EVOLUTION OF DATA MANAGEMENT
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1. INTRODUCTION

BACKGROUND: DP EXPERIENCE SINCE 1972
DB EXPERIENCE SINCE 1978

DBMS: SYSTEM 2000, TOTAL, VAX-DBMS

HARDWARE: IBM, NCR, DEC/VAX

ASTUTE: CO-FOUNDER OF OFFICIAL ASTUTE-EUROPE
ASSOCIATION
VICE-PRESIDENT AND PRESIDENT ASTUTE-EUROPE
(1981 - 1983)
CURRENTLY COMMITTEE-MEMBER FOR 'SPECIAL
AFFAIRS'.

MISC.: MEMBER OF 'DATABASE CLUB', N.G.I.
- SUBGROUP 'PROTOTYPING'
- SUBGROUP 'DATA MANAGEMENT AND INFORMATION
CENTRE' (LEADER)

MOST RECENT JOB: INVESTIGATE EFFICIENCY AND
ORGANIZATION OF DATA BASE
ADMINISTRATION FOR A LARGE
COMMERCIAL BANK AND IMPLEMENT
SUGGESTED PROPOSALS.
2. FROM NOTHING (?) TO DATABASE ADMINISTRATION

THE EARLY DAYS:

FILES = DESIGNED FOR SINGLE PROGRAMS
CONTROL, IF REQUIRED, EXECUTED BY PROGRAMMER/ANALIST

NO CENTRAL CONTROL EXECUTED/NECESSARY?
LATER:

DATABASE = REFLECTS DATA STRUCTURE ON CORPORATE LEVEL RATHER THAN ON PROGRAM LEVEL.

ADMINISTRATION = CORPORATE LEVEL = CENTRAL

NEW TECHNOLOGY \Rightarrow NEW PHILOSOPHY
* DATABASE ADMINISTRATION AS AN ANSWER OF MANAGEMENT TO A TECHNOLOGY CHANGE.

* IMPORTANCE OF DATA BECAME MORE OBVIOUS.

* NEED FOR SOLVING CONFLICTS ABOUT DATA DEFINITIONS, DATA OWNERSHIP, ETC.

* CHOOSING AN OPTIMAL SOLUTION FOR DATA STRUCTURES AGAINST A PURE DATA STRUCTURE.

* BALANCING AND CONTROLLING THE USAGE OF DATA QUERY LANGUAGES VERSUS QUICK ON-LINE TRANSACTIONS.

FROM A SINGLE 'DATABASE ADMINISTRATOR' TO A ....
DATABASE ADMINISTRATION TEAM

DBA: A HUGE NUMBER OF TASKS AROUND DEVELOPMENT AND ADMINISTRATION OF DATABASE APPLICATIONS AND DATABASES.

- DESIGN
- CREATION
- OPERATIONAL SUPPORT
- PERFORMANCE
- REORGANISATION
- SECURITY
- DOCUMENTATION
- COORDINATION
- IMPLEMENTATION
- TRAINING
- ...

LATER: SPLIT UP BETWEEN

DATA ADMINISTRATION (DA)

DATABASE ADMINISTRATION (DBA)

DA: 'RESPONSIBLE FOR DEVELOPMENT AND CONTROL OF POLICIES, PROCEDURES, RULES AND PLANNING OF DEFINITION, ORGANISATION, SECURITY AND ACCESSIBILITY OF ALL DATA WITHIN A COMPANY'.

SPLIT UP ==> COOPERATION!
3. DIFFERENT KINDS OF DATABASE TYPES

WHY NOT:  - INTEGRITY CONTROL ONLY BY APPLICATION
          - MAINTENANCE OF REDUNDANT DATA

QUESTION: DIFFERENCE WITH 'GOOD OLD DAYS'?

ANSWER: DBMS/DATABASE AS A LUXERY (AND EXPENSIVE) ACCESS METHOD (ICEBERG)!
DBMS cost penalties are often hidden by the more visible and obvious benefits.

DBMS cost/benefits "iceberg".
CORPORATE DATABASE

WHY: - 'IDEAL' SITUATION BY TOTAL INTEGRATION OF CORPORATE DATA STRUCTURES  
- INTEGRITY CONTROL BY DBMS (?)

