



# Decision Support & Environmental Scanning: Past Hallucinations, Present Realities, and Future Prospects

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***Omar A. El Sawy***

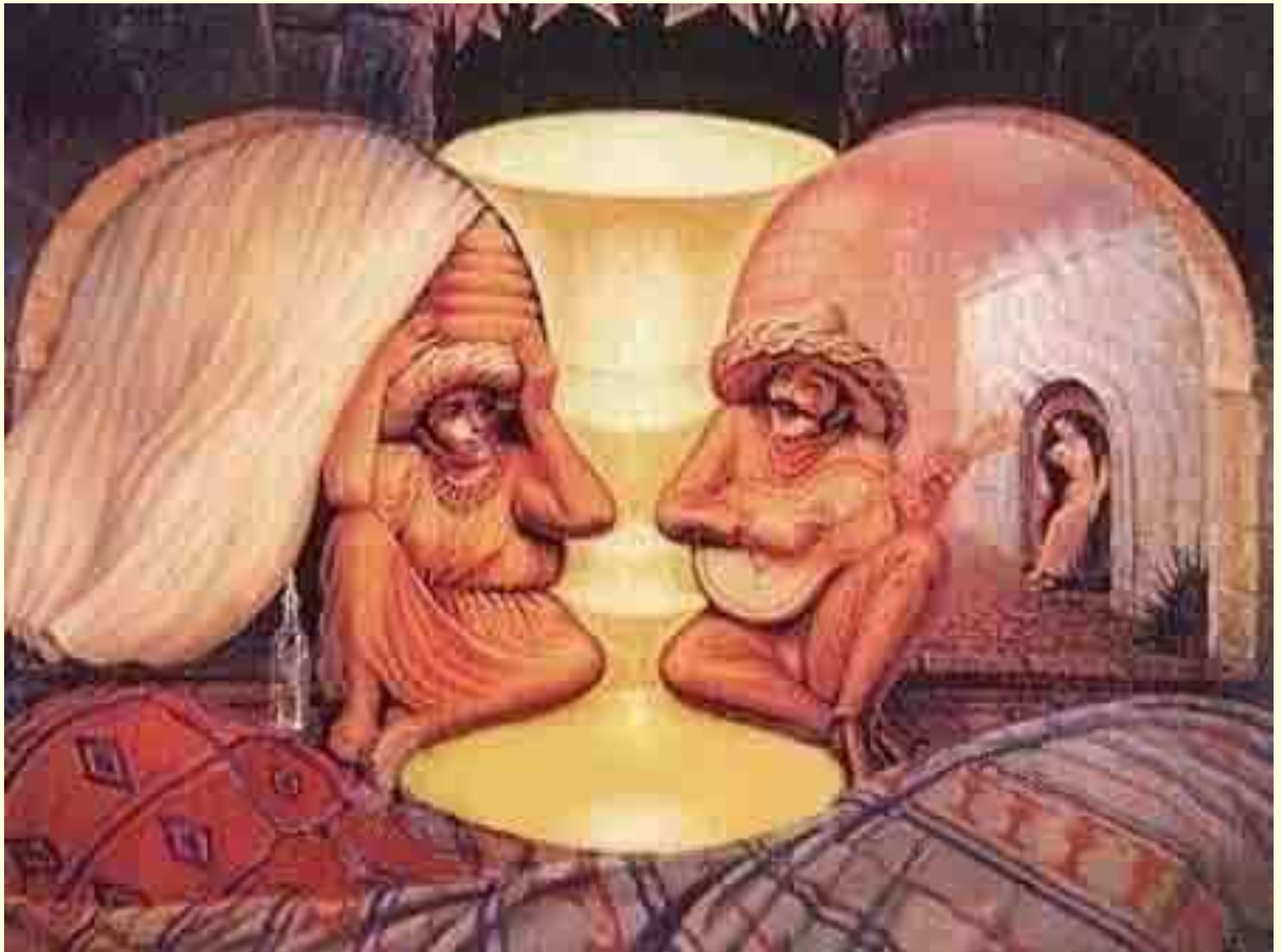
*Marshall School of Business  
University of Southern California*

*DSS–2010, 15<sup>th</sup> IFIP WG 8.3 International Conference  
on Decision Support Systems, Lisbon, Portugal, July 2010*

.. about the DSS-2010 Conference theme ...

my interpretation of the socio-technical gap phenomenon ...





**Collective Hallucinations... ? Not in DSS !!**

# What can we learn from Yesterday's Tomorrows to ReVision the Future ?

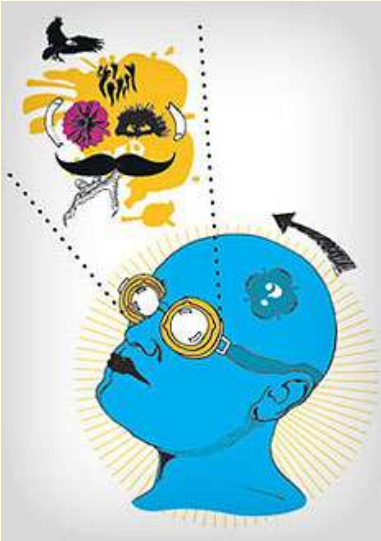


# *Let us try and avoid Type III Errors !*



*... solving the wrong problems ...*

# Agenda & Path



Looking at  
The past

Where are we now ?

????



Future  
Opportunities ?



Let's skip the period 3000 B.C. until 1980 A.D. ...



e-gyptians  
using DSS tools  
circa 2670 B.C.

Chariot 2000 B.C.



# DSS

**“Three letters that can change the way you think.”**

Have you heard about Decision Support Systems (DSS)? Do you understand what DSS really means?

It's a fact that Decision Support Systems are being used in companies small and large around the world. With DSS, managers are actually using computers as extensions of their minds.

Computers are being seen as friendly tools rather than strange objects run by people who converse in unusual terms. The implications are enormous - and that's not an overstatement.

EXECUCOM is the world's leader in providing DSS technology and in associated research and development. Our product, the Interactive Financial Planning System (IFPS®), is now

helping to build decision support systems for over 600 companies around the globe.

And we have a number of new products in the wings which will do even more to put DSS power in the hands of the people who need it the most. (Like our new optimization system which lets executives ask not only "What If?" but *What's Best?*")

Want to know more? Call my secretary, Carolyn Wadsworth, at (512) 345-6560, and I'll send you articles and information that will point the way for establishing DSS as a reality in *your* company.

**EXECUCOM**  
PO Box 9758  
Dept MS-1  
Austin, TX 78766

*Dr. G. R. Wagner, President  
EXECUCOM Systems Corporation*



## The Promise of DSS in early 1980s...

“With DSS, managers are actually *using computers as extensions of their minds.*”

1980 Buick







## The Promise of GDSS in mid 1980s ...

“Changing the  
technology and  
physical context  
of group decision  
making...”

1984 Buick



Prof. Paul Gray in an early Decision Room

BUSINESS WEEK  
OCT 12, 1987

# Strategic Information at Your Fingertips

## Commander EIS Executive Information Software

Commander EIS puts the strategic information you need to manage your business at your fingertips, by delivering information electronically with touch-activated computer screens. Touch the screen and Commander EIS displays reports personalized to your management style.

Commander EIS includes an Electronic Briefing Book of reports and charts containing your company's performance against important goals, both financial and nonfinancial. Additionally, Commander EIS Exception Reporting lets you set variance ranges so that numbers in reports are color-coded to draw your attention to performance deviations. The exclusive **Execu-View™** feature of Commander EIS permits the probing of highlighted exceptions.

During your planning and problem solving meetings, Commander EIS provides immediate information for strategic decision making. Critical management information is never out-of-reach, or out-of-date with Commander EIS.



Commander EIS runs on IBM mainframes using VM/CMS or MVS/DC operating systems, and on PC/XT/AT/PS/2. The personal computer version runs on IBM PC/XT/AT/PS/2 compatible desktop PCs or fully compatible micro-computers with EISA and offers a mouse or a touch screen.

### Get the facts on EIS!

For this informative, free report on EIS and how it benefits executives and their companies, write or call Chris Kelly at Comshare 1-800-922-7979.

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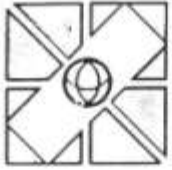
## The Promise of EIS in late 1980s ...

