SOFTWARE :

COMMENTS ON

RESEARCH, MARKET, DEVELOPMENT & AVAILABILITY

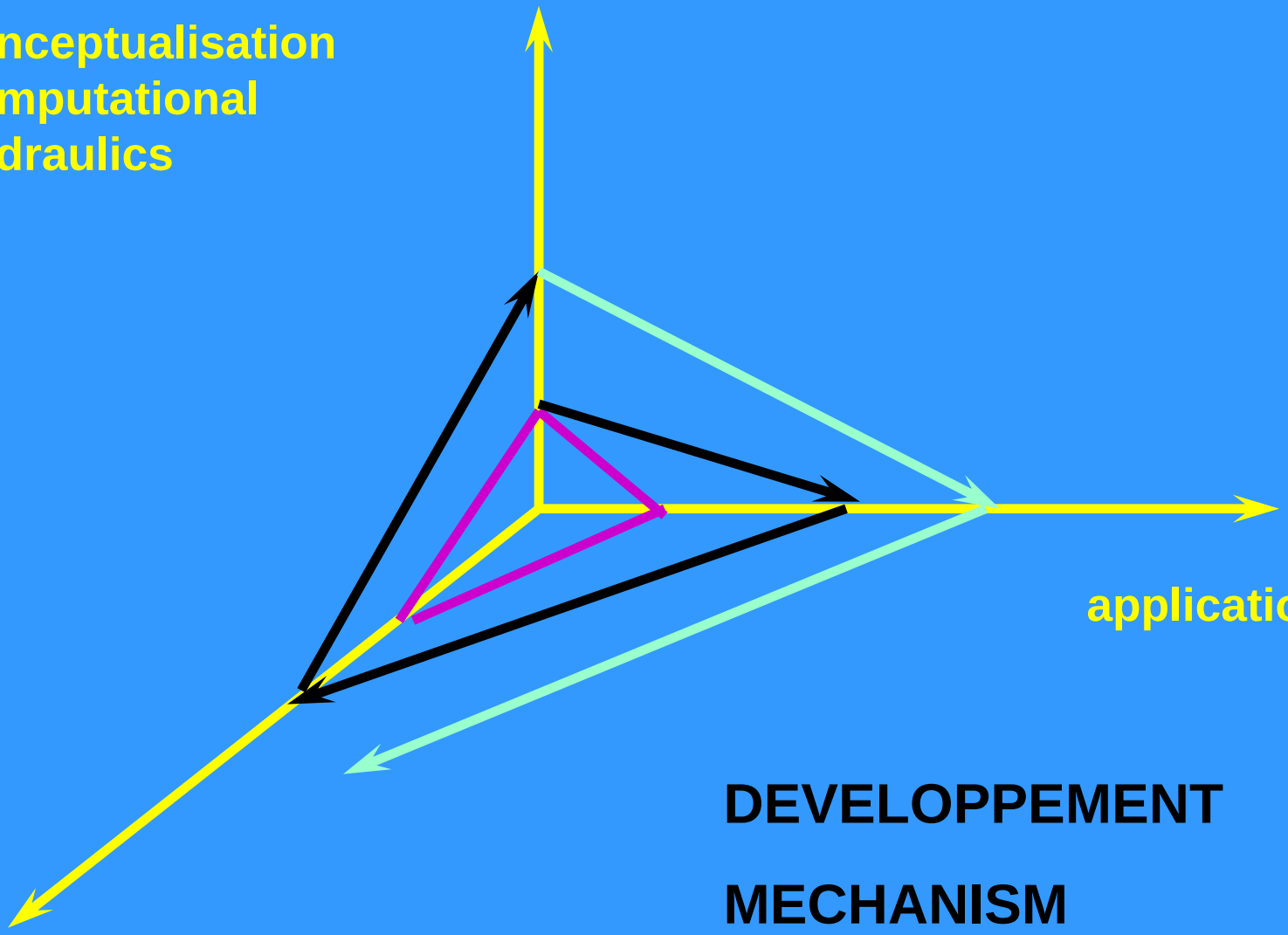
RESEARCH AND DEVELOPMENT:

