THE HAPPY TRANSITION

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An overview of the transition from traditional mass batch processing into user driven interaction distributed system at City of Bergen, Norway.

ORGANIZATION STRUCTURE OF THE CITY OF BERGEN

Bergen, Norway's second largest city, is situated on Norway's West Coast about 500 km north west of Oslo. Once a Hanseatic city, and the largest Nordic city in 1600, Bergen now has a population of 210.000, and covers an area of 465 km^2. The city administration's number of full time employee equivalents is 10.000. The total 1981 budget is $ 400 mill.

The administration's structure is very much like the divisionalization we often see in industrial corporations with an equal number of employees, with one staff division, The City Manager Division. Within this division, the EDP department is located. In addition there are some 10 functional divisions.

To get a clear picture of the various EDP activities within the government, one has to make observations from different viewpoints. The systems have been initiated out of different needs, they are built and are working differently, and the administration's influence on the way the systems are developed varies from practically none to complete control.

After the assimilation of some of the neighbouring societies in 1972, the main objectives of the EDP department can be summed up as follows:

1. Consolidation of the joining (as of 1972) societies operating systems.

2. Initiating and implementation of a number of comprehensive systems on a large IBM mainframe, owned jointly by local adminstrations and private enterprise in the region (= KDV).

3. Setting up local, decentralized processing services, with data entry and information systems, partly for distributed interaction with exisiting centralized systems, but also for establishing, none-mainframe-dependant local solutions.

The development has been done in cooperation with the user divisions, and project groups have often been established for the various tasks.

The city decided in 1972 against setting up an internal data processing centre with the resulting centralized development and processing concept. For control, planning and approval of the EDP activities a professional organ was established located in the City Manager's staff. At this point, a committee named by and among the politicians took office. (The EDP committee.) Their mandate will be discussed later, after a look on how the consider

INFORMATION TECHNOLOGY VS. ORGANIZATION THEORY.

First, it is recognized that in relation to the development of data processing these two concepts must have a uniform and harmonic platform. It is commonly accepted that the information technology has great influence on employment and the working environment, as well as areas of responsibility and distribution of competance, but also on the quality and rapidness with which tasks are completed. The technology also defines information accessability and availability in support of planning and managing the society's development. Traditional organization theory points out a relation between the subsystems of technology, administration and the social subsystem, where the technological system is represented by machines and in this case also software, - the social subsystem by interhuman relations and structured, as well as unstructured, ways of contact and communication. In the administrative subsystem we will find guidelines, policies, structures, plans and hierarchical command lines. In the same way as with traditional technology, the information technology will impact on the administrative and social subsystems, especially when applied for rationalization purposes. These unreflected impacts are often felt negatively. If, on the other hand, the information technology is used purposely to influence and prepare the organization to cope with new tasks, and to solve old tasks in a different and more effective way to produce detail and new management information, this impact changes radically.

The effects appear in different ways, and often several at the same time. One obviously and very little desired effect is e.g. that know-how of certain (routine) jobs is drained out of the social system and instead put into the information technology as "axioms" e.g. burnt into ROMs. This will gradually transfer employees into "operators", resulting in loss of insight. A too technological information exchange is also a risk of making people lose their feeling of belonging in a social subsystem. Reallocation of competance and information through incompetent use of technology will gradually and undeliberately restructure, and in the worst case, b.ake down the administrative subsystem, whether the effect is extreme centralization or decentralization.

These phenomenons are some of the main reasons for the strong involvement we see throughout the world when EDP issues are discussed. They are also fundamental for the decision to have a co-ordinated development of the organization structure, people and data processing, and what is more important, the city must always master and control the information technology and the applied methods.

THE EDP MASTER PLAN.

The political controlling authority was when this situation was recognized transferred from the EDP committee to Administration Committee as a consequence of the increasing importance of technology. An excerpt of it's mandate tells that:

"The committee will have general guidelines approved for the use of EDP in the city administration, an. within these consider long range plans for the city's EDP development. These plans shall be designed also with regard to their social impacts within the city. The committee will influence federal and other public plans to reflect the needs of the city".

The EDP master plan must, because of the strong relationship between organization development, personnel development and data processing, be integrated in the city overall long range planning. The master plan is the strategic plan for the EDP development the next 5 to 10 years.

