On the Transformation of Traditional IS Service Department into a Modern IS Center: A Case Study

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Abstract

Some issues related to the transformation of a traditional IS service department into a modern team-based information center are discussed. The process of transformation comprises human resources analysis, investigation of possible ways of transformation, proposal of a new organization and constitution of development teams (DTs). New organization is based on DTs with flexible structure, which ensures a successful transformation. Education during transformation must be adjusted to the customer and can include different approaches such as on-the-job education, full curriculum and the short-term training plan, consulting services, end-user education and so forth. An educational framework should propose the standards to be followed and possible adjustments of those standards, which would make the education successful. A study done for a large state-owned Croatian company, carried out in practice as part of the initial strategy plan, will be presented and used as an example.

Keywords: Consulting, Team Organization, IT Education.

Introduction

The described case study has resulted from a project which was negotiated after an invitation for bids asking for preparatory activities to establish a modern integral IS system within a large state-owned Croatian company. The company in question had suffered heavily during the war period in Croatia and was still hardly recovering. The authors' team acquired the contract with the principal professional aim to re-establish an eminent information technology team within the company. In the seventies, such a team had existed but due to unfavorable circumstances during the last decade, it has been practically annihilated. Most of the competent professionals have left for better jobs and nearly a hundred IT related people with obsolete or inadequate skills has remained.

The authors' team had believed that only an investment in own IT professional staff could solve the problem in long run. Some company managers placed their hopes in acquiring of sophisticated worldwide well-known and expensive ERP software. The authors being in the role of consultants strongly objected. A paradigmatic situation in the Company was that "they had excellent rules, but the rules could not be obeyed". The reason for that was a chronically lack of money and the Company's behavior had to adapt to it and pay for it an additional price.

The authors suggested an IS development being under complete control of the Company's IT staff, with necessary purchases of system, database and office automation standard software and of some very specific highly specialized professional software. The rest of the software, comprising the support for the Company's basic activity, representing the Company's professional know-how should be developed predominantly by their own staff including some outer consulting assistance. This software would be in permanent development and change because a significant business process reengineering was ahead. At the time of the project no one could tell how this reengineering would proceed and how it would finish. The authors perceived the IS as an appropriate tool to enforce the Company restructuring. On the contrary, even an ideal off-the-shelf acquired software solution would fail because the gap between the current status and the target status, supported by such an ideal solution, would be insurmountable.

In this article we try to present our proposal how to educate the IT professionals within the Company to fulfill the

demanding task of re-establishing the Company's own IT competence.

The Analysis of Resources

Human resources

In order to develop the optimal plan of education, an analysis of human resources (HR) in information systems (IS) service department was performed. Special attention has been paid to the level of existent knowledge in information technology (IT) area. Supporting staff that does not participate in system development was not taken into consideration. The analysis comprised:

- Hierarchical and functional groups of employees,
- Formal education and skills,
- Working and professional experience.

Originally, the department was organized a couple of decades ago and around an obsolete technology. Although some new equipment had been purchased during the time, the department has remained organized as a traditional data center (DC). At the time of analysis, the department engaged 79 employees out of possible one hundred. The employees are dispersed into groups covering particular business areas, such as basic activity, Infrastructure and Finances, Controlling and common business functions.

The key results of analysis can be briefly presented as follows:

- Only a 30% of all employees (24) can be considered as developers.
- A bulk of employees is engaged as operators (9 employees), data preparation staff (11 employees) and staff being in charge of running the applications (6 employees), which makes 33% of all employees.
- Although there are over 30 engineers (39%), only 19% of all department employees are professionals in any technical field.
- A minority (9%) was educated in electrical engineering or computing.
- Near one half of the staff (46%) has academic education.
- The department is experienced in IT implementation related to obsolete technologies (employees have been working in IT sector for more than 17 years in average).
- The average age is 45. Every fifth employee is less than 40 years old (22%). Every fourth is over 50 (24%).
- A number of employees cannot speak English (36%), which may be a significant barrier to successful education.

The primary question is what such an organization can do to improve the structure of its human resources. Can this be done by employment of additional staff? What would be the costs? How long it would take? Knowing the financial and organizational situation of the Company, and having in mind that a local labor market cannot respond adequately, the authors of this paper suggested the following.

Primary short-term objective must be to retain existent employees who acquire operative useful knowledge in modern information technologies. In parallel to that, the mechanisms of attracting and detention of quality professionals must be established. Filling the unoccupied working places should be planned for later.

Amongst the objective circumstances, an additional reason for the former statement was the assumption that in short term in which the development of transitional applications was planned, bringing in new developers would potentially cause the well-known Brooks effect. "Adding manpower to a late software project makes it later" (Brooks, 1982).

