

## *n*-dim

*n*-dimensional information modeling

### Provide a computer-based support system to

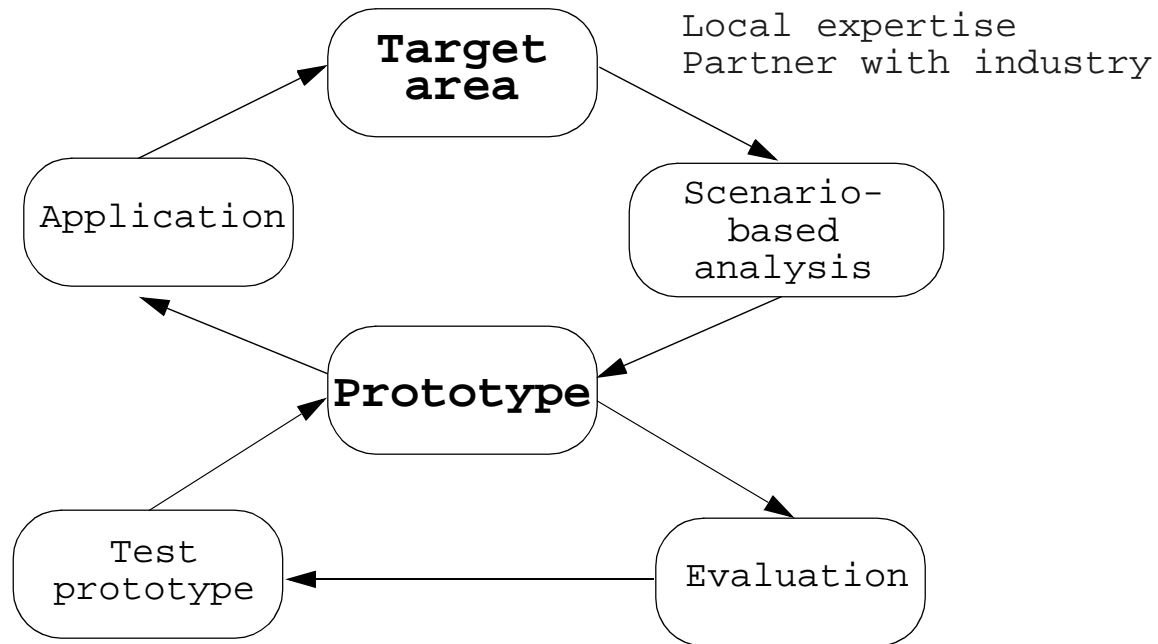
- **improve the communications among diverse, geographically distributed teams?**
- **capture what they actually do?**
  - + **to capture “who,” “what,” “where,” “why,” “how”**
  - + **to allow reuse of their processes and information**
  - + **to allow process improvement**

## Outline

- **How the n-dim group operates**
- **What the n-dim system looks like**
- **Technical issues we are solving**
- **Brief look at one industrial project**

## How we (13 of us) operate?

- **Evolve and test our understanding by working with industry, government, our own project and CMU design courses**



## Objective, methods, and outcomes

Objectives Methods	Understanding of the current state of information management	Development of support systems	Support system effectiveness	Infrastructure for evolving information systems	Study of the role of communication in design projects
Information flow-study-questionnaire and interviews	An information map of the business division studied.	Identification of a specific target area for support.	Current process as base line.		Identification of communication gaps.
Prototyping and user participation		Use and system specification document, series of working prototypes	Areas of improvement of use and performance before testing.	Infrastructure is used in creating the system prototypes.	
Testing by users (not controlled study)  Industry / Classroom			Identification of needs (research and improvement.) to reduce effort and time	Identification of infrastructure facilities that are surfaced by the application.	

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Soc science methods (multiple regression/ natural language analysis)			Structured recording of meetings improves the complexity handled in the outcome.		Arriving at consensus on the language of concepts early is critical to design outcomes.
Layered modular architecture		Prototype based object tool kit for interfacing multiple computer languages through common object system	Facilities for rapid system development of new functionality by end-user.	<i>n</i> -dim a modeling system (generic graph modeling environment) for evolving and capturing of history.	

## The $n$ -dim support system

### Our hypotheses

- **About 85% of design is social - i.e., meetings, phone calls, e-mail, etc.**
- **Design is an evolution of the artifact description, the information and the process**
- **Designers must be able to evolve the system quickly and by themselves**
- **Designers are always creating models to tame complexity**

## **Proposal: supply a general *modeling* environment**

- **to manage (capture, organize, share) information**
- **to support collaboration and negotiation**
  - + **same time, same place**
  - + **same time, different place**
  - + **different time, different place**
- **to integrate new and existing tools**
- **and to support continual improvement (learning)**