“Strategic Information at Your Fingertips”

1988 Buick



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**IFIP**  
International Federation  
for Information Processing

IFIP TC—8.3 Conference on  
**ENVIRONMENTS  
FOR SUPPORTING  
DECISION PROCESSES**

Budapest, Hungary, June 18—21, 1990.

Organized by the  
John von Neumann Society for Computing  
Sciences



List of Participants

**DSS goes  
Contextual around 1990..**

IFIP WG8.3 goes  
Socio-Technical  
in 1988, 1990...

1990 Lada



# Call for Papers and Presentations

11th INTERNATIONAL  
CONFERENCE ON DECISION  
SUPPORT SYSTEMS

# '91

DSS-91

**Information  
Technology  
for  
Executives  
and  
Managers**

Executive  
Information  
Systems

Decision  
Support  
for Fast  
Response  
Management

Information  
Technology  
Support for  
Management  
Teams

June 3 - 5, 1991  
Manhattan Beach, California

(10 minutes south of Los Angeles International Airport)

Deadline for submissions: October 1, 1990

**DSS tries to go upscale in  
early 1990s...**

Executive suite, fast response,  
and management teams..

1991 Buick



## CONTINENTAL AIRLINES FLIES HIGH WITH REAL-TIME BUSINESS INTELLIGENCE<sup>1,2</sup>

Ron Anderson-Lehman  
Continental Airlines

Hugh J. Watson  
University of Georgia

Barbara H. Wixom  
University of Virginia

Jeffrey A. Hoffer  
University of Dayton

### Executive Summary

Real-time data warehousing and business intelligence (BI), supporting an aggressive Go Forward business plan, have helped Continental Airlines transform its industry position from "worst to first" and then from "first to favorite." With a \$30M investment in hardware and software over six years, Continental has realized conservatively over \$500M in increased revenues and cost savings in areas such as marketing, fraud detection, demand forecasting and tracking, and improved data center management.

Continental is now recognized as a leader in real-time business intelligence based upon its scalable and extensible architecture, prudent decisions on what data are captured in real-time, strong relationships with end users, a small and highly-competent data warehouse staff, a careful balance of strategic and tactical decision-support requirements, its understanding of the synergies between decision support and operations, and changed business processes that utilize real-time data.

### CONTINENTAL TRANSFORMS ITSELF

Real-time business intelligence (BI) is taking Continental Airlines to new heights. Powered by a real-time data warehouse, the company has dramatically changed all aspects of its business. Continental's president and COO, Larry Kellner, describes the impact of real-time BI in the following way: "Real-time BI is critical to the accomplishment of our business strategy and has created significant business benefits." In fact, Continental has realized more than \$500 million in cost savings and revenue generation over the past six years from its BI initiatives, producing an ROI of more than 1,000 percent.

Continental's current position is dramatically different from only ten years ago. The story begins with the

arrival of Gordon Bethune as CEO, who led Continental from its "worst to first" position in the airline industry. A key to this turnaround was the Go Forward Plan, which continues to be Continental's blueprint for success and is increasingly supported by real-time BI and data warehousing.<sup>1</sup> Currently, the use of real-time technologies has been critical for Continental in moving from "first to favorite" among its customers, especially among its best customers.

Continental's real-time warehouse provides a powerful platform for quickly developing and deploying applications in revenue management, customer relationship management, flight and ground operations, fraud detection, security, and others. Some of these applications, the quantifiable benefits they are generating, and the technology in place that supports them are described. Continental's experiences with real-time BI and data warehousing have resulted in insights

<sup>1</sup> The senior accepting editor is Jack Beckart.

<sup>2</sup> We thank Aimee Marie Reynolds, Luisa Chung, Sajeen Bhasarr, Carlos Ibarra, and the rest of the data warehousing team at Continental Airlines for their contributions to this article. Teradata, a division of NCR, provided funding for this case study.

<sup>3</sup> Some people prefer the term "right-time" over real-time in order to emphasize that data only needs to be as fresh as the decisions or business processes require. Depending on the business need, data can be hourly, daily, and even weekly or monthly and still be real-time. We use the terms real-time and right-time synonymously.

# Real-Time Business Intelligence makes a difference with exemplars... 2004 ...

## ... environmental scanning makes a difference ...

### 2004 Buick





**COLLABORATION**  
More, faster,  
and in your face P. 22

**STAYING POWER**  
Mainframes revived  
for an SOA world P. 28

**NEW DAY**  
Changes in store  
for Sun's R&D P. 30

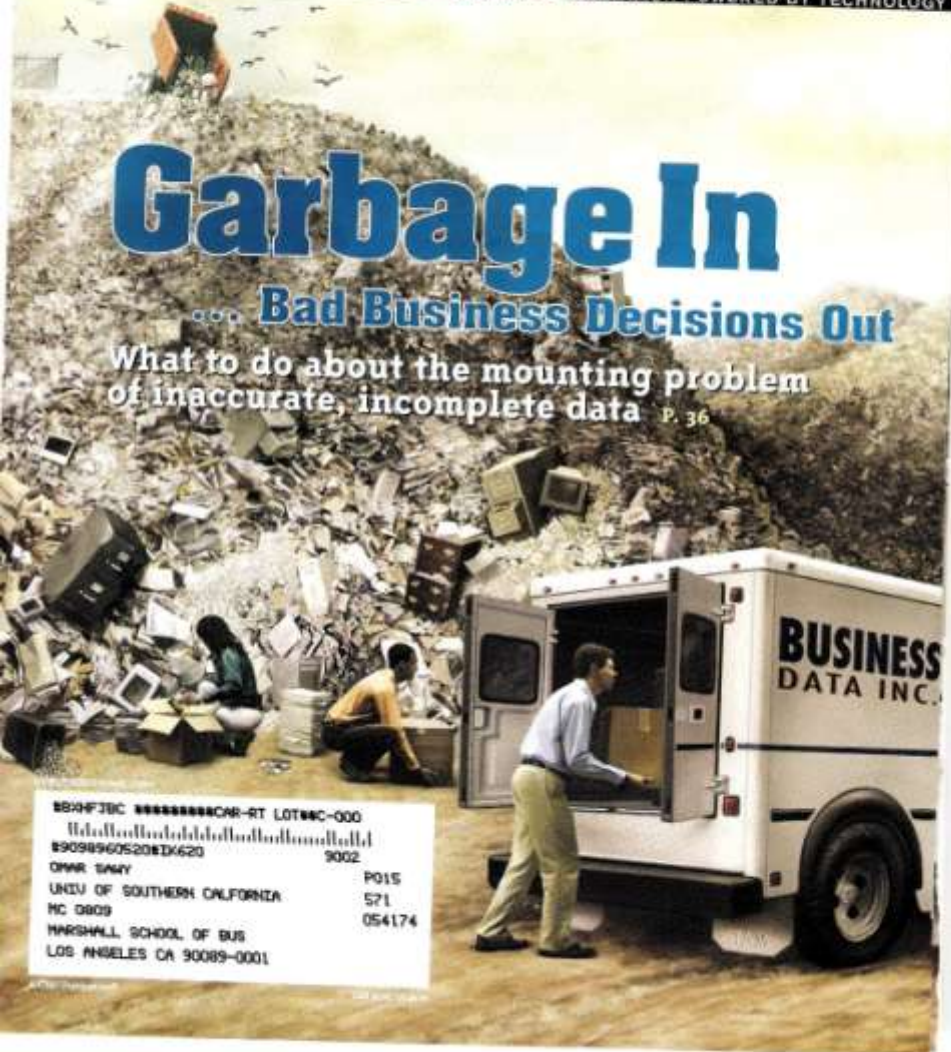
**DISCOVERY TOUR**  
E-mail as court  
evidence P. 47

# InformationWeek

MAY 8, 2006  
BUSINESS INNOVATION POWERED BY TECHNOLOGY

## Garbage In ... Bad Business Decisions Out

What to do about the mounting problem  
of inaccurate, incomplete data P. 36



883HF3BC \*\*\*\*\*CAR-RT LOT#MC-000  
 89098960520EDK620 9002  
 OMAR SAWY P015  
 UNIV OF SOUTHERN CALIFORNIA 571  
 MC 0809 054174  
 MARSHALL SCHOOL OF BUS  
 LOS ANGELES CA 90089-0001

**Data inundation  
problems are  
amplified in mid 2000s..**

... data warehousing comes  
to DSS ... and knowledge  
management attempts to  
augment DSS...