It defines long range objectives, general guidelines to reach the objectives, and the span in regulation and the restructuring of activities. The resource plan will explain what resources are available or needed, in terms of personnel, technology, capital and know-how to reach the objectives. A tactical plan will state short term aims, with action plans, budgets and definition of resource available. This planning pattern has so far bee prevailing in the city's overall planning procedures, and has also been true for the EDP sector.

The EDP master plan is the strategic platform for the long range activities, as well as for the single projects. The Master plan is therefore considered by the Administration Committee (the politicians), and is approved as a directive for further development prior to the planning on the division and department level.

SYSTEMS METHODOLOGY IN THE 60IES AND 70IES

Two types of systems have been prevailing: sectorial purpose system and function oriented systems. The sectorial systems have been serving the tax sector, the social security sector, the public and private property (real estate) sector, whilst the functional systems have been applied across division borders for applications as payroll, accounting and accounts payables and receivables.

The systems were designed as self-contained systems within the single finctions, comprising data entry, transport/transmission to the central mainframe, storing, processing and result presentation. The functional systems have had the design objective to provide adequate solutions for the smallest as well as the larges public adminstration unit. Mostly these systems were developed by resources outside the city government administration. Often large project organization were employed to develop and design the systems, and to make it possible for most of the involved parties to be heard. Typically, these projects were established and completed as inter city government co-operation. The size of the systems and their complexity, has resulted in an increasing staff of specialists within the differen system areas, but outside the city's administration. These systems are highly vulnerable, as operation

experience shows that their maintainability is person dependant. This city co op organization of system development have influenced the cost of development and operation, and competance has been drained out of the executing divisions into the system development organizations.

This approach in system development in the 60ies and 70ies has had the side effects of information centralization and reduced availability and accessability for the users, centralized competance, development and maintenance with reduced user influence possiblities. Local administrations are as a consequnce driven by conditions established in the EDP systems.

The system development trends of the 60ies and 70ies, have cemented the sectorial and central way federal and city governments manage.

THE COMPLEXITY VS. COST ASPECT.

Profesionally, it is recognized that the more complexity you introduce into a system to make it all-comprising, the higher the cost of development and operation will be. If we consider the cost aspect related to the completeness of a system, the cost will increase as a constant function until you have an approx. 80% coverage, while it will take an exponential function to cover the last 20%. In other words, the 80-20 rule is applicable, you do 80% of a project for 20% of the total cost. There was and still is a lot of room for productivity tools and action to improve this picture.

These large systems also have certain needs to exchange data, and information integration between systems that one by one is complex, is not made easier by different software, software technology inherant in each system and the time factor for development. The systems are expensive to develop and operate, and it is necessary to have several users to make the cost of operation economically acceptable. This service bureau syndrome has gradually defined the cities' adminstrations as necessary for the continued growth of the IBM 3033 site mentioned earlier. Consequently, attempts to localize data processing on minis amd micros are often considered as threats to the large centralized

facility, and are therefore obstructed in different ways.

The systems of the 60ies were mainly of the periodic batch type. File information was transferred from the classic ledger cards to magnetic representation. It was necessary to make frequent printouts of file information to keep an adequate level of information. The terminal solutions of the 70ies made on-line inquirires on passive registers possible. This change in information accessing made other organizing and retrieval methods necessary, involving higher cost of operations for the periodic systems. It also involved enhancements of the central computer.

These complex common city government systems produced a staff of "experts", often located outside the local administrations and with little feeling for the administration's real needs. The situation can be labelled as "Systems by the experts and for the experts". We often find the user left with complex, technically oriented manuals, without true insight in how the system functions. The expected gain in productivity and rationalization was not realized, and we see the users as suppliers of data (as contrary to information) and receivers of results. The user influence of their working environment is reduced, and in many cases the stress factors are increasing.

Another aspect of these large systems is the fact that the register information is organized and primarily has the objective to satisfy sectors within the different divisions of the administration. It is necessary, however, for effective administration to have access to more data than defined for each sectorial system. Therefore, we see many manually driven support systems connected to the large, complex systems.