BUT: - A LOT OF WORK TO GET THERE (EXTENSIVE DATA ANALYSIS)
- COMPLEXITY OF DEFINITION, OWNERSHIP; ALL IN ONE PASS
- TECHNICAL PROBLEMS (SELECTIVE METHODS FOR RECOVERY, SECURITY, PRIVACY, SIZE, .... )
SO WHAT ELSE: SUBJECT DATABASE

ADVANTAGES: SOLVES MOST OF DISADVANTAGES OF OTHER APPROACHES.

NOTE: DATA DOES NOT EXIST FOR A PARTICULAR PROJECT OR DEPARTMENT.
GOAL OF SUBJECT DATABASES:

NUMBER OF APPLICATION SYSTEMS

NUMBER OF DATABASES

A = APPLICATION DATABASE
S = SUBJECT DATABASE
4. THE ORGANIZATIONAL PLACEMENT OF DBA

- All tasks, which could be considered as DBA task, should be executed somewhere in the organization. So why not within DBA department?!?

APPROACH FOR PLACEMENT DECISION

1 - CLEAR UNDERSTANDING OF THE ‘DATABASE PHILOSOPHY’
2 - DECIDE UPON DATABASE DIRECTION: APPLICATION/SUBJECT/ CORPORATE
3 - DEFINE ALL DBA TASKS
4 - CONSIDER THE CONSEQUENCES OF IMPLEMENTING OR NOT IMPLEMENTING THOSE TASKS
5 - CONSIDER THE ADVANTAGES/DISADVANTAGES OF DIFFERENT DBA ORGANIZATION STRUCTURES.

AND ....

THE PLACEMENT OF DBA SHOULD BE DEPENDANT OF THE REQUIRED LEVEL OF EFFICIENCY IN EXECUTING THE DBA TASKS!

THERE IS HARDLY A SINGLE SOLUTION, SINCE EVERY COMPANY IS DIFFERENT!
FOLLOWING SITUATIONS ARE ACCEPTABLE WITHIN THE LAID DOWN CRITERIA ....

FIRST STAGE: PLANNING, RESEARCH, POLICIES, PROCEDURES, SELECTION, ETC.

NO EXECUTABLE TASKS!!
SECOND STAGE: ADVISORY AS WELL AS EXECUTING TASKS

DATA ADMINISTRATION MIGHT BE FOUNDED.
CONSULTANT DBA

MATURE SITUATION: HIGHLY INFLUENTIAL POSITION.

NOTE: 'DA' MIGHT GROW AS WELL AND REPORT SOMEWHERE ELSE IN THE ORGANISATION.
FOR A DECENTRALIZED ENVIRONMENT:

1 DBA PER DIVISION + 1 CENTRAL DBA
   OR
1 CENTRAL DBA (COMMUNICATION PROBLEMS)
   OR
1 DB-DESIGN GROWS PER DIVISION + 1 CENTRAL DBA (ALL TASKS)

__________

WORST SOLUTION FOR A MATURE SITUATION

- AS A SECTION OF DEVELOPMENT (BAD FOR OPERATIONS, ACCENT ON DB(-APPL.) DESIGN)
   OR
- AS A SECTION OF OPERATIONS (BAD FOR DEVELOPMENT, ACCENT ON TECHNICAL AND OPERATIONAL ASPECTS).
OTHER FACTORS OF INFLUENCE

- HISTORY (WHO ORIGINALLY CAME WITH THE DB IDEA)
- BACKGROUND OF DBA MANAGER (SYSTEMS PROGRAMMER, INFORMATION ANALIST)
- TYPE OF BUSINESS (INFORMATION ABOUT PRODUCTS - DATA INTEGRATION POSSIBLE, INFORMATION AS A PRODUCT - NEED FOR INTEGRATION STRONG)
- HARDWARE/SOFTWARE COMPLEXITY (DISTRIBUTED DB -- TECHNICAL ORIENTATION)

.... LAST BUT NOT LEAST:

- HUMAN NATURE OF DBA PERSONNEL
  - KNOWLEDGE
  - EXPERIENCE
  - ATTITUDE
  - DIPLOMACY
  - ....
5. THE INTERNAL ORGANIZATION OF A DBA TEAM

WHAT PERSONAL CHARACTERISTICS ARE REQUIRED?

