professor Malek added that every program was surely an infinite number of processes. Professor Nygaard answered that he felt processes did always have substance and that it was important to observe

and measure them, it is his opinion that we only deal with observable and measurable properties in informatics. Dr Kay asked if emotional motivations were observable and measurable and the speaker answered that hate was an emotion and had state, but indicated he was not certain it could be observed and measured.

Professor Mamdami observed that causation was not part of the definition given for a process and Professor Nygaard answered that by his definition the sequence of changes of state comprised the observation of the process.