2006 Buick



THOMAS H. DAVENPORT, JEANNE G. HARRIS  
Co-authors of *Competing on Analytics*  
and ROBERT MORISON

# Analytics at Work

Smarter Decisions  
Better Results



**Analytics becomes the  
Hype as we enter 2010 ..**

... data mining, Google, and  
tons and tons of data ...

2010 Buick



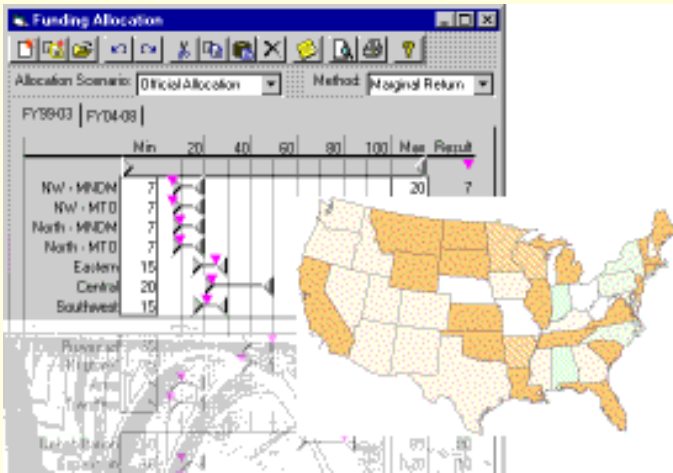


**.. and Dashboards become common place in all apps as we enter 2010 ..**

... and business intelligence is in full swing ...



2010 Buick





.. and DSS is fusing into the digital world of the masses...

Welcome to **decisionsupportworld.com**

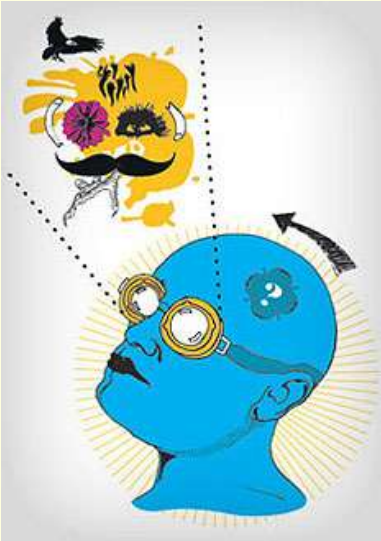
- ▶ Decision Support Analysis
- ▶ Data Driven Decision Support System
- ▶ Support Process
- ▶ Decision Plus
- ▶ Analytic Hierarchy Process
- ▶ E Business Management
- ▶ Executive Information Systems
- ▶ Database Data Mining
- ▶ Food Supply Chain Management
- ▶ Financial Data Analysis
- ▶ ERP Business Intelligence



**SEARCH**

DECISION SUPPORT | SUPPORT DELL | TECH SUPPORT | IT SUPPORT | COMPUTER SUPPORT | HELP DESK

# Agenda & Path



Looking at  
The past

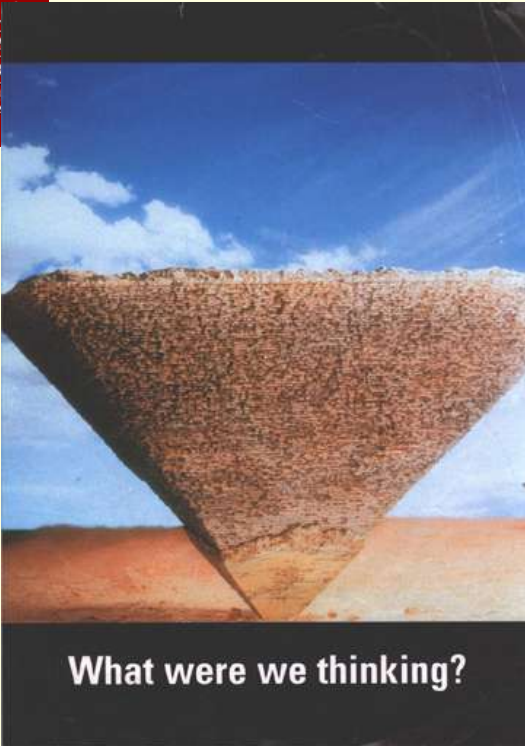
Where are we now ?

????



Future  
Opportunities ?





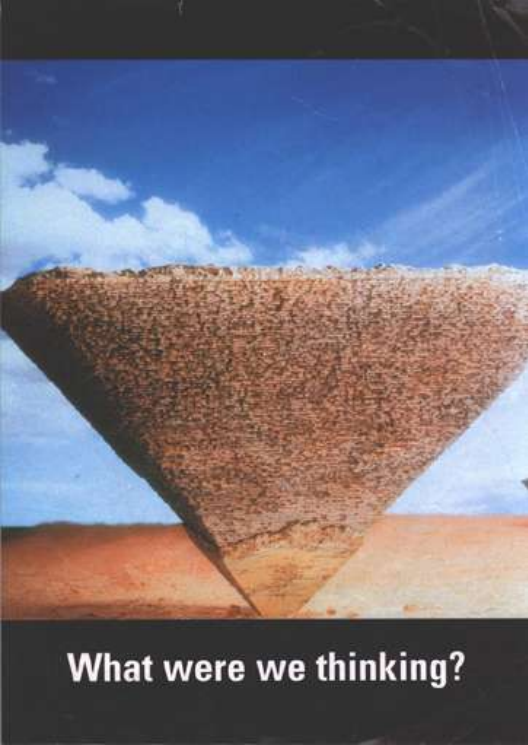
## Game Changers in the Digital Business World ?

Change the rules  
in the business  
ecosystem

Disruptive  
technologies  
& innovations

Disrupting industry  
boundaries

New business  
models for  
delivering  
products & services  
through digital platforms



What were we thinking?

## Game Changers in the Digital Business World ?

New assumptions  
about doing business  
and interacting

Things we thought  
would never happen,  
actually did ..

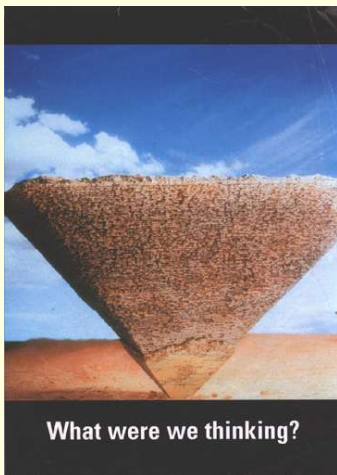
New players, modes of  
communication, interruption norms,  
response time norms.

Trends that were only  
seen with early adopters  
become mainstream ..

## New Research Opportunities for Decision Support & DSS & Environmental Scanning in next 5 years ..

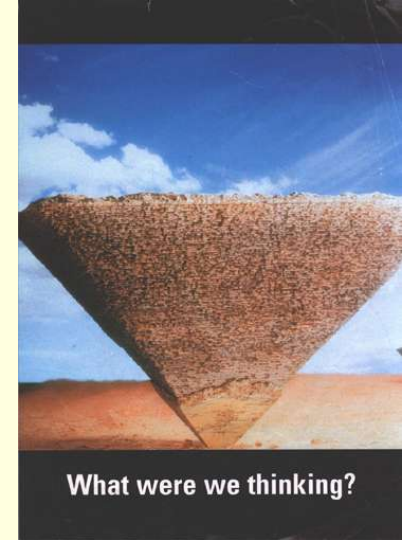


## Game Changers In the Digital World



# GAME CHANGER #1

## *Pervasive & Distributed Business Intelligence !*

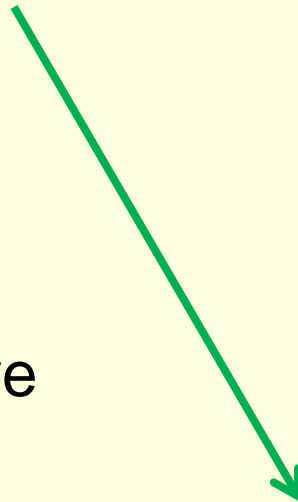




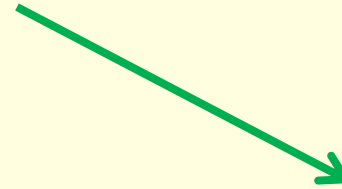
## Manifestations Triggered by Game Changer ?