Technical resources

In parallel to HR analysis, inspection and evaluation of technical resources were performed. Taking of an inventory comprised: hardware, operating systems, database management systems, programming languages, development tools, utilities and applications. Special attention was paid to the end users' satisfaction with applications being in operation.

The archaic technology was widely recognized and can be classified as:

- Old hardware (IBM 3090/120J, UNISYS 1100/73, etc.).
- Old-fashioned and non-standard operating systems (VMS, EXEC UNIVAC 1100, etc.).
- Old-fashioned databases and data retrieval systems (IMS, VSAM, DL/1, etc.).
- Obsolete programming languages and tools (Mapper, PL/1, etc.).
- Development tools associated with hardware (CSP, Visual Age).
- Inadequate applications.

The Proposal of Transformation

The organization of development teams

It was proposed to the Company to re-organize developers and to form development teams (DTs) which can consist of the following members:

- a team manager,
- a development leader,
- a system analyst/designer,
- the programmers,
- a database administrator,
- a system engineer.

The classification of DT members is based on activities and jobs to be done. The distribution of roles to particular persons, as well as the number of members, can depend on a particular project and on available human resources. For example, the implementation leader may play the role of a system analyst. The team can include many programmers. The role of the database administrator and the system engineer may be assigned to the same person.

This model of team organization was proposed considering possible subsystems of a new global information system, technical feasibility and deficiency of quality IT professionals.

As an extension, outsourcers can temporarily be added to the team. For example, an outsourced development leader can be obligated to counseling, planning and control (Fertalj et al., 1999, Fertalj et al., 2000). As a steward, he can also be a leader in creating the learning context and the learning culture (Agarwal et al., 1997). Until the end of the project, the team will be educated enough to take over further development and management of the IS.

The process of transformation must be adjusted to the company. The transformation must insure normal continuation of running development projects and maintenance of existent applications. Thus at the beginning of the transformation, forming of the teams can be carried out only logically. Formal redefinition of workplaces can be postponed, as part of broader company restructuring and after the development teams have achieved some practical results.

Organizing the non-developers

Selection and education of novice developers

Part of the staff who were not engaged in development and/or the staff working on workplaces that will be closed after the transformation is over (e.g. traditional operators), can join the development teams.

Preliminary evaluation and selection of such employees can be done within the department. After that, potential developers take appropriate courses. More sophisticated evaluation and final selection of novice developers can be done after the courses, based on the progress of each course participant and in collaboration with course lecturers.

After the process of selection and education of novice developers is over, selected persons join the development teams. The remaining staff can join the teams to support the end users, as described in the following paragraphs.

Technical support team

Part of the staff can form a team for technical support (TST) who can help the users in using the hardware (e.g. personal computers), system software and software utilities. The main tasks of the team are:

- Preparation of course laboratories during the initiation of education.
- Installation and maintenance of PC operating system and office automation packages.
- Installation of applications and other software products (e.g. anti-virus software).
- Ad-hoc (on-call) support of end users having the technical problems.

This team should preferably be formed of younger employees with some technical prior knowledge and skills.

Application support team

Another team can be formed to educate the end users in using commercial software and applications. The main tasks of the team would be:

- Education of end users to work with (personal) computers.
- Tutoring of end users in using the software.
- Ad-hoc (on-call) support of end users whilst using the applications.

This team should be formed of the remaining employees, after the completion of development teams is over, and in parallel to the TST constitution.

The Educational Framework

Consulting

Although consulting cannot be strictly recognised as education, it should be planned as part of training and support for both the management and the developers. Whatever the possible ways of system development are, the counselling must be planned for at least:

- development of transitional applications,
- development of new information system,
- IS management.

During the period of initial strategy, the consultants can have a significant impact on the company's attitude to systems development. The consultants should point out to various approaches to system development such as (Awad, 1985; Fertalj, 1997; Willcocks and Lacity, 1998; Watts, 1989):

- in-site development,
- outsourcing,
- purchase of commercial off-the-shelf packages (COTS),
- customisation of application packages.

In our experience, this approach to customers can increase their flexibility in considering further design and development, although the company had bad experience with the particular approach in the past. The consultants must do their best to convince the management that an information system cannot be bought completely off-the-shelf.

The education of IT staff

Seeing the number of employees who should be educated and trained, the transfer of knowledge should be done by appropriate IT courses. A quality evaluation and selection of IT staff can be performed during the courses, which would complete the constitution of aforementioned teams. Simultaneously or even prior to that, part of the staff can take part in courses in English language.

The education of IT staff should start with IS fundamentals, database modelling, standard operating systems and standard programming languages.