EVOLUTION BY INTERACTION BETWEEN

CONCEPTUALISATION, FORMULATION, NUMERICAL ALGORITHMS

AND

TOOLS (hardware & software)


conceptualisation
computational
hydraulics
applications
DEVELOPPEMENT
MECHANISM
Informatic tools

MARKET AND APPLICATIONS

INTERACTION BETWEEN:

- **DEMAND**
- **STATE OF KNOWLEDGE**
- **AVAILABILITY OF THE TOOLS**

TWO KINDS OF EVOLUTION, TWO KINDS OF DEMAND:

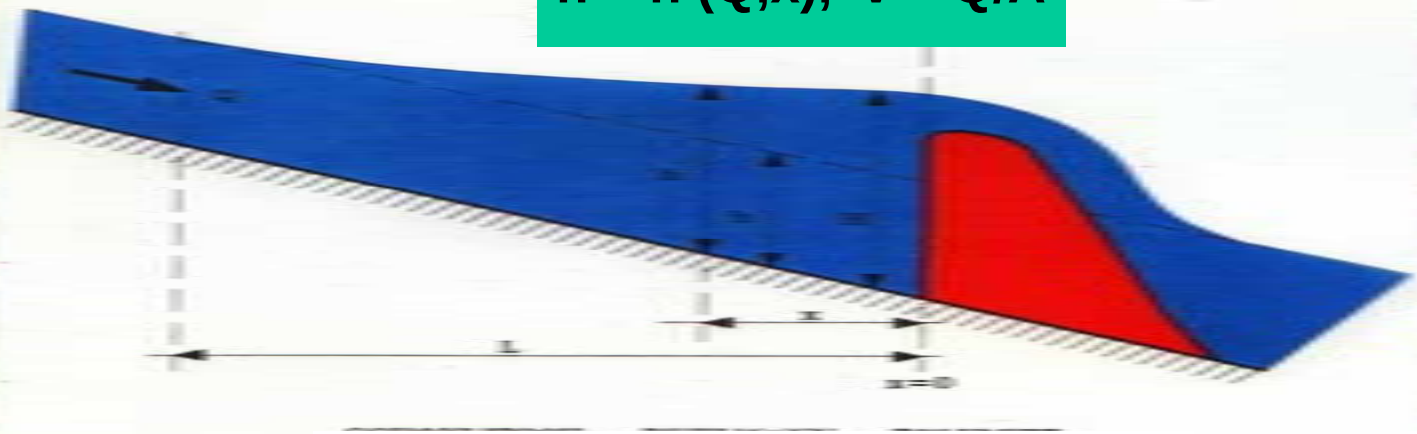
- TECHNICAL, INTEGRATING NEW KNOWLEDGE

- COMMERCIAL/ EVREDAY ENGINEERING

EVOLUTION OF THE TECHNICAL DEMAND - EXAMPLE OF RESERVOIR STUDIES

Reservoir hydraulics problem until 1960

$h = h(Q,x)$, $v = Q/A$



Schoklitsch, Rühlmann, Tolkmitt:

or

Bresse:

EVOLUTION OF THE TECHNICAL DEMAND :

STRONG DEMAND :

1960 - **steady state flow 1D backwater**

1970 - **1D wave propagation following turbines and gates manoeuvres**

1980 - **unsteady 2D vertical, variable density (heat, sediments, salinity)**

WEAK DEMAND :

1997 - **unsteady 3D, variable density, water quality, ecosystems**

- **30 YEARS OF STRONG TECHNICAL DEMAND**

  DUE TO NEEDS OF ENGINEERING WORKS

- **THEN « soft » TECHNICAL DEMAND:**
  SOCIAL COST AND WATER QUALITY DID NOT FIND THEIR EXPRESSION IN BUDGET TERMS IN DECISION MAKING AND MANAGEMENT

- **BUT explosive COMMERCIAL DEMAND**

	conceptualisation	informatics tools
1995	HYDROINFORMATICS M.B. Abbott	WINDOWS, PENTIUM
1985	4th GENERATION DHI	SIG, BD, IHM, UNIX
1987	3rd GENERATION IAHR Committee	MAINFRAMES - IBM 340
1960	2nd GENERATION SOGREAH, A. Preissmann	FORTRAN IBM 650
1953	J.J. Stoker	1st application
1927	CFL – numerical theory	
1895	Massau & characteristics	
1871	B. de St.-Venant equations	

AND SINCE 1995?