Large enterprise application vendors have bought BI vendors



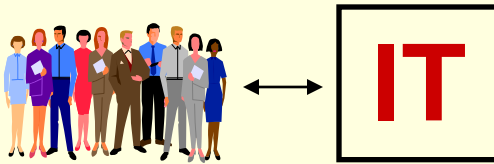
DSS & BI blend with BPM



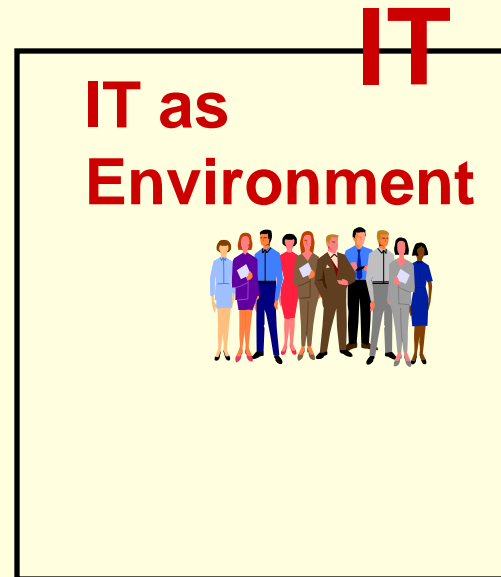
IT fusion affects the DSS context

# The Changing Role of IT: More Hidden but more Critical !

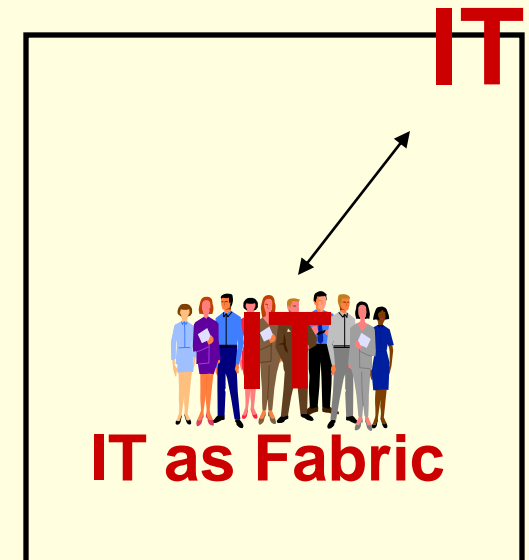
## IT as Tool



**Connection  
View (~1970-95)**

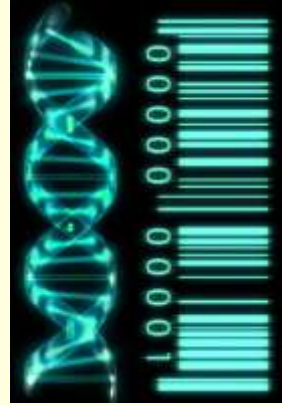


**Immersion View  
(~1991-2011)**



**Fusion View  
(~2004- ?)**

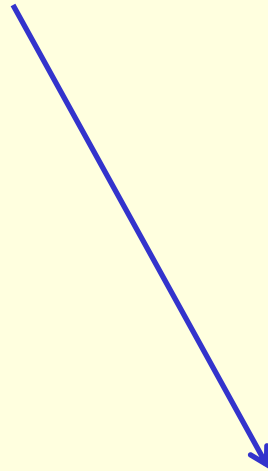




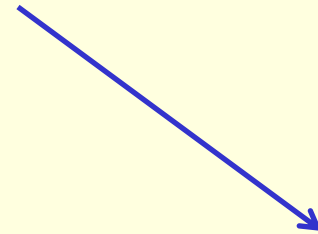
## Opportunities for Research & Innovation ?



Designing the  
BPM - BI - DSS  
organizational interface  
at the process level



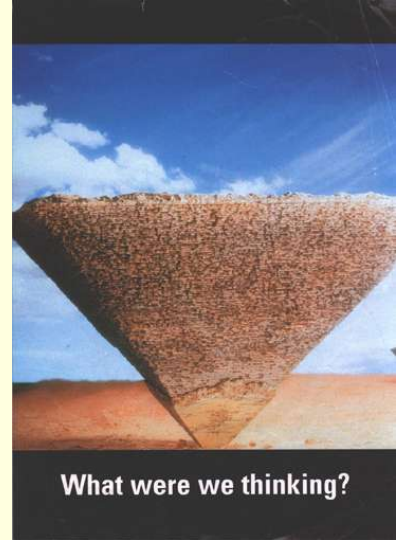
DSS for contextually-aware  
exception handling



SOA-DSS  
architectures

## GAME CHANGER #2

# *Porous Enterprises !*

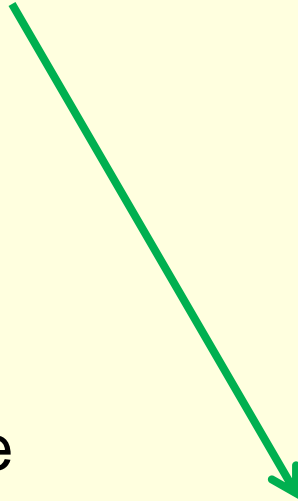




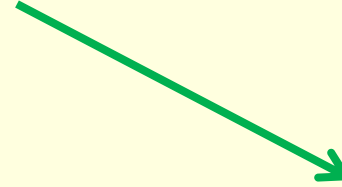
## Manifestations Triggered by Game Changer ?



Emphasis on “flows”  
of new knowledge  
from outside enterprise



“Think Hives”  
rather than  
Hierarchy

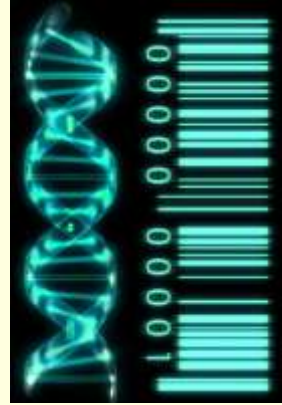


Engagement with  
Customers,  
Competitors,  
Community,  
Crowd...

The Open Innovation movement methods will start permeating all aspects of managing enterprises and managing innovation, rather than just software. Wikis & social network technologies are 1<sup>st</sup> generation of enablers.

Mass Collaboration will be a major factor of production.





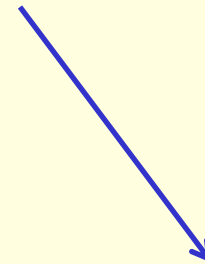
# Opportunities for Research & Innovation ?



DSS & Crowdsourcing



DSS for  
Open Innovation

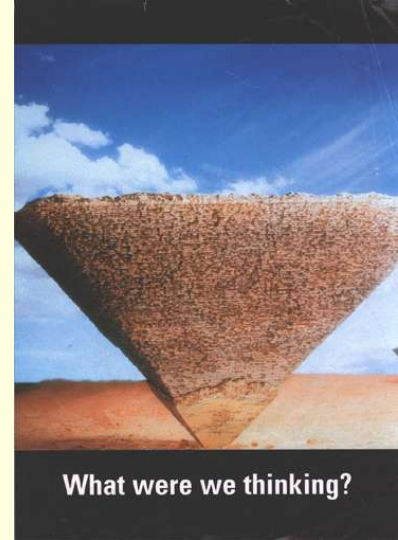


Designing  
Dashboards  
for Cross-Enterprise  
Decisions



## GAME CHANGER #3

# *Digital Turbulence !*



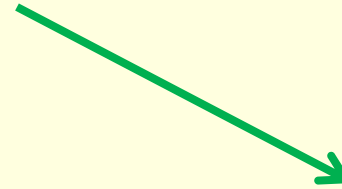


## Manifestations Triggered by Game Changer ?



IT Systems,  
Organizational  
Capabilities,  
& Environmental  
Turbulence  
fuse systemically

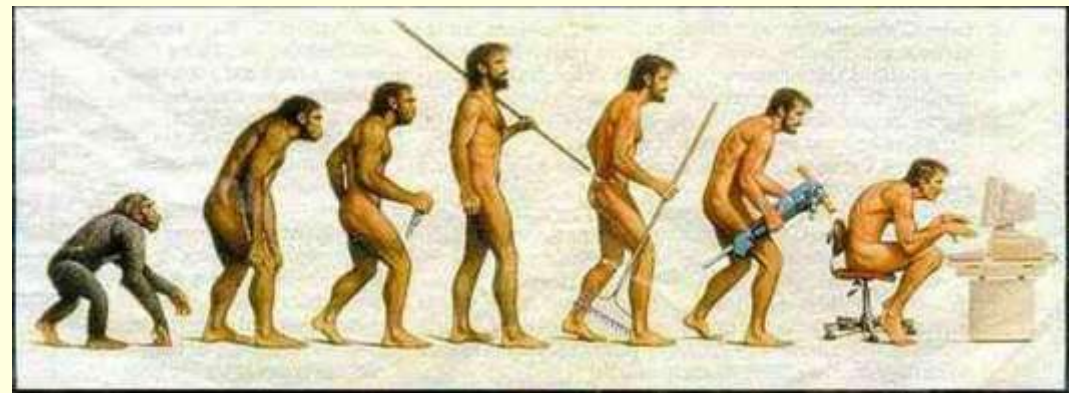
*El Sawy DSS 2010 Lisbon*



Dynamic agility  
a requirement..



