A FRAMEWORK FOR THE ANALYSIS OF THE
RELATIONSHIP BETWEEN BUSINESS ORGANIZATION EVOLUTION
AND
BUSINESS INFORMATION SYSTEMS EVOLUTION

M. RICCIARDI
INFORMATION SYSTEMS
MARKETING DIRECTOR

IBM ITALY
SEGRATE - MILANO

ABSTRACT

This paper describes a matrix which put into evidence the tight "correlation" existing between the EDP Development and the Organization Development of a Company.

The matrix is obtained linking together two models : the Greiner's representation of the five phases of the Business Organization Development and the Nolan's hypothesis on the stages of EDP growth.

The result is a method used as framework to evaluate the information systems status and define its main development strategies to support the Business Organization Evolution.

I N D E X

1. BUSINESS ORGANIZATION DEVELOPMENT PHASES (GREINER) (1)
2. EDP DEVELOPMENT STAGES (NOLAN) (2)
3. SYNTHESIS BETWEEN MODEL 1 AND MODEL 2 TO ALLOW:
 - A DIAGNOSIS OF I.S. STATUS RELATED TO THE BUSINESS ORGANIZATION STATUS
 - A DEFINITION OF I.S. ARCHITECTURE AND MAIN DEVELOPMENT STRATEGY COHERENT WITH THE EVOLUTION OF THE BUSINESS ORGANIZATION.

REF. :

- (1) Larry E. GREINER
Harvard Business Review, Vol. 50 July-August '72, p. 76, nr. 4
- (2) Richard NOLAN
"Managing the Four Stages of EDP Growth"
Harvard Business Review, Vol. 52 January-February '74, p. , nr. 1
"Thoughts about the fifth stage" - Working Paper -
Harvard Univ. - Oct. 1975
"The Data Resource Hypothesis - Business Needs a New Bread of EDP Manager"
Harvard Business Review, March-April 1976, Vol. 54, p. 125, nr. 2
page 123.

BUSINESS ORGANIZATION DEVELOPMENT PHASES

1.1 THE FORCES AND THE FACTORS DETERMINING THE DEVELOPMENT OF A BUSINESS

Larry Greiner, in his referenced paper, points out that the internal history of the organization may influence the strategies, the feasibility of organizational changes (new structures) and, as a consequence, the Business Development even more than the external historical forces (like the market place) .

He identifies the major factors determining the Business Development in :

1. THE AGE (of the Business)
2. THE DIMENSIONS
3. THE PERIODS OF DEVELOPMENT
4. THE PERIODS OF REVOLUTION
5. THE TREND OF DEVELOPMENT OF THE INDUSTRY SEGMENT .

1.2. THE 5 PHASES OF THE DEVELOPMENT

Figure 1 A) reproduces the Greiner's Organization Development Model, which shows the sequence of the five development and crisis phases, the main characteristic of which are described in detail in Greiner's referenced paper and are summarized in the first six lines of the matrix of fig. 2: Business Aspects versus Organization Phases.

The main conclusion and recommendations arrived at by Greiner are the following:

- Understand in which stage of development or of crisis the company is
- Each phase leaves its mark of strenght & experience
- The tensions provide ideas & awareness for changes
- Recognize that the spectrum of solutions is limited
- Leave the present structure before the revolution becomes too much violent
- The evolution is not automatic: but it is struggle for survival
- Realize that each solution will generate new problems
- Analyze problems in a wide historical perspective

- The historical events determine in a sure way what will happen a long time after
- Analyzing better the history we can better put into perspective our future work

If we extend Greiner's analysis to the Information Systems of an organization we could add to the preceding some further considerations related to the following basic question: "which is the type of information system more appropriate for each organizational phase?"

In general we can consider obvious that the information systems support requested by the business is different in each phase and also that the EDP Management System and Style have to change as the Business Organization and therefore the EDP rôle change.

More specifically, adding a new line to the Business Aspects versus Organization Phases Matrix we can consider that:

- The Information Systems produced when the company organization is in phase 1 (creativity) are normally structured to support Operational/Accounting Aspects such as billing, payroll etc.
- In Phase 2 (authority) the demand is still for Information Systems of operational type to support a style of Management mainly concerned with control as opposed to standard of production/cost.
- The tendency to delegation which characterizes the phase 3 implies that the Business demand is toward Functional Information Systems able to support not only the operational activities but also the Management of the different functional and geographical units.
- The Phase 4 cannot practically be put in place without having implemented Information Systems integrated enough to be able to support the Company Planning and Measurement Processes which are essential for implementing the coordination of the Business Resources and Organization.
- The characteristics of the Phase 5 (Team work etc.) ask for a kind of Information System Cross Level and Cross Functions (based on Business Process) in a mature DB/DC environment.

2. EDP DEVELOPMENT STAGES (4 and 6 STAGES HYPOTHESIS)

In 1973 Professor Nolan discovered that the EDP Budgets for a number of companies, when plotted over time from initial investment to mature operations, forms an s-shaped curve.