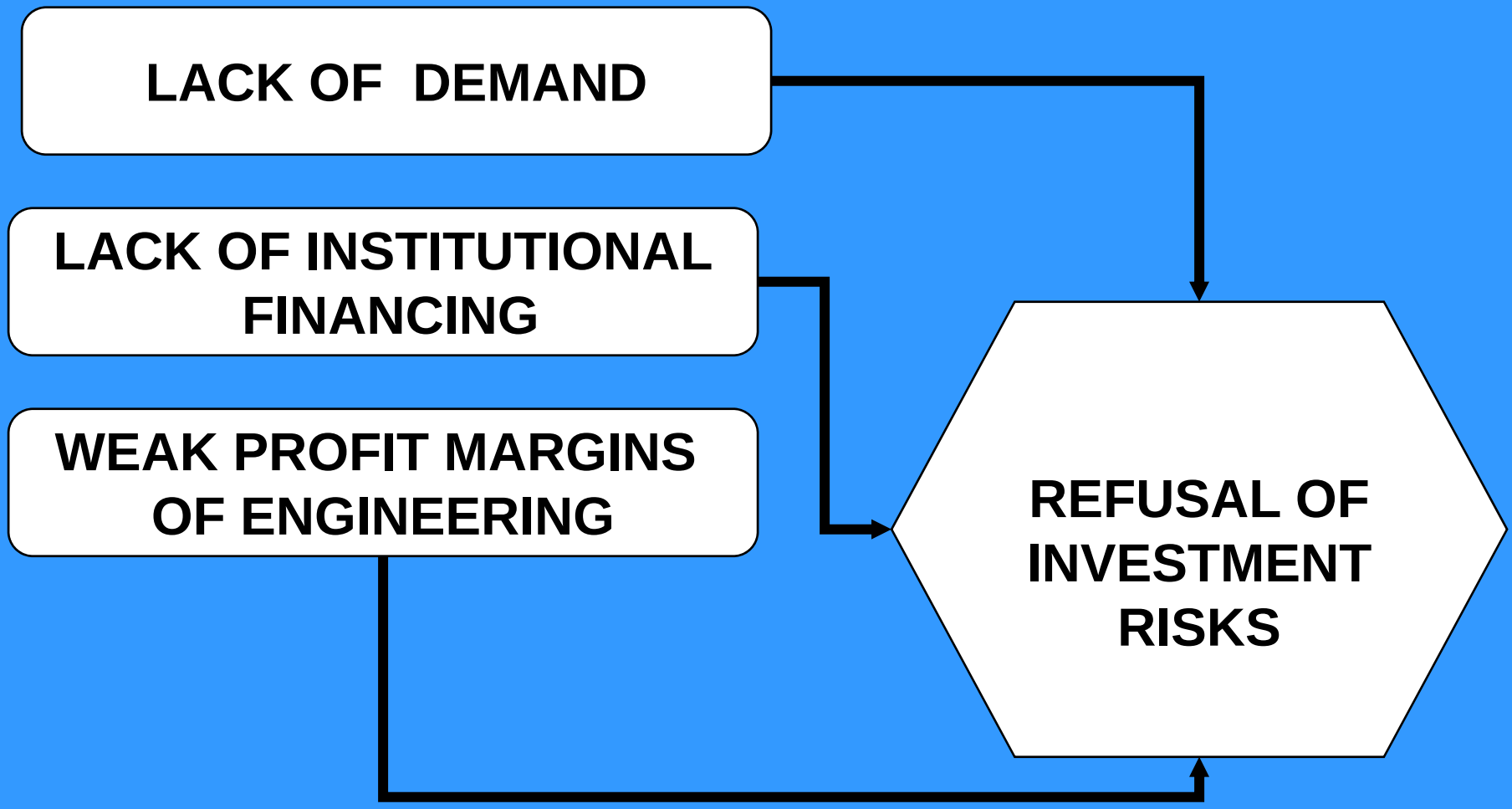
➔ ***Conceptualisation*** **– NOTHING REALLY NEW**

➔ ***Algorithmes*** **- INDIVIDUAL RESULTS**
(Guinot, Kutija,…)
NOT INTEGRATED IN COMMERCIAL CODES

➔ **Massive *applications* :**
- **engineering studies**
- **encapsulation (management & forecasting systems)**

STAGNATION ?