Homo Digitalis appears !





## Opportunities for Research & Innovation ?

Mashup Cultures  
& Emergence in DSS  
(mashup composers)



Configurational  
Approaches  
to DSS

Unpacking the  
Environmental  
Turbulence  
“Variable” in DSS



## Structure of theories and the causal logic they capture

Variance  
Theories  
(western)

*Invariant  
relationship  
between  
cause & effect*

Process  
Theories

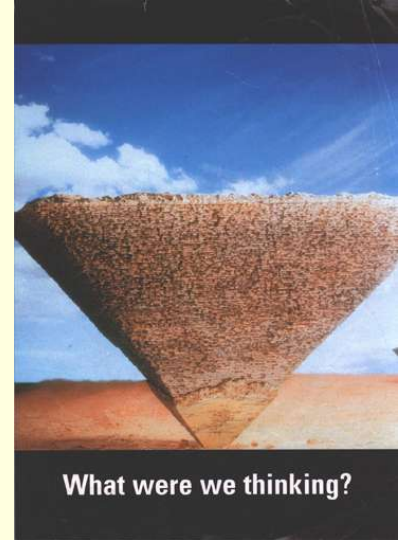
(middle eastern, mediterranean,  
Latin,...)

*Precursor  
insufficient to  
cause the outcome*

Configurational  
Theories  
(eastern ?)

*Accommodates  
systemic  
mutual causality*

## GAME CHANGER #4



What were we thinking?

***Web 2.0 becomes  
a major force  
to be reckoned with !***



# Gartner Hype Cycle for Web & Interaction Technologies - 2009



Plateau will be reached:

- less than 2 years
- 2 to 5 years
- 5 to 10 years
- ▲ more than 10 years
- ⊗ obsolete before plateau



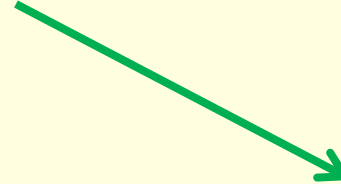
## Manifestations Triggered by Game Changer ?



Massive consumerization  
of IT hits the enterprise



Community information  
for decision making  
through social ties



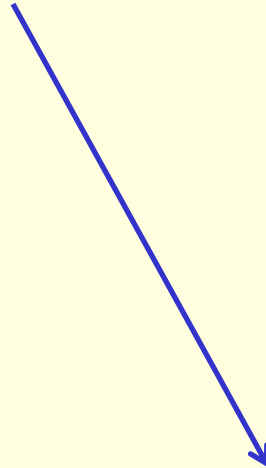
Interactive  
Ubiquitous  
Collaboration



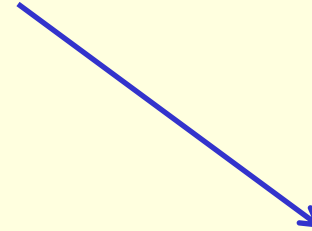
## Opportunities for Research & Innovation ?



Designing  
business intelligence  
dashboards  
in context of social media

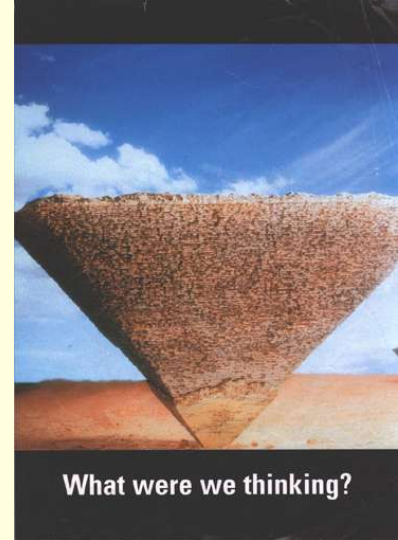


Designing DSS interfaces  
for mobile devices



DSS for consumers  
& hedonic DSS

## GAME CHANGER #5



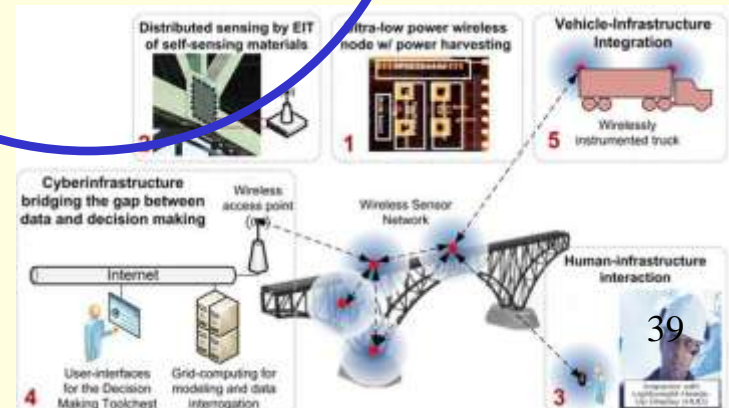
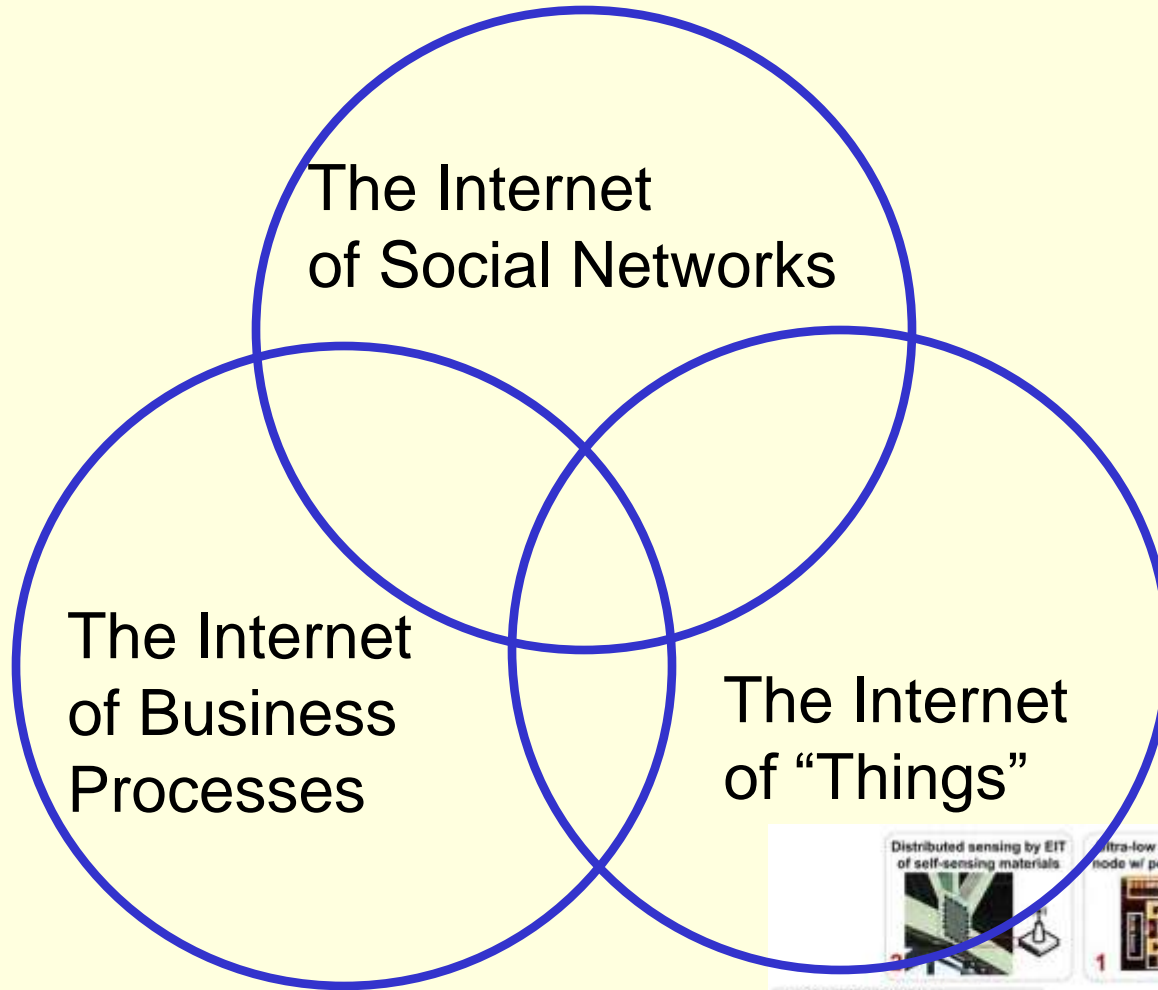
## ***Draconian Data Deluge !***



VS.



