

# Why Dansk Datamatik Center ?



1960s: Simple programming courses  $\implies$  Big systems + lots of errors

NATO 1968:

## SOFTWARE ENGINEERING

Report on a conference sponsored by the  
NATO SCIENCE COMMITTEE  
Garmisch, Germany, 7th to 11th October 1968

Peter Naur +  
Brian Randell +  
many others

IBM Vienna:

VDM = Vienna Development Method aiming at

*”systematically developing a compiler from a language definition”*

Dines Bjørner + H. Bekic + Cliff Jones + many others

- VDM:** - Specification language **VDM-SL** (also called **META-IV**)  
- **Methods/rules** for deriving + manipulating specifications

```
AccNum = token; CustNum = token;  
Balance = int; Overdraft = nat;  
AccData :: owner : CustNum  
          balance : Balance  
state Bank of  
  accountMap : map AccNum to AccData  
  overdraftMap : map CustNum to Overdraft
```

Data types

```
inv mk_Bank(accountMap,overdraftMap) ==  
  for all a in set rng accountMap &  
    a.owner in set dom overdraftMap  
  and a.balance >= -overdraftMap(a.owner)
```

Invariant

```
pre  cust in set dom overdraftMap  
post r not in set dom accountMap~ and  
     accountMap = accountMap~ ++{r|-> mk_AccData(cust,0)}
```

Pre- and Post-  
Conditions.

## Short story of DDC:

1968: NATO-conference on problems with SW. New term: **Software**

1970s: Still many big datasystems delayed, with errors and shortcomings

1979: Discussions with ATV, Academy of Technical Sciences (~ IVA in Sweden).

**DDC created:** ATV society with 10 members: Private + public IT companies (no banks)

**Ambition:** Learn companies better SW development practice.

1980-84: **DDC** Growth: from 2 to 40 people

from 1 mio.DKK to 13 mio.DKK

Main Projects: **Compiler development** for Ada and CHILL.

1985: **DDC International** (now DDC-I Inc.): Develop + market + sale Ada systems.

1985-89: Many SW development projects together with member companies.

Courses, seminars, publications

VDM developed into **RAISE** = **R**igorous **A**pproach to **I**ndustrial **S**oftware **E**ngineering.

1989: DDC closed. Some projects + staff transferred to CRI Inc.

Norway 1967-90:

SIMULA Obj-orient.

DELTA Modeling Lang.

BETA Modeling Lang.

Sweden 1984-99:

SISU System Developm

Langefors, Bubenko, ...

## ADA Project:

1980: US DoD wanted a *cure-it-all* language: Ada

French/German consortium ready to get EU-money.

1981: DDC + Olivetti + Chr.Rovsing: EU-contract [Portable Ada for minicomputers](#).

1980-81: First [Formal Definition](#) (VDM) of Ada + Run-time system.

1984: [Ada completed](#) + US-DoD validated

First Customers:

Nokia, 2 \* Honeywell, Beijing Inst. of System Engin., NEC (Ja

1985: Subsidiary [DDC-International Inc.](#): Ada, *later* C, C++, Safe  
(Now in Phoenix, USA.)