The changes of this curve correspond to the main events (often crises) in the life of the EDP Function that signal important shifts in the way the Information System Resources are used and managed.

Nolan was able to single out four stages of the DP evolution, which he later expanded into six stages, each of which is characterized by a particular aspect of the Information System growth process, and which he calls:

- I: Initiation
- II: Proliferation
- III: Control
- IV: Integration
- V: DB/DC Architecture
- VI: Maturity

Figure 1 B is a plot of the first five stages of Prof. Nolan's hypothesis v. EDP Budget Expenditure.

Furthermore he recognized remarkable similarities between the problems which arise and the Management Techniques applied to solve them at each stage, despite variations among industries and companies, and different ways of usage of the DP Equipment.

The main characteristics of each stage are summarized in the Matrix: I.S. Aspects v. I.S. Development Stages of Figure 3.

3. SYNTHESIS BETWEEN GREINER'S MODEL AND NOLAN'S MODEL

3.1. EVOLUTION MATRIX

If we put together the two models as in Figure 1, we obtain a matrix which represents all the possible combinations between organizational phases and DP stages.

The logic of this matrix is to link together a model of development of the Leading System (in this case the entire Company) and a model of development of the subsystem under study (in this case the Information System).

The matrix has, horizontally, the scale of time of the DP Development Stages, and vertically the Company Organization Phases.

FIG. 1 - EVOLUTION MATRIX - COMPANY ORGANIZATION DEV. v. DP DEVELOPMENT

BUSINESS ASPECTS VERSUS ORGANIZATION PHASES

ORGANIZ. PHASES BUSINESS ASPECTS	I CREATIVITY	II AUTHORITY	III DELEGATION	IV COORDINATION	V TEAM
MAIN GOAL OF THE MGT.	PRODUCE & SELL	EFFICIENCY OPERATIONS	ENLARGE THE MARKET PLACE	CONSOLIDATE THE ORG.	PROBLEMS SOLUTIONS & INNOV.
STRUCTURE	WITHOUT	CENTRALIZED BY FUNCT. (SPECIALIZED)	DECENTRALIZ. GEOGRAPHIC.	STAFFS & GROUPS	CREATION
TOP MANAG. STYLE	INDIVIDUALISTIC & BUSINESS ORIENTED	AUTHORITARIANISM	ORIENTED TO DELEGATION	COMMITTED TO CONTROL	IN FAVOUR OF PARTICIP.
CONTROL SYSTEMS	MARKET RESULTS	STANDARDS OF WORK	REPORTS & PROFIT CENTRES	PLANNING & INVESTMENT CENTRES	COMMON OBJECTIVES
RECOGNIT. FROM THE MANAG.	SHARE IN THE PROPERTY	SALARY INCREASE PER MERIT	INDIVIDUAL AWARDS	PART OF THE PROFITS & STOCKS	TEAM AWARDS
COMMUNIC.	FREQUENT & INFORMAL	FORMAL & IMPERS.	NOT FREQ./ REPORTS/ LETTERS/ PHONE CALLS/SHORT VISITS	- PLAN REVIEWS - BY LINE - BY FUNCT.	- FREQ. MEETINGS - COMMON WORK
INFORMAT. SYSTEMS	OPERAT. (BILLINGS, PAYROLLS)	OPERAT. ORIENTED TO ACC. CONTR.	ORIENTED TO FUNCTIONAL UNITS MGT.	- DP CENTRAL - IS ORIENT. TO INTEGR.	DB/DC APPL. TO THE DAY BY DAY ACTIVITY

I.S. ASPECTS VERSUS I.S. DEVELOPMENT STAGES MATRIX

<div> I.S. DEVEL. I.S. STAGES STAGES </div>	I	II	III	IV	V
	INITIALIZAT.	PROLIFERATION	CONTROL	INTEGRATION	DB/DC ARCHIT.
SYSTEMS LEVEL	OPERAT.	OPERAT.	FUNCTIONAL	GENERAL	CRSS LEVEL & FUNCTIONS
APPLICATIONS	ACCOUNTING	OPERAT. CONTROL	FUNCTIONAL UNIT MANAG.NT	FUNCT. UNIT MGT/ BUSINESS MGT	PROCESS MGT.
DP PEOPLE SPECIALIZAT.	COMPUTING PROGRAMM.	VARIETY OF APPLICAT.	VALIDITY & CONTROL	DB/DC MGT SYSTEMS IS PLANNING	DATA RESOURCES MGT
ORGANIZATION	INSIDE THE FIRST USER DEPART.	ANALYSTS- PROGRAMM. ASSIGNED TO AREAS	DP DEPARTM SEPARATED STEERING COMMITTEE	BECOMES SEPARATED FUNCTIONS	THE DIRECT DATA RES. FUNCTION IS CREATED
MANAGEMENT STYLE	PERMISSION	ORIENTED TO SELL	CONTROL- ORIENTED	SYSTEMS & RESOURCES PLANNING	DB/DC ARCH COHERENT WITH CY STRATEGIES
PLANNING	EXPENSES BUDGET	EXPENSES BUDGET	COST CONTROL FOR HW & APPLICAT	3-4 YEARS PLAN FOR HW, SW, RESOURC. METHODS	DATA RES. FUNCTION PLANNING
CONTROL	VERY LOW	FLEXIBLE	TIED . PRIORITIES . BUDGETS . STANDARDS . PROJECTS	SOPHISTICATED EFFECTIVENESS VS. PLANS	MEASUR. OF DATA RES. FUNCTIONS VS. CY PLAN