# Three “Internets” are growing ...

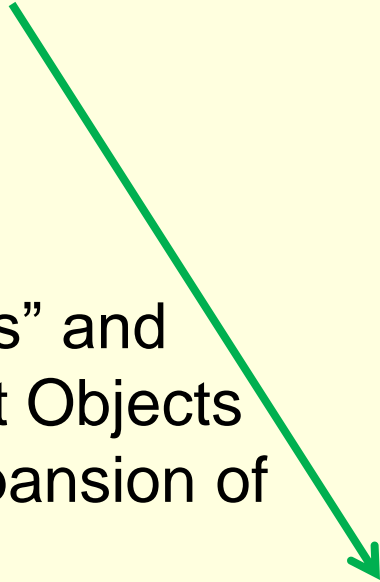




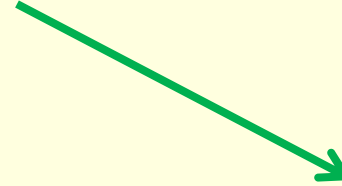
## Manifestations Triggered by Game Changer ?



The Internet of “Things” and Communicating Smart Objects will drive the huge expansion of the Internet

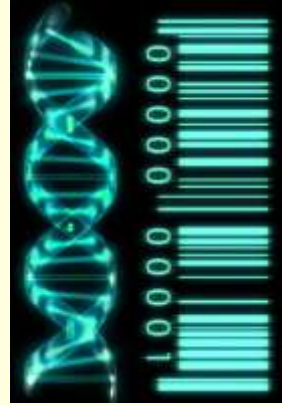


Knowledge management becomes more critical



People start paying more attention to Berner\_Lee’s notion of the semantic web





## Opportunities for Research & Innovation ?

↓

Scanning versus  
Searching versus  
Probing versus RSS  
versus ..?

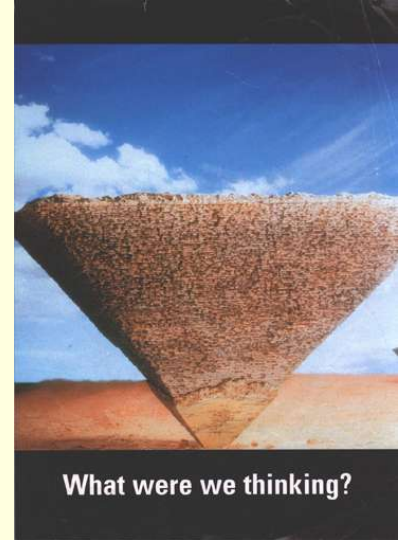
↘

The search for a  
*Semantic*  
Entity-Relationship model

↙

Managing Distractions &  
Interruptions in DSS  
(attentional user interfaces)

# GAME CHANGER #6



## *From the Internet to the Splinternet !*



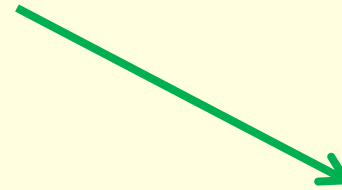


## Manifestations Triggered by Game Changer ?

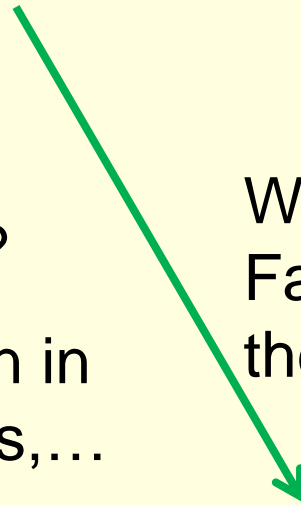


No More Unified Web ?

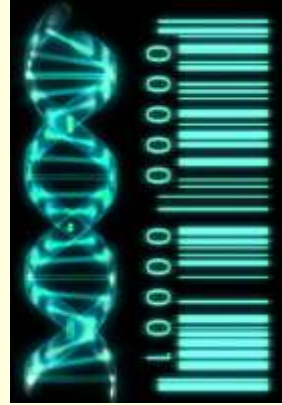
Dueling & Fragmentation in  
Devices, Platforms, Apps,...



Walled Communities such as  
Facebook, LinkedIn,.. Change  
the universality of search on the  
internet



Proprietary & multiple platforms:  
iPhone, Kindle, Android,  
WebTVs,.....



## Opportunities for Research & Innovation ?

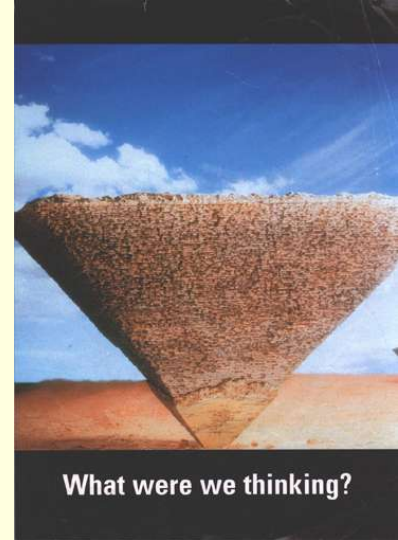
DSS &  
the Digital Divide

Rich identity  
& DSS with  
Multiple Personnas

New forms of  
Information  
brokers

## GAME CHANGER #7

***Expectations for Multimedia  
Interaction are Exuberant !***



Rich Multimedia Interfaces  
will be commonplace & “free”

1990 -- : Computing cost erosion era ..

*Compute !*

1995 -- : Connectivity cost erosion era ..

*Connect & Communicate !*

2000 -- : Bandwidth cost erosion era..

*Collaborate & Coordinate !*

2005 -- : Mobility cost erosion era..

*Unwire me !*

2010 --: **Interactivity cost erosion era..**

*Engage richly real-time in Digital Work-Life !*

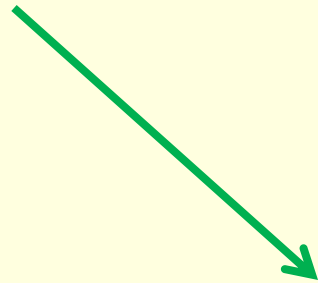




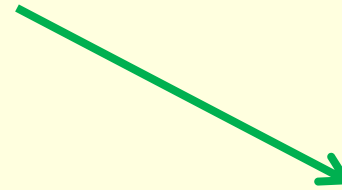
## Manifestations Triggered by Game Changer ?



Augmented  
Reality

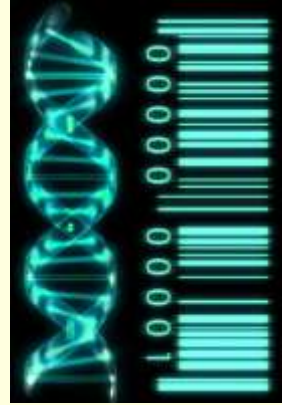


Mobile  
everything



Games  
Continuously  
raise the bar on  
multimedia interface  
complexity

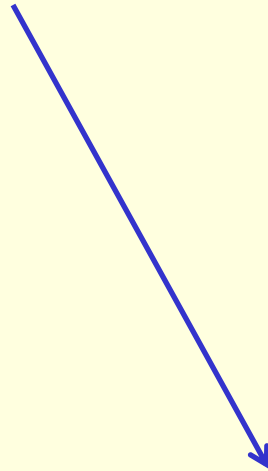




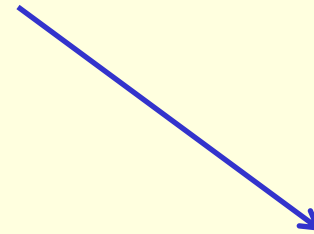
## Opportunities for Research & Innovation ?