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<tr>
<th>AREA OF EXPERTISE</th>
<th>EQUIVALENT KNOWLEDGE OF</th>
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<tbody>
<tr>
<td>DATA PROCESSING</td>
<td>DESIGNER/ANALIST</td>
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<td>PROGRAMMER</td>
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<td>SYSTEMS PROGRAMMER</td>
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<td>DC SPECIALIST</td>
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DBA = DBA

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IN THE REAL WORLD YOU ARE UNLIKELY TO FIND ONE MAN WITH THESE SKILLS
AT THE START: NO STRUCTURE, HEADING FOR A SPECIALISATION

**DATABASE OPERATIONS**
- DBA MGR.
  - DBMS SPECIALIST
  - DD SPECIALIST
  - DC SPECIALIST
  - ADMINISTRATION

**DESIGN**
- DBA MGR.
  - LOGICAL DB DESIGN
  - PHYSICAL DB DESIGN
  - DD SPECIALIST
  - STANDARDS & PROCEDURES

**DD**
- DBA MGR.
  - STANDARDS & PROCEDURES
  - DATA DICTIONARY
PROJECT SUPPORT

- PROJECT ≠ DATA AREAS ➔ APPLICATION DATABASES!
FUNCTIONAL STRUCTURE

DBA MGR.

DBA DESIGN
- LOGICAL DB DESIGN
- PHYSICAL DB DESIGN

ADMIN.
- DD SUPPORT
- PLANNING
- TEACHING
- ADMIN.

DBMS SUPPORT
- DBMS SPECIALIST
- SYSTEMS PROGRAMMER

ALSO SUPPORT FOR OPERATIONS

+ BUILT-IN COORDINATION
+ SUBJECT OR CONCERN DB BOTH POSSIBLE
-/+ DEPENDANCY OF DBA
- ONLY EFFECTIVE WITH SUPPORT FROM MANAGEMENT

IDEA: DBA CAN IMPROVE QUALITY AND SPEED OF SYSTEMS DEVELOPMENT.
- HARD TO COORDINATE

- POTENTIAL DANGER FOR CONFLICTS

- NEED FOR EXCESSIVE INFORMATION Flows (POTENTIAL PROBLEM FOR ORGANISATION: GALBRAITH).
EVOLUTION OF DATABASE ADMINISTRATION

'TWO YEARS AGO WE HAD NO PROBLEMS AT ALL .......

'IN ORDER TO PREVENT PROBLEMS IN THE NEAR FUTURE ......

<table>
<thead>
<tr>
<th>PHASE</th>
<th>MAIN TASK</th>
<th>DATABASE ASP.</th>
<th>DBA POSITION</th>
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<tr>
<td>INTRODUCTION</td>
<td>PLANNING</td>
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<td>STAND ALONE APPLICATION (PROJECT 1)</td>
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<td>PROJECT OR FUNCTIONAL</td>
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<td>INTEGRATION OF APPLICATIONS</td>
<td>CONSULTANT OR MANAGEMENT</td>
<td>FUNCTIONAL OF MATRIX</td>
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6. DBA SKILLS AND DBMS TYPES

EASE OF USE BY NON DBA USER

DIFFICULT

HIERARCHICAL

NETWORK

INVERTED FILE

RELATIONAL

SEMANTIC

EASY

TIME
FLEXIBLE FOR DBA MEANS:

- TOLERANCE IN SOLVING DB DESIGN MISTAKES
  BUT
  RELATIVE LESS TECHNICAL / MORE USER SUPPORT

NOTE: TOTAL SUPPORT INCREASES
7. DBA AND DA

- IMPORTANCE OF DATA ANALYSIS

- BAD ANALYSIS → BAD DATABASE DESIGN

  MAJOR CHANGES IN DB STRUCTURES

  MAJOR CHANGES IN PROGRAMS

  DBMS MORE EXPENSIVE THAN TRADITIONAL ACCESS METHODS

- FLEXIBLE DBMS ALLOWS EASY CORRECTION OF SOME MISTAKES

- ESSENTIAL:

  - MANAGEMENT SUPPORT FOR DATA ANALYSIS

  - GOOD RELATIONSHIP BETWEEN DBA AND DA

  - CORRECT ORGANISATIONAL PLACEMENT

  - DA ALSO CENTRALISED; NOT BY PROJECT

  - USAGE OF AUTOMATED DATA DICTIONARY
"GIVING AND TAKING"

- REQUESTED: DETAILED ACCESS PATH ANALYSIS (USAGE OF DATA)

- MAKE CERTAIN DBA PRODUCTS AVAILABLE FOR DESIGNERS/PROGRAMMERS BY USE OF A DD/DS OR ANY OTHER TOOL.

THINK ABOUT THE OTHER DBA ASPECT:

- DIPLOMAT

- FRIENDLY COLLEAGUE

- .....
9. DBA AND OPERATIONS

OPERATIONS SHOULD BE ABLE TO DO THE REGULAR WORK THEMSELVES!

DBA: SUPPORT (AS BACK-UP/DIFFICULT PROBLEMS)
STANDARD AND PROCEDURES (SET UP & CONTROL)
EDUCATION

OPERATIONS: EXCEPTION REPORTS
LOGGING FOR DBA
MISC. INFORMATION
10. SOME FUTURE INFLUENCES

MORE THAN 1 DBMS

REALITY TODAY (MICRO / MAINFRAME) IN MANY COMPANIES:

- MAINFRAME
  - RELATIONAL (DB2, ORACLE, .....)
  - HIERARCHICAL (IMS, .....)
  - TRADITIONAL
    - NETWORK (IDMS, .....)
    - INVERTED (SYSTEM 2000, .....)

- MICRO
  - QUESTION: DBA

- MINI
  - WHO DOES THE DESIGN AND ADMINISTRATION?

INFORMATION CENTRE

- DBA-TASK: COPY MANAGEMENT

- WHAT TO DO WITH ALL THOSE TOOLS WHICH GIVE DIRECT ACCESS TO OPERATIONAL DATA?

DESIGNERS WORKBENCH

- IMPROVED DESIGNS

- FASTER DEVELOPMENT

4TH GENERATION TOOLS

- LESS SYST. DEVELOPMENT (BY DP PROFESSIONALS)

- MORE SUPPORT (BY DBA !)

KNOWLEDGE BASES

- THE (DATABASE) DESIGN AUTOMATED?
II. CONCLUDING REMARKS

DATA MANAGEMENT POLICY OF DP MANAGEMENT INFLUENCES LEVEL OF DBA IN THE ORGANISATION:

APPLICATION  
\[\text{PREFERENCE} \rightarrow \text{DBA LEVEL}\]

SUBJECT  
\[\text{PREFERENCE} \rightarrow \text{HIGHER DBA LEVEL}\]

CORPORATE  
\[\text{PREFERENCE} \rightarrow \text{HIGH DBA LEVEL}\]

WHEN POLICY IS: EVOLUTION FROM APPL \(\rightarrow\) SUBJ \(\rightarrow\) CORP THEN

PLACE DBA AT RIGHT LEVEL = 1 STEP HIGHER.

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FUNCTIONAL STRUCTURE : STRONG PREFERENCE

OTHER STRUCTURES HAVE OFTEN DISADVANTAGES FOR EFFECTIVENESS

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HUMAN NATURE = IMPORTANT!

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MANAGING THE SHARED DATA ENVIRONMENT

CRITERIA FOR SUCCESS

- COMPREHENSIVE EDUCATION
- CLEAR USABLE STANDARDS & PROCEDURES (AUTOMATED)
- REGULAR OPEN DESIGN REVIEWS
- GOOD USE OF AVAILABLE EXPERTISE
- EARLY FULL INVOLVEMENT
  - USER/DP STAFF IN DBA PLANNING
  - DBA STAFF IN DP PLANNING
- GOOD COMMUNICATIONS AND CHANGE CONTROL
- USE OF DATA DICTIONARY

NOW IT IS UP TO YOU !!

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