Education of development teams

Initial education of development teams should be planned with respect to activities having the highest priority for the company. For example, recently it was solving the Y2K problem. Generally, it can be assumed that internal development teams can be engaged in adapting the existent applications, which will become a part of the new IS. It is important to form operable teams as soon as possible. Thus, the initial education should cover:

- particular operating system (e.g. Unix),
- database modelling and structured query language (SQL),
- particular database management system (DBMS),
- particular development language and tool (programming language and interactive development environment, CASE tool),
- one general purpose programming language (e.g. C language).

The courses in operating system, DBMS and programming language can be carried out after the decision about purchasing particular software has been made. Alternatively, the courses can take place even before the decision has been made, if there are course deliverers who already dispose with the required software.

Education of user support teams

Education of technical support team and application support team can consist of the following:

- Taking the courses in operating system, office automation and optionally, programming tools.
- Getting acquainted with new applications prior to installation of applications.
- Preparation of materials (end user documentation, lecture notes) guided by outer lecturers or consultants.
- Giving the courses and ad-hoc support to the end users, under instructions and guidance of outer lecturers or consultants.

It is assumed that in the preliminary period TST and AST are focused on gaining the computer literacy of end users, which would later turn into training of end users during implementation of new applications.

Continuous IT staff education

The IT department can be advised to take the following measures and activities, as part of the continuous IT staff

education and also to attract and detain quality professionals.

Special type of consulting during IS design and development of new applications: The education and training can be performed on-the-scene as a part of joint IS analysis and development (Fertalj et al., 2000).

Purchase of literature: The IS service department should subscribe to relevant domestic and foreign journals and magazines. A couple of books should be purchased monthly.

Presentations and fairs: The department members should take part in presentations of IT products and should visit the IT fairs in order to keep informed about the state of the IT market and IT trends. Attending the presentations and fairs can be considered as a part of additional rewarding system.

Technical and scientific conferences: The department members should be stimulated to attend to conferences in order to keep informed about the developments in the profession. Attending the conferences can be conditioned by writing the papers about concrete problems and solutions related to the IS of the company.

Formal education: Good and perspective workers could get scholarship for undergraduate or postgraduate study. In return, such employees would be obligated to stay with the company for some time.

Foreign languages: As already mentioned, part of the staff can take part in courses in a foreign language (English is assumed).

The education of end users

Technical support team and application support team can carry out education of end users that is related to computer literacy and use of applications. Outer specialists can transfer a special knowledge that is required in particular business areas.

The following activities can forward the introduction of new applications and improve implementation and use of the applications:

- Distributing the internal book of regulations about the deportment of users.
- Writing or rewriting the complete technical and user documentation.
- Writing the clear extract of help together with brief reference to applications and their features.

The listed activities can be carried out in parallel to the IS development.

The Curriculum

The courses

The intention was to develop a curriculum in which every course takes at most one working week, as presented in Table 1. The curriculum defines the course code and title, potential groups of attendees (e.g. management, programmers, etc.), prerequisites, duration and short description. If possible, potential course providers should be listed. The curriculum can be divided to areas (Gorgone & Gray, 1999; IEEE & ACM, 2000; SECC, 2000), which was done for the Company.

Standards to be followed

Course organiser is an organization that provides the location and the equipment required by a course. Customer is an organization that employs the attendees of a course. Educator represents a lecturer or a group of lecturers. Either educator or customer can be the organiser.

- One hour implicates 45 minutes of lecturing and a 15 minutes break.
- Course schedule must be adapted to attendees and to their working time.

Code	Title	Duration
C01	Database administration	24 hrs / 4 days
C02	Fourth generation language	24 hrs / 4 days
C03	CASE tool	15-30 hrs / 3-5 days
C11	Management by IS and IS management	8 hrs / 1-2 days
C12	Information technology trends	4 hrs / 1 day
C13	Strategic information system planning	12 hrs / 2-4 days
C14	Enhancement of large systems	18-30 hrs / 3-5 days
C21	Information systems development	30 hrs / 5 days
C22	Project planning and development	15 hrs / 3 days
C23	Development tools and environments	12 hrs / 2 days
C31	Conceptual data modelling	18 hrs / 3 days
C32	Relational database design	24 hrs / 4 days
C41	LAN technologies	16 hrs / 2 days
C42	Structured cabling in LANs	8 hrs / 1 day
C43	LAN switching	8 hrs / 1 day
C44	Internet/Intranet technologies	16 hrs / 2 days
C51	Office automation package	30-40 hrs / 5-7 days
C52	Use of network services	15 hrs / 3 days
C61	Computer Aided Design	40 hrs / 5-7 days
C62	Graphical information systems	40 hrs / 5-7 days
C63	Practical operational research	as required
C71	MS Windows	10-12 hrs / 2 days
C72	MS Windows NT	30 hrs / 5 days
C73	Unix operating system	30 hrs / 5 days
C74	Unix administration	30 hrs / 5 days
C81	Structured programming	30 hrs / 5 days
C82	Data structures and algorithms	30 hrs / 5 days
C91	PC based programming tools	30 hrs / 5 days
C92	Object oriented programming	30 hrs / 5 days
C93	Web programming	30 hrs / 5 days

Table 1: The courses.