HCI research  
Renaissances again



Tunnel vision  
issues with dashboards

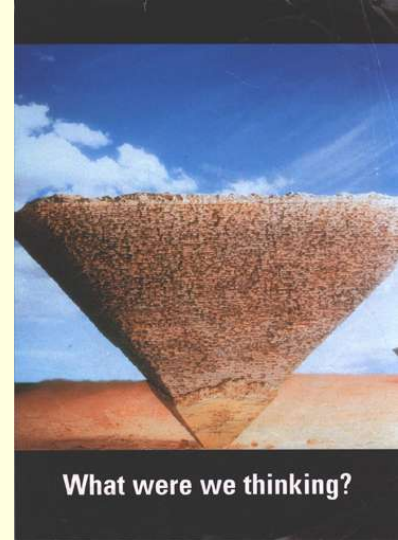


DSS for the  
handicapped



## GAME CHANGER #8

# Real-Time Has Yet Another Go !

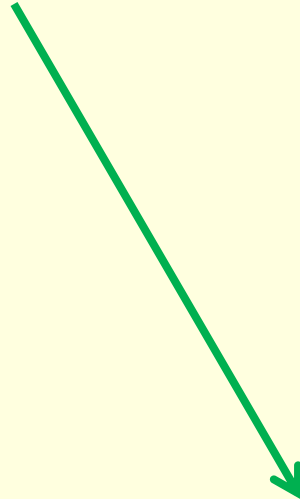




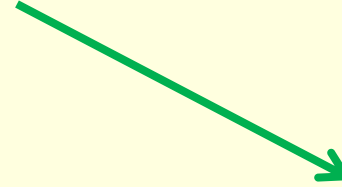
## Manifestations Triggered by Game Changer ?



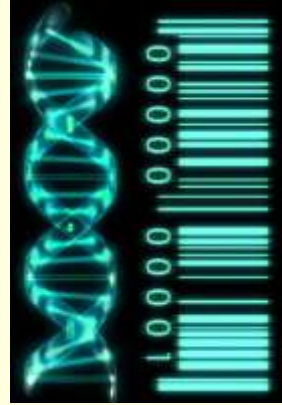
Need for quick  
action & agility



Questionable  
Information quality



Multiple distributed  
perspectives  
Need to integrated in  
real-time..



## Opportunities for Research & Innovation ?

↓

OODA Loops  
need an upgrade

↘

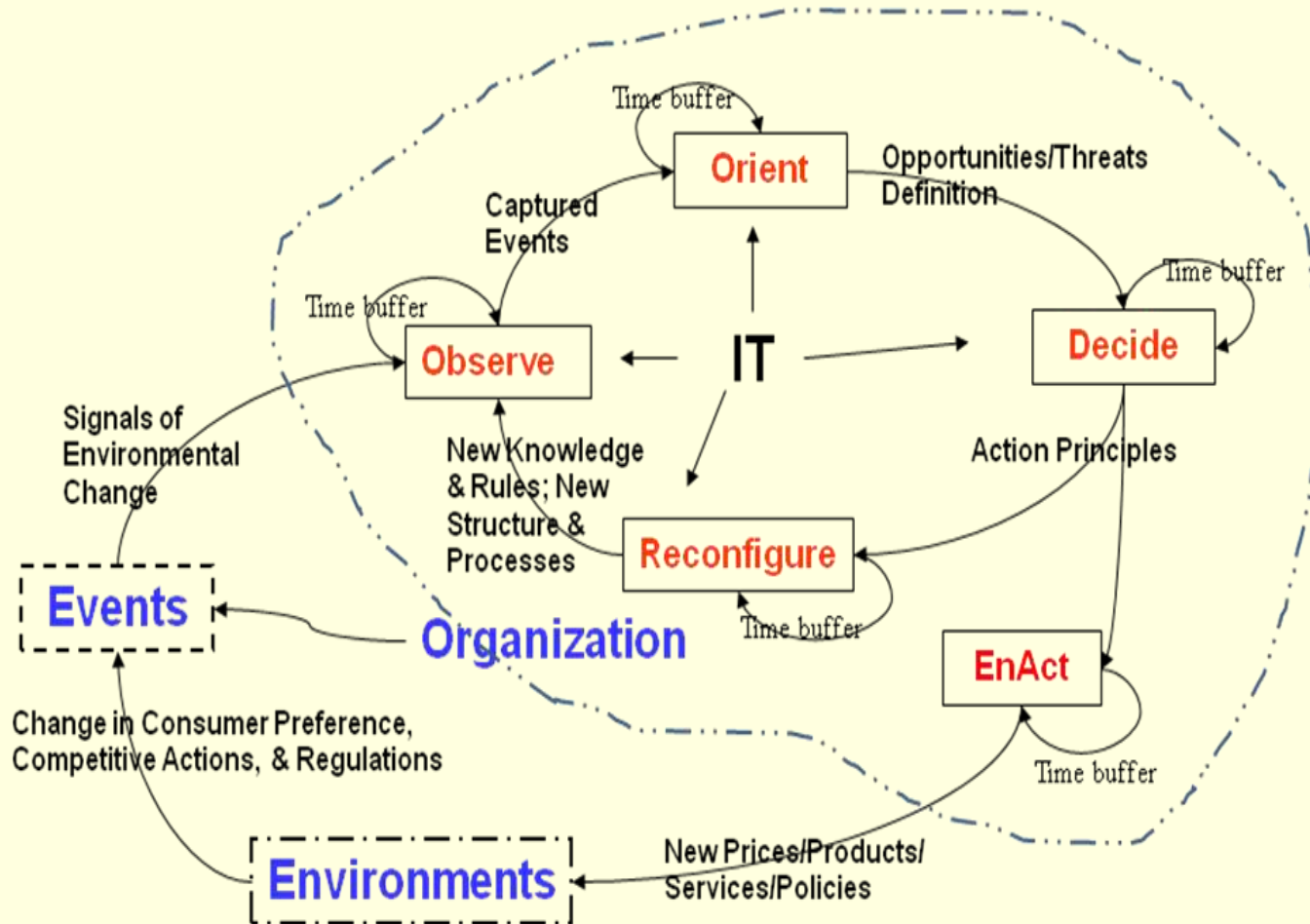
Value & Intelligent Latency  
Reduction in DSS

↘

Fly-by-wire  
DSS

# Open-System Event Management Model

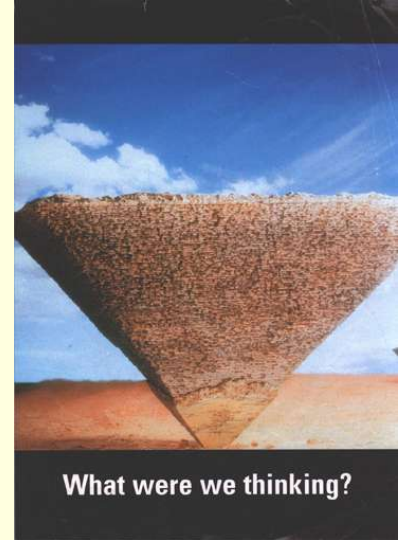
(YoungKi Park, 2009)