## Approaches to managing models

### Patterns first then objects

Examples

*Corporate-wide data bases*

*Document handling systems*

*Lotus-Notes*

Required to attach powerful tools

### Objects first then patterns

Example

*World Wide Web*

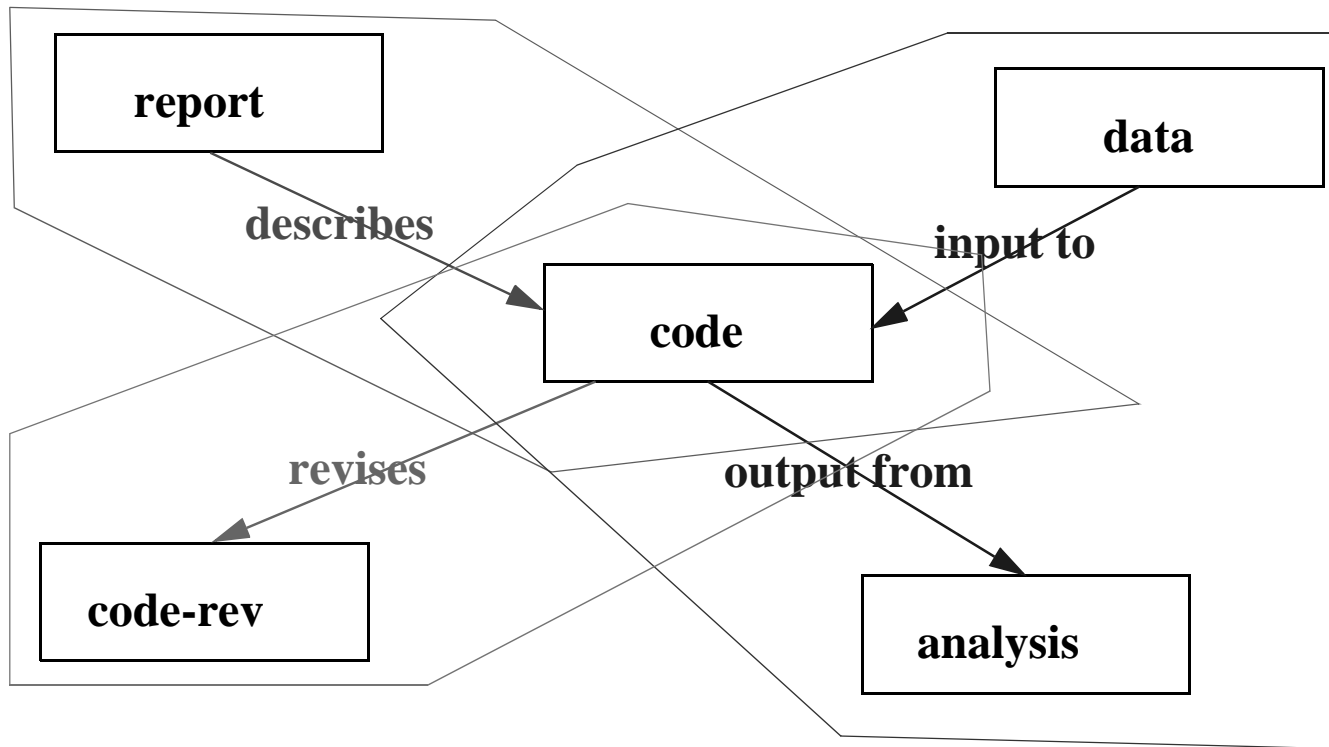
Required to learn about objects

**We really need both approaches**

# Modeling approach

**Flat space of objects**

**Models to establish relationships**



## **Technical issues that arise**

### **For a large distributed system provide**

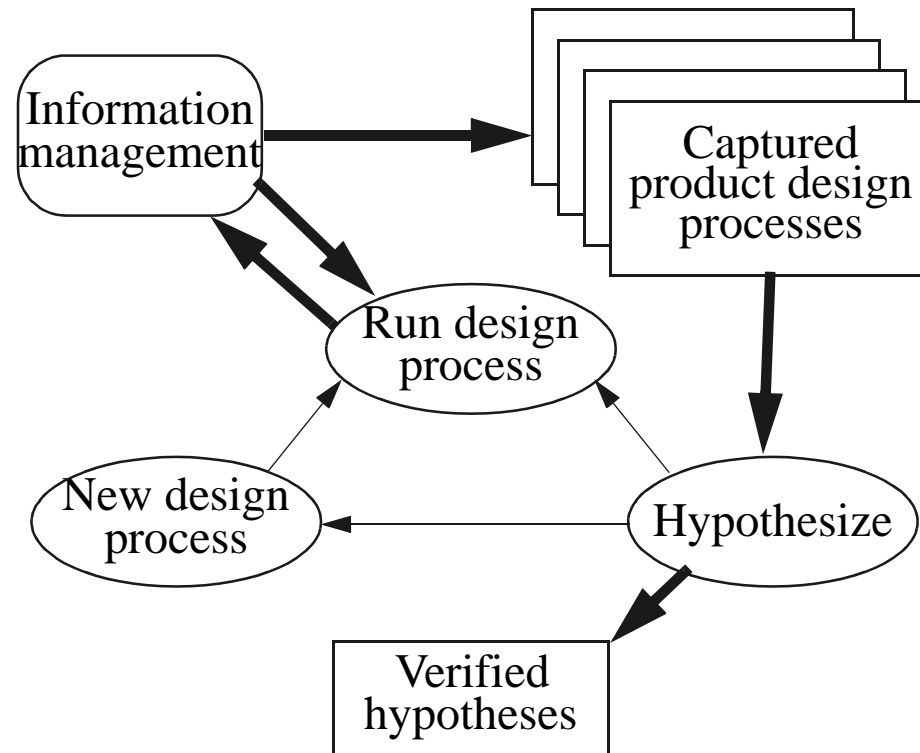
- **Access**  
Private, public and publish storage
- **Security**
- **Version and “pedigree” management**
- **Pattern extraction, capture and sharing**  
e.g., languages
- **Storing and finding things**
- **Event handling**