STAGNATION ? WHY ?



BUT WHY THIS LACK OF TECHNICAL DEMAND ?

REASONS ARE MOSTLY SUBJECTIVE:

- Engineering education that does not show benefits of better simulation of phenomena,
- Cultural approach of “play station” generation of engineers who believe in what they see on the screen,
- Marketing “pushing” for uncritical use of existing tools rather than indicate honestly their limitations.

This comes from both , software sellers and consultants.

AND STILL:

Inadequate or inexistent conceptualisation for

- **SEDIMENTATION, GEOMORPHOLOGY**
- **MORPHODYNAMICS (RIVERS, ESTUARIES)**
- **ECOHYDRAULICS, ACQUATIC ECOSYSTEMS**
- **3-D : TURBULENCE, BOUNDARY CONDITIONS**

Deficient or unreliable algorithms

- **3-D (between tinkering and mystification)**

PERSPECTIVES ?

WHERE THE DEMAND CAN COME ?

- « EDUCATION » OF USERS **(UNDERSTAND THAT SOPHISTICATION BRINGS IN TERMS OF FINANCIAL BENEFITS)**
- POLITICAL PRESSURES **(CAUSED BY MODIFICATION OF THE ENVIRONMENT, CLIMAT AND LEADING TO NEW REGLAMENTATION)**
- INTERNATIONAL COMPETITION **(INDUCED BY FINANCING AGENCIES – WORLD BANK? UNDP? Not any more!)**

MODELLING CODES – CURRENT SITUATION

- **INDUSTRIAL DIVISION OF WORK - DEVELOPERS/USERS**

- **AVAILABILITY OF INDUSTRIAL CODES ON THE MARKET**

TWO ILLUSIONS :

- **« EVERYTHING can be found free on the WEB »**
- **« We can develop this ourselves or nearby university can do it » !!!**

- **RESULTS OF HISTORICAL EVOLUTION 1980 - 1990 In Europe:**

  - Emergence of suppliers of industrial-quality codes

  - Impossibility to catch up with the latter (prohibitive costs)