## GAME CHANGER #9

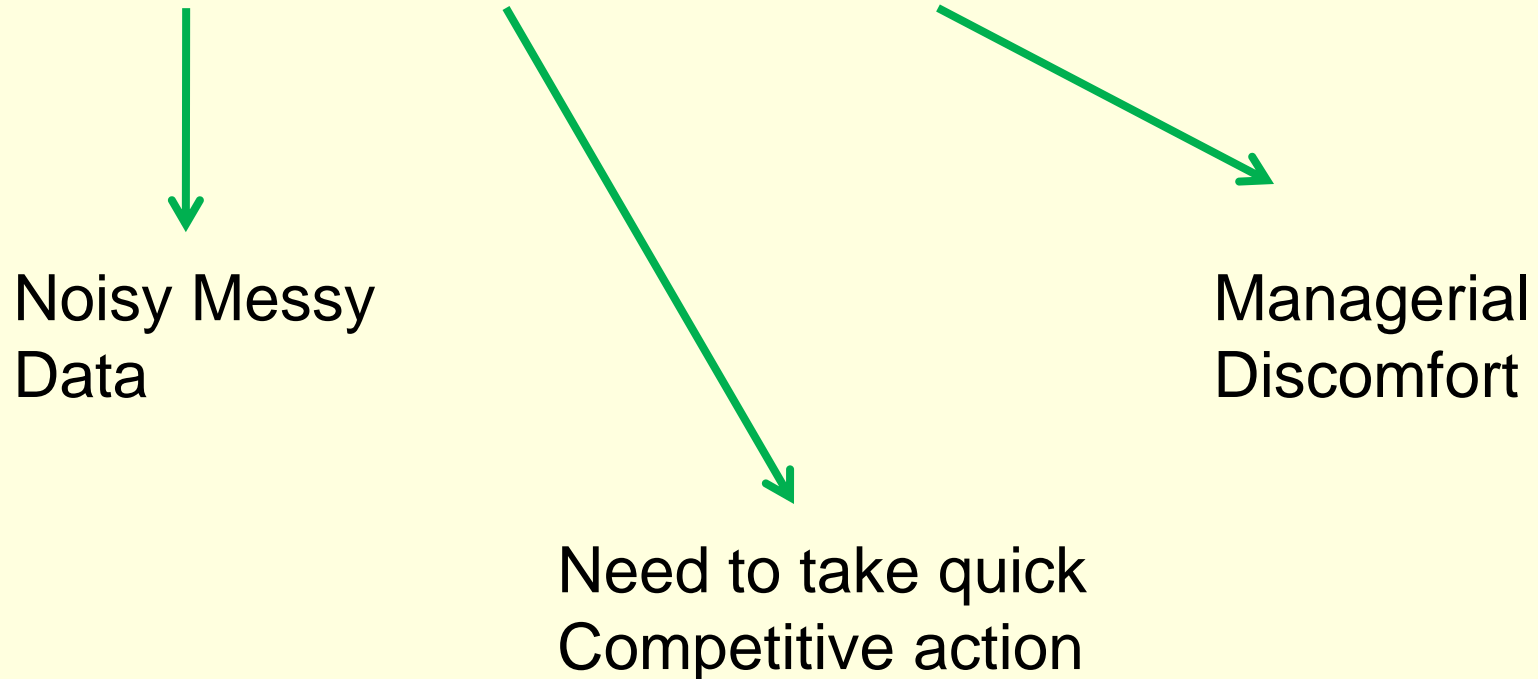
***Competing on  
Half-Truths  
& while  
Improvising !***

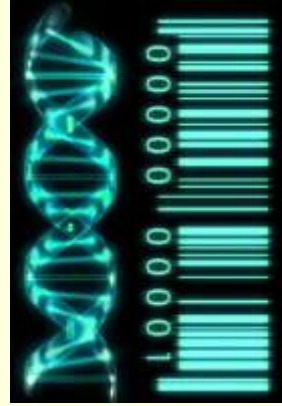
entrop





## Manifestations Triggered by Game Changer ?





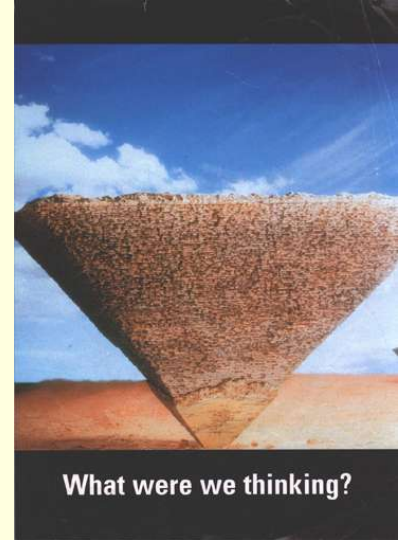
## Opportunities for Research & Innovation ?

Assumption Surfacing  
& Scenario Generation  
& Risk

Issue-Based DSS

Emergence &  
improvisation  
around decisions

## GAME CHANGER #10



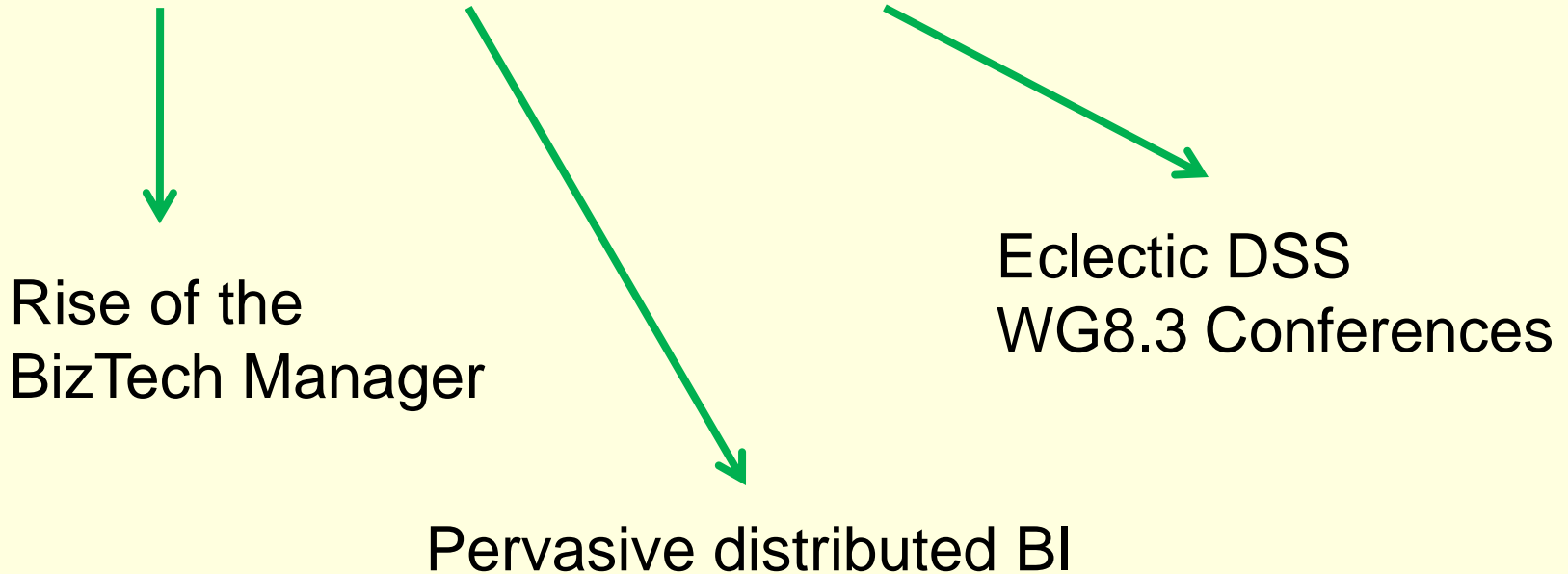
***DSS has disappeared into the fabric of organizations, Long Live DSS !***







## Manifestations Triggered by Game Changer ?



Questions asked in 1980 ....

dSS or dsS or dSs or Dss or DSs or DSS ?



Questions asked in 2010 ....

What are good ways and bad ways of fusing DSS into the fabric of the context ?



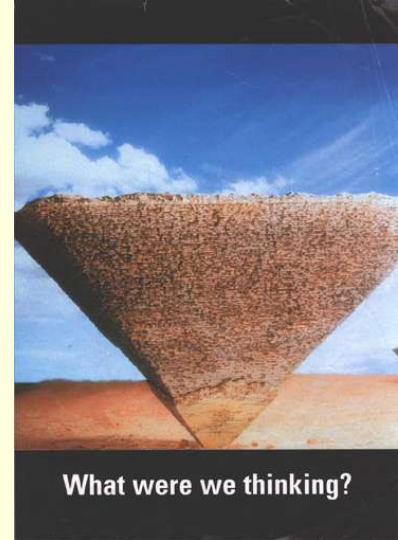
## Opportunities for Research & Innovation ?

DSS fusion

Links to digital  
turbulence

Deeper understanding  
of decision making and scanning

GAME CHANGER #11, 12, 13, 14, 15, .....



***What are YOUR Game Changers ?  
... and what New  
Research Opportunities  
in DSS do they Generate ?***





Buick 2015 !



# QUESTIONS ?



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## Addendum

An Illustration  
from the India TED Conference, November 2009  
on the potential of “Sixth Sense Technology” ....

| [http://www.ted.com/talks/pranav\\_mistry\\_the\\_thrilling\\_potential\\_of\\_sixthsense\\_technology.html#top](http://www.ted.com/talks/pranav_mistry_the_thrilling_potential_of_sixthsense_technology.html#top)