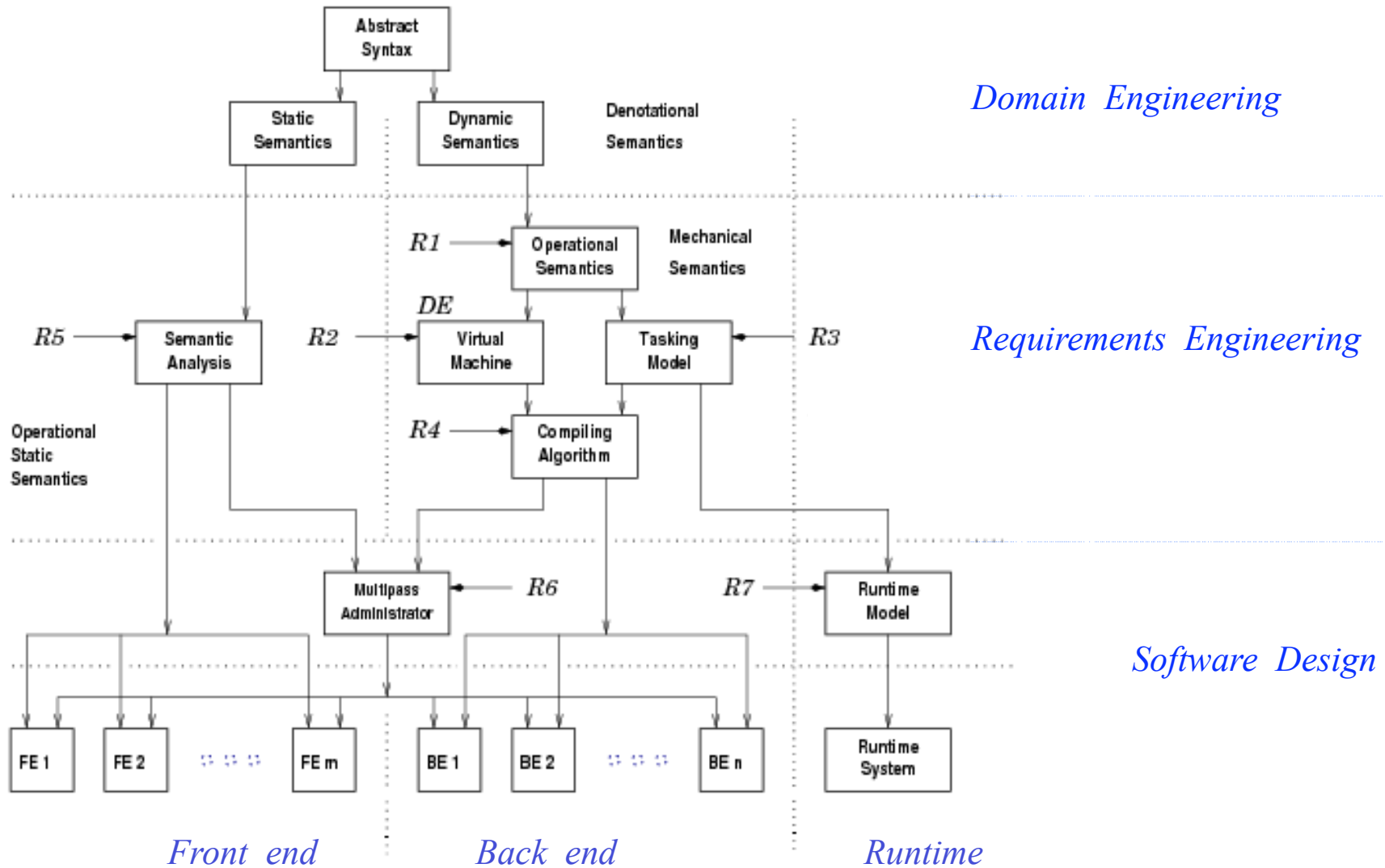
1984-87: EU-contract: [Formal Definition of Ada](#). 4 volumes  
DDC + Italy.

**Alas! - No real interest in Denmark.**



# ADA Project:

# VDM Specification of Ada compiler



Ada compiler **First** to be US-DoD **validated** in Europe

**On schedule**, <20% budget excess.

**CHILL** = CCITT High Level Language  
Formal description + Compiler

⇒ Public property ⇒ No lasting income.

Revision of VDM ⇒ **Rigorous  
Approach to  
Industrial  
Software  
Engineering**

**RAISE** = Language + Methods + Tools for  
{ Requirements Analysis  
Specification  
Design + Development  
of general software

EU Development contract ⇒ No lasting income.

**Office Automation Projects:** Cooperation with Member Companies on:  
Taxonomy + Terminology  
Generic Office Automation System.

DDC closed after 10 years, because:

- DDC's major SW products had **no interest** for the Danish IT-companies.
- DDC **failed to convince** Danish IT-companies of the usability of Formal Methods.
- EU and Government **funding** not enough to run DDC.
- ADA didn't get the expected **worldwide spreading**.
- and we failed to cultivate and utilize **Nordic know-how**.

## DDC Achievements:

- **Awareness** of modern SW techniques among Danish IT users + producers.
- The ADA system basis for **DDC-I Inc.**, USA.
- The **RAISE** methods + tools + people continued in SW company CRI Inc.
- 50-100 **young candidates** got experience with advanced SW technology  
    ⇒ new SW companies.
- Many publications and **international** contacts.
- Many projects **better performance + quality** than common in 1980s.

- with thanks to my co-authors

Dines Bjørner, Ole Oest, Leif Rystrom