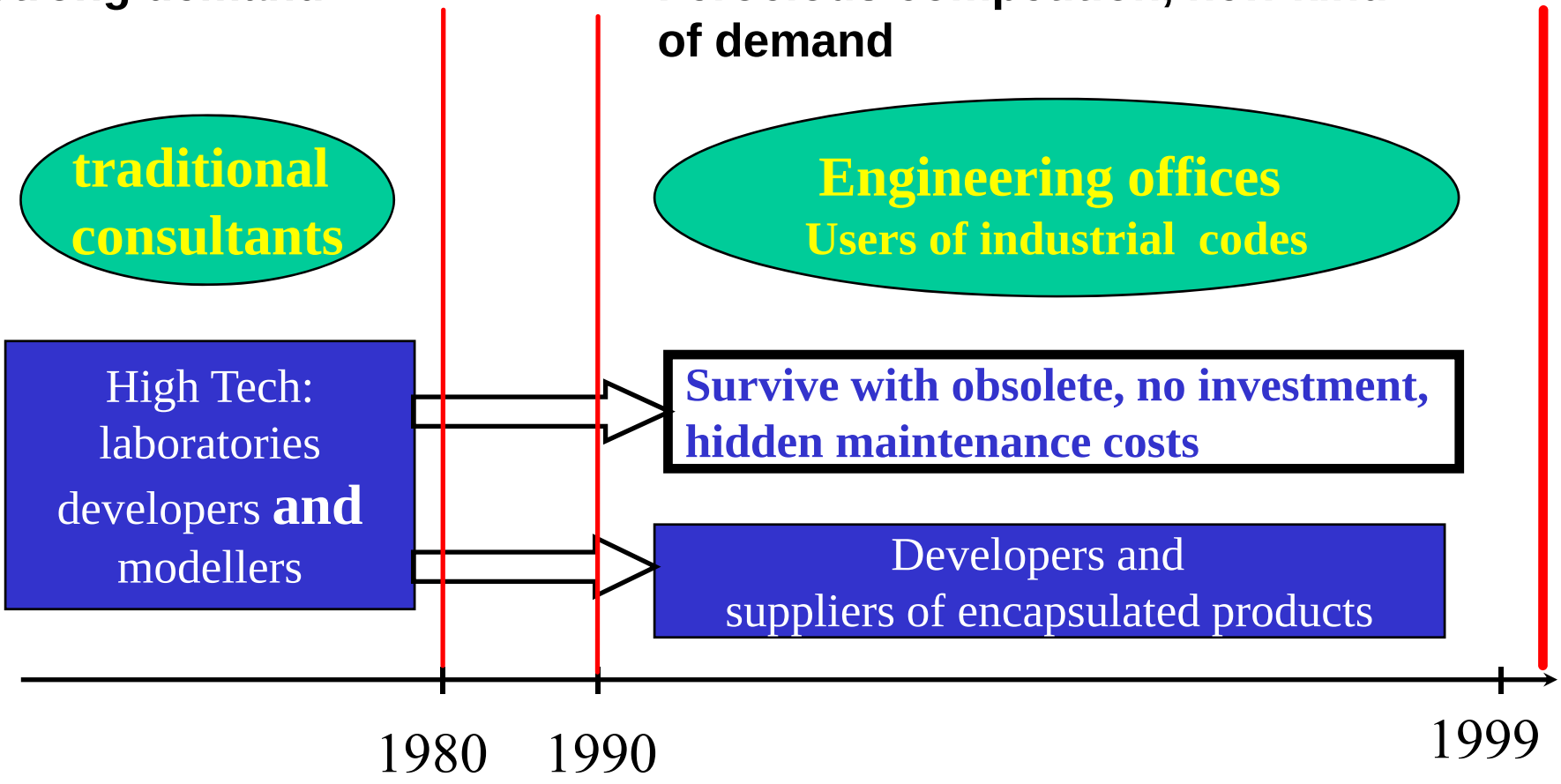
  - Two types of users

  *** those who have real expertise**