3.2. SOME CONSIDERATION ON THE EVOLUTION MATRIX AND EXAMPLES ON ITS USE

The Matrix is a scheme which:

- Represents an attempt to put in relation the Development stage of the Company macro organisation & the DP development stage identifying the point in the matrix which represents the combination of the 2 stages.
- Stresses the concept that the judgement upon the DP development stage has to be "relative" being dependant on the stage in which the Company is at that moment.
- Makes available a first diagnosis tool to evaluate if the stage and the development strategies (architecture) of the Business are coherent with the status and perspectives of the Company Organization.
- Allow to use a common and synthetic language.

The organizational phase in which the Company is when it starts the utilization of the DP Systems can influence its first reaction regarding DP. In general we can observe that:

- If the Company is in the Phase 1 (Creativity) the DP can be developed until Stage 2 (proliferation) but it is very difficult to reach the Stage 3 (Control) being the control completely out of the prevalent mentality of the people.
- The Phase 2 (Authority) can be a stable Phase & therefore the DP can be developed until the Stage 3 & more.
- The Phase 3 (Delegation - Decentralization) makes it difficult or impossible to realize the Stage 4 (Integration) because the company philosophy in this Phase is exactly the contrary.
- The Phase 4 (Coordination) requires a DP Development close to the Stage 4 (Integration) because the effective implementation of the organizational phase needs an architecture of the I.S. able to make available an effective Planning Measurement & Control System.
- The Phase 5 characterised by team work requires available DB/DC Systems supporting the teams with information complete from an horizontal & vertical point of view.

In reality the evolution of the DP stages is combined with the Company development phases.

The path in the Matrix becomes a line and each stage has problems depending also on the past history of the development.

In general, starting from a given square of the Matrix we can have 3 major types of development :

- DELAYED : DP is following passively the organizational evolution (path as A)
- SYNCHRONISED : DP development has well understood the main business tendencies and maintain available and is consistent enough with organizational development (path as B)
- ADVANCED : DP is adopting a development strategy consisting in anticipating I.S. availability to prevent (or reduce) next crisis (Path as C) .

If, for example, the Company is moving from an authority phase (2) to a delegation Phase (3) and ask the DP to move from the DP Stage 2 (the Proliferation) to the stage 4 (Integration) (Path C) , that will represent for the DP Management a kind of commitment very difficult to fulfill both for technical reasons (skip of Stage 3) and organizational reasons (delegation Phase is normally not the right condition for I.S. Integration) .

This strategy can only be implemented if the company Top Management is well aware of the difficulty and the spectrum of problems that may be encountered, hires the right DP manager, anticipates the delegation phase carrying on investments, commitments and part of the actions normally typical of the following coordination phase (like the creation of Planning and Control Procedures, investment centres)

Another case which corresponds to many practical example is when a Company in Phase 2, having the DP in Stage 3 is evolving its organization toward delegation .

It may happen that the EDP function is maintained centralized so that all the decentralized functions will be served by the same EDP Organisation which is, in this case, in condition to progress as foreseen in the Nolan stage Model .

If, viceversa, even EDP function is impacted by the delegation process and single organizational units put in place their own EDP Organization, we may assist to the regression of these new EDP Environment to the Stage 1 .

In this case it is easy to foresee a spectrum of problems going from discrepancies and difficult relations between the decentralized EDP Units and what remains of the central one, up to the loss of the EDP Development and Management Experiences already present in the Company .

Another typical example is when EDP persists in remaining in a proliferation (2) Stage characterized by operational Systems when the main problem of the Company is to solve the control crisis .

Often this situation happen when the EDP Management Style is too much oriented toward technical aspects of EDP and is unable to understand the major Business Requirements connected with the Macroorganization Evolution.

In this cases there is an evident lack of communications between the Company Top Management and the EDP Management, there are no appropriate I.S. planning methodology and no organizational structures and procedures able to create a common understanding.

Typically this situation is the true reason which, in many cases, explains the existance of strong tensions and disagreements between EDP and USERS.

The lesson coming from these examples is the necessity to first well analize and understand if EDP is really well supporting the development of the organization, and then define EDP Development Strategies coherent with the business objectives, before discussing any specific solution and technology.