### **The *n*-dim system so far**

- **250,000 lines of code**
- **on top of basic object system (BOS)**
- **in C**

## And maybe now

we really can develop theories for products



## Feature comparisons

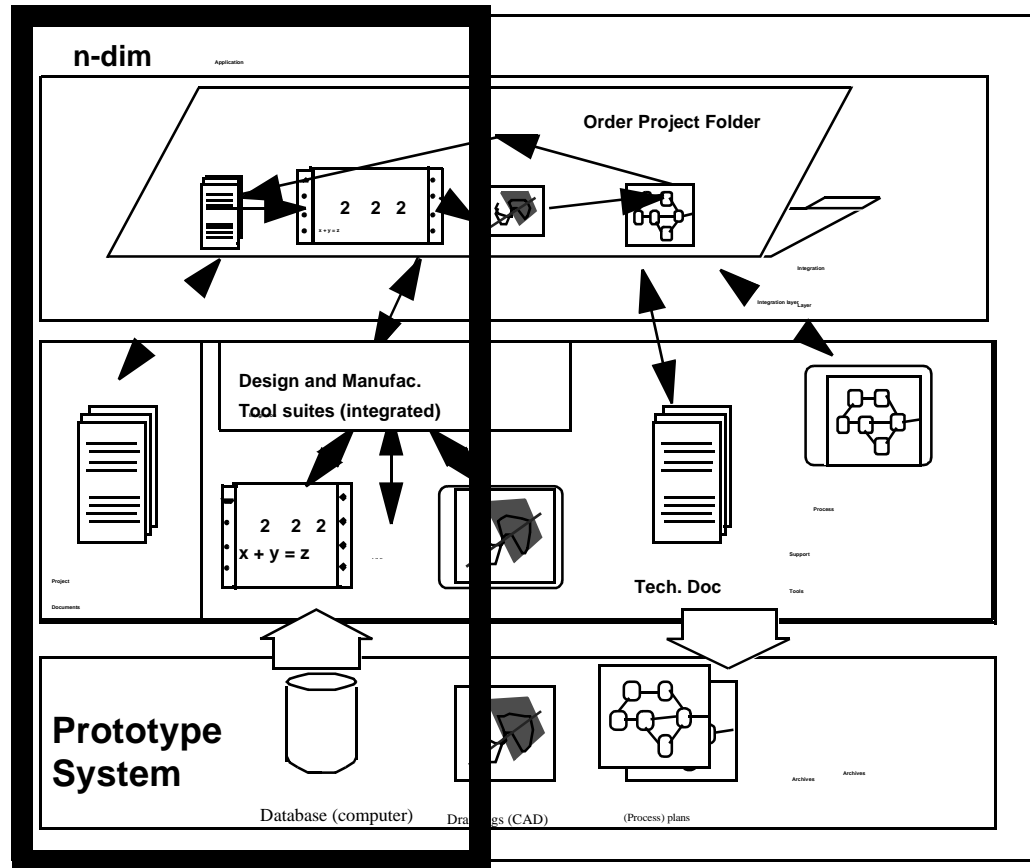
Technologies Activities	Notes	WWW	PDM	DBMS	Video	Shared Work Spaces	<i>n-dim</i>
Sharing information	P	P	F	F	P	P	F
Sharing tools	N	P	F	N	N	F	F
Capturing history	P	N	P	P	N	N	F
Capturing rationale	P	P	N	N	F	F	P
Negotiating	P	P	N	N	P	P	P
Coordinating	F	N	P	P	P	P	F
Integrating Tools	P	P	F	P	N	N	F
Structuring information	P	P	P	P	N	P	F

**Legend: F Full coverage; P Partial coverage; N No coverage**

## Feature comparisons -2

<b>Technologies</b> <b>Activities</b>	<b>Notes</b>	<b>WWW</b>	<b>PDM</b>	<b>DBMS</b>	<b>Video</b>	<b>Shared Work Spaces</b>	<b><i>n</i>-dim</b>
<b>Finding information</b>	P	P	F	P	N	P	F
<b>Using standards</b>	N	N	F	F	N	N	P
<b>Evolving system</b>	P	P	N	N	N	P	F
<b>Learning</b>	N	N	N	N	N	N	F
<b>Customizing</b>	P	P	N	P	N	N	P
<b>Legend: F Full coverage; P Partial coverage; N No coverage</b>							

# An industrial project



## In summary

We discussed

- **How the n-dim group operates**
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- **Technical issues we are solving**
- **Brief look at one industrial project**