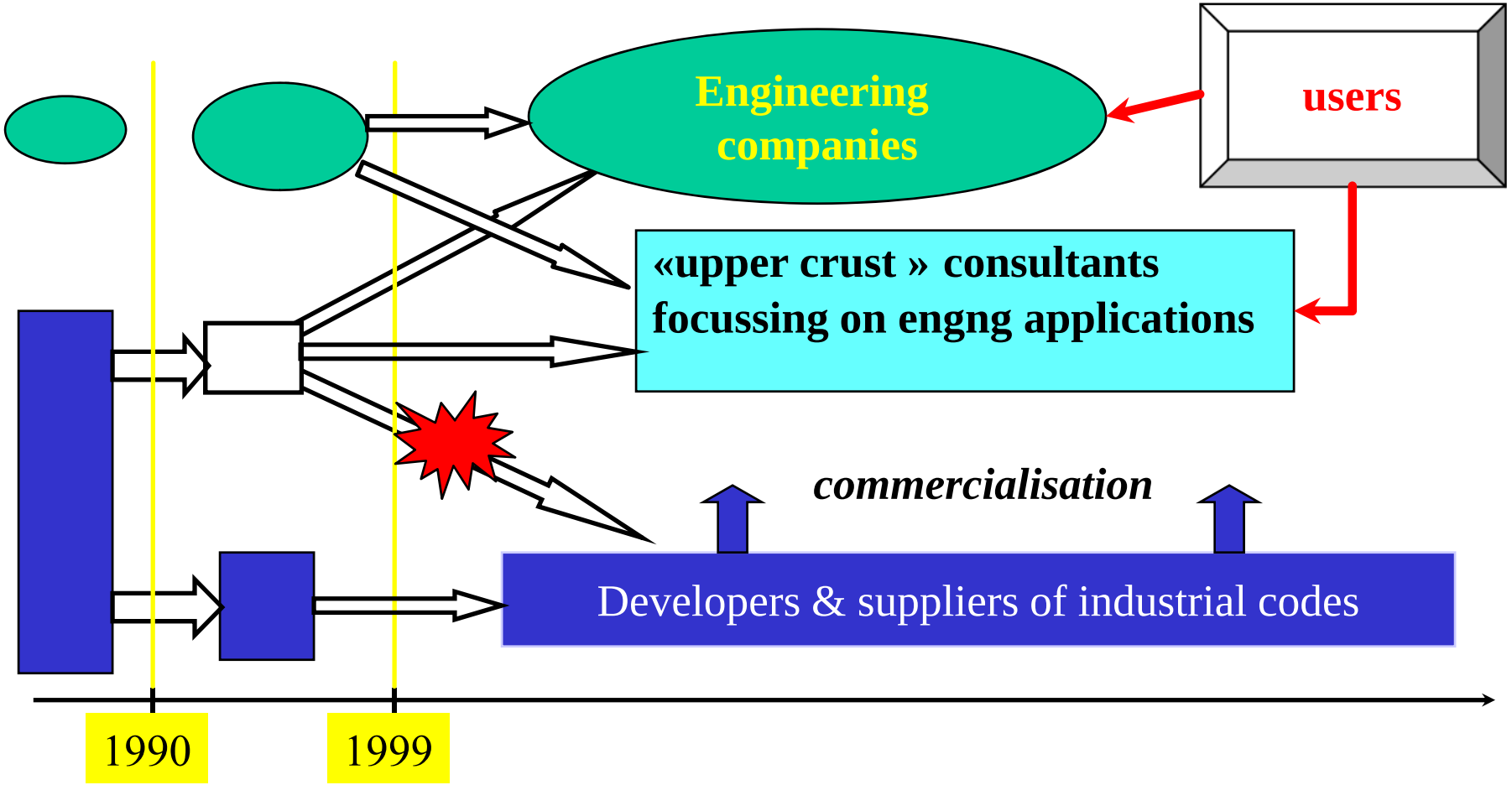
  *** «slaves» of 2 or 3 codes, limited to standard applications**