As these effects of the centralized systems were getting more apparaent, it was now recognized that in order to stop the unfavourable development of cost, and to stop the drain of competance out of the administration, these large systems should be frozen, and the competence must be reestablished within the function units of the administration. Further, the units must build up their own EDP know how, enabling them to cope with their own problems.

LOCAL TECHNOLOGY.

In the mid 70ies the situation described was getting increasingly obvious within the city. Distributed data processing seemed to be a solution, as it was necessary to continue using most of the large systems for some years. It was made a policy to avoid participation in new inter city projects based on large mainframes.

The first HP-3000 was installed at the City Manager's Division in mid 1977. Successively, local computers were installed at the City treasurer, the City Transport Authority and at the City Electrical Utility. The equipment covers functions within these main application areas:

- Data entry and local storage
- Local processing of local and remotely located information (other HP-3000 x IBM)
- Data presentation (line printer, VDU and graphics)
- Statistical analysis and presentation
- System illustration models
- Programming/System Development
- Data preparation
- Data communication
- Education and training
- Integrated text processing.

The HP-3000s are linked horizontally to each other, using HP-DSN. Theoretically, any terminal user have access to all resources in the network, also including several connections to the IBM mainframe. In this concept all HP-3000 members in the network are equal.

Relatively demanding tasks are asigned to the HP-3000, such as

- setting up local, terminal based data entry and inquiry systems, working against the large (batch) periodically run inter city systems, and validation and transportation of data to and from these systems.

- establishing local interactive information systems and interaction with local micros, data network, terminal administration, data reduction and aggregation, together with statistical analysis.

A PHILOSOPHICAL VIEW OF THE 80IES.

The platform for the data processing of the 80ies is an analysis of the single data item; where it is born, generated, transported, stored, processed and where and how it is presented, and how it can be aggregated to the next information level. One of the most obvious shortcomings of the systems described earlier, was the lack of defined aggregation levels and data reduction levels. Detail transactions are of interest only up to a certain (management) level, and will represent a tremendous overhead when carried forward on all processing levels. To capitalize on this recognition, it is necessary to define each data item with reference to it's organization homestead. Definitions also have to be made for establishing, maintenance and transaction responsibility. In the same way, procedures and policies for the use of data items outside it's origining domain must be established, since all items are readily available from a technological point of view. The process of setting up a responsibility/right-to-use structure, is done over time and in line with the on-going development of organization, responsibility, delegation, decentralization and localization.

In this way, the data structure is integrated into the city's organization pattern.

The system concept can be constructed based on the same general principles.

Instead of envisioning unified systems within each of the cities' divisions, the systems are exploded into autonomous system elements for

- data entry
- data storing
- data retrieval
- data transportation
- data processing
- data presentation.

A combination of the different system elements will often with little effort provide the desired solutions.

The interaction between the system elements, whether the elements are implemented on the same technology or different technologies, is based upon the standardized data items, and standardized methods for moving data between technologies. The explosion of the classic all-comprisning system concept into functional elements, makes adaptions to individual and local needs easier, and the external characteristics are flexible, as the funcionalized elements contain less obstacles to the practical implementations. It is also possible to standardize processing characteristics, eliminating the needs to design new processing routines for new tasks and new data items. By processing it is here meant processing to change register data into new data before conversion into information (e.g. traditional payroll batch processing). A data processing system deals with raw material, work in process and finished goods inventory.

During the 60ies and 70ies it was a recognized practice to gather all single transactions for the different system areas for a common and unified processing in a huge mass transaction system prior to the final results. The uncritical transport of single transactions to the registers of the large systems has made these systems unsuitable as management tools. Through a flexible and localized application of data entry, storing, retrieval and presentation, transaction data can be handled on a low organization level. Instead of sending the total transaction volume on to the next level in the organization, the data entry system will make aggregates to the next management level. The transactions can be stored in its system of origin for the purpose of e.g. statistical processing. On an expection basis single transactions are forwarded one or more levels up (e.g. payroll transactions). The distributed concept complies with the need for authorized information retrieval, both vertically and horizontally.

As data processing in the 60ies and 70ies focused on quantities, the focus of the 80ies will be on improved quality and productivity in retrieval, transportation, analysis and presentation of information.