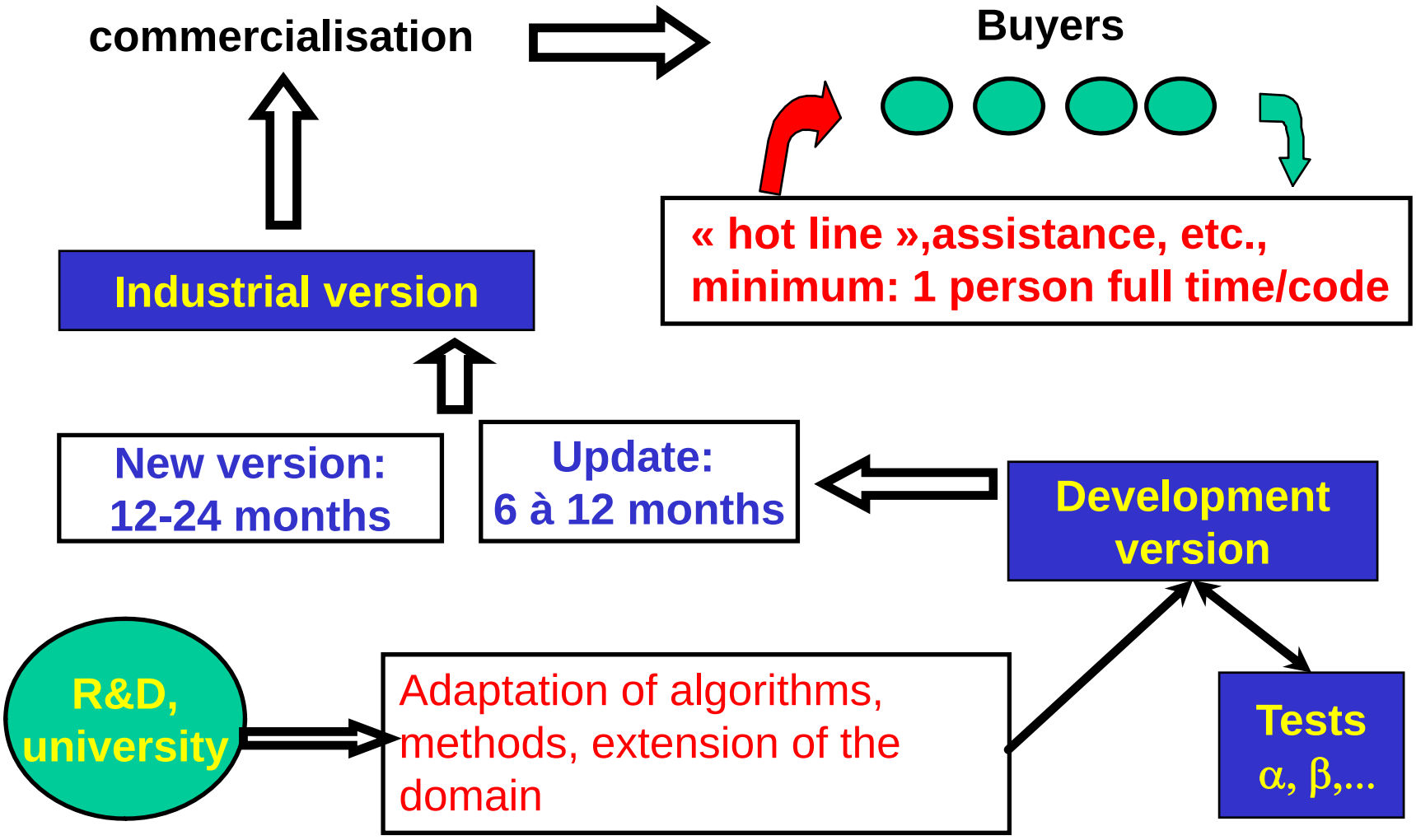
Golden age: high margins, Strong demand

Industrial age : weak margins, Ferocious competition, new kind of demand



Evolution


Engineering companies
users
«upper crust » consultants focussing on engng applications
commercialisation
Developers & suppliers of industrial codes
1990
1999


commercialisation
Buyers
« hot line »,assistance, etc.,
minimum: 1 person full time/code
Industrial version
New version:
12-24 months
Update:
6 à 12 months
Development
version
R&D,
university
Adaptation of algorithms,
methods, extension of the
domain
Tests
α, β,...

MOST OFTEN APPLIED MARKET AVAILABLE CODES:

RIVERS AND INUNDABLE PLAINS

ONE DIMENSIONAL PROBLEMS (1-D)

- **MIKE 11**

  Owner: DHI (Denmark)

  Developer: DHI (Denmark)

  Processing of rivers and canals :

  de Saint-Venant equations

  multiconnected networks, structures

  Processing of inundated plains:

  Considered as a network of channels , flow simulated with de Saint-Venant equations

  Algorithm: Abbott - Ionescu (DHI)

- **SOBEK**

  Owner: **Delft Hydraulics (NL)**

  Développer: **Delft Hydraulics (NL)**

  Processing of rivers and canals:

  de Saint-Venant equations

  multiconnected networks,structures

  Processing of inundated plains:

  Quasi 2-D (network of cells)

Algorithme: Preissmann (SOGREAH)

- **ISIS**

  Owner: **Wallingford Research (UK)**

  Developer: **Wallingford Research (UK)**

  Processing of rivers and canals:

  de Saint-Venant equations

  multiconnected networks, structures

Processing of inundated plains:

Quasi 2-D (network of cells)

Algorithm: **Preissmann (SOGREAH)**

- **CARIMA**

  Owner: **SOGREAH (France)**

  Developer: **SOGREAH (France)**

  Processing of rivers and canals:

  de Saint-Venant equations

  multiconnected networks, structures

Processing of inundated plains:

Quasi 2-D (network of cells)

Algorithm: **Preissmann (SOGREAH)**

MOST OFTEN APPLIED MARKET AVAILABLE CODES:

RIVERS AND INUNDABLE PLAINS , COASTAL AREAS

TWO DIMENSIONAL PROBLEMS (2-D)

- **MIKE 21**

  Owner : DHI (Denmark)

  Developer: DHI (Denmark)

  Flow conceptualisation:

  de Saint-Venant 2-D equations

  Algorithm: Finite differences

  recent version: finite elements

- **TELEMAC 2-D**

  Owner: **EDF (France)**

  Developer: **EDF (France)**

  Commercialisation:

  SOGREAH (FR)

Flow conceptualisation:

de Saint-Venant 2-D equations

Algorithm: Finite Elements

- **Delft 3D/2D**

Owner: Delft Hydraulics (NL)
Developer: Delft Hydraulics (NL)

Flow conceptualisation:

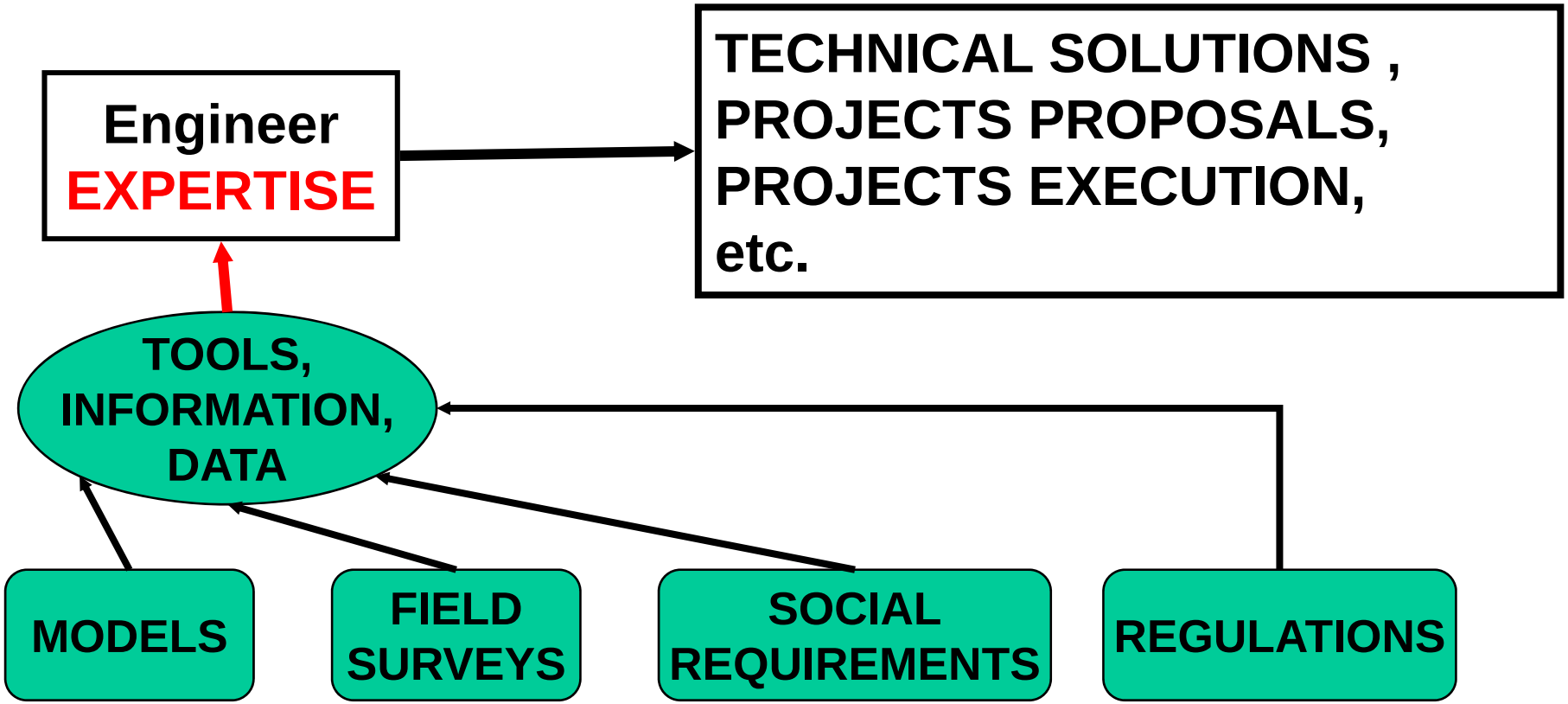
de Saint-Venant 2-D equations

Algorithm: Finite Differences

Final word ?

LET US RENDER TO ENGINEER WHAT IS ENGINEER'S JOB !!!!!

MODELLING EXPERTISE IS TO BE SEPARATED FROM MODELLING TOOLS !!!


Engineer
EXPERTISE
TECHNICAL SOLUTIONS ,
PROJECTS PROPOSALS,
PROJECTS EXECUTION,
etc.
TOOLS,
INFORMATION,
DATA
MODELS
FIELD
SURVEYS
SOCIAL
REQUIREMENTS
REGULATIONS