- The organizer is obligated to provide a laboratory equipped with personal computers. It is recommended that laboratory have 15-20 workplaces and a special workplace for the lecturer. There should be a LCD, an overhead device and a blackboard installed.
- The organiser is obligated to provide the computers with operating system and office automation package, and to connect the computers into a local network.
- Educator is obligated to install the necessary equipment which customer does not have, that is customer is not obligated to purchase the equipment required by the educator.
- The educator must deliver the lecture notes to the attendees prior to start the course.
- After the course is over, the attendees should fill a questionnaire, i.e. a student opinion form. The educator should prepare the questionnaire in collaboration with the customer. The attendees get appropriate diplomas.

The customer contracts the course (location, schedule, price, etc.) with a concrete organizer and/or educator. In practice, particular educator can offer a course with different title and nearly the same content. It is assumed that the content of a course related to a particular software product applies to the current release of that product. A customer can select the educator(s) based on prior co-operation or by a contest. Some courses, such as training of end users, can be carried out by the proprietary staff.

A course might take shorter/longer time than originally defined. Duration of a course can be modified but not dramatically, hence this can make the course too intensive, thus less productive. In particular, if a performer offers a course that takes two weeks or longer, the attendance must be split into smaller portions. Subsequent portions should have the interregnum of at least 3 days. The courses and course portions should preferably start on Mondays.

At the end of a course, the attendees should get the time to practice and to implement the adopted knowledge. Optimally, they should practice at their workplaces by performing their standard tasks and solving the real problems they would normally deal with.

The educators must be neutral and correct. The training must not advertise the product or the possible supplier of the product the staff is being trained for.

A Preliminary Plan of Education

A preliminary plan was created having in mind the existent department structure, the running projects, the available time and IS development. The plan encompassed instruc-

PRELIMINARY EDUCATION PLAN		IS Design		Databases		Prog. Languages		DB Admin.	Operating Systems & Servers				Networks & Communications				Office Automation	
		C21	C03	C32	C31	C02	C91	C01	C72	C73	C74	C93	C41	C42	C43	C44	C51	C52
IT managers	4	4	4	4	4	4	4											
IS designers	15	15	15	15	15	15	15	4										
Programmers	27			27	27	27	27											
System engineers	6			3	3			3	6	6	6	6	2	2	2	2		
Network engineers	3								3	3	3	3	3	3	3	3		
Database administrators	3			3	3			3	3	3	3	3						
Tech. support team	6																6	6
App. support team	6																6	6
Total	**70**	**19**	**19**	**52**	**52**	**46**	**46**	**10**	**12**	**12**	**12**	**12**	**5**	**5**	**5**	**5**	**12**	**12**
Number of groups		2	2	4	4	4	4	1	1	1	1	1	1	1	1	1	1	1

Table 2: Preliminary plan of education.

tion in several areas that, as we believed, were essential for starting the top priority activities.

The courses were planned for staff groups according to knowledge areas, as shown in Table 2.

Due to the pragmatic circumstances, the plan could not cover all employees and all subjects, which would be required to accomplish the successful IS development. Therefore, the education should continue after the initial set of courses, in parallel with IS development and according to reasonable prospects.

Conclusion

The suggested activities were presented to the Company's Executive Board in written and in oral form. Our proposal has been accepted as a properly completed job. The next step was merely dictated by the World Bank as the only financial source because the Company had neither own money nor sufficient local support. It turned out that an international bidding to supply the IS was issued. The authors objected to that, but it appeared that no other solution was in sight.

The authors had not participated in any further activity regarding that. According to available information, an expensive solution was considered for purchase, but the State did not give guarantees so the bidding failed. After a change in management, the Company signed another contract with other consultants, having a similar purpose as ours. We are not aware about the outcome. The management has changed again and most probably the time and money have been wasted.

It is worth noting that our project was the third similar project in sequence. From this example we can learn how a large inert organization in financial difficulties prolongs its agony before the need for a surgical cut will prevail. We believe that it proofs our point that no outside help, financial nor professional can save a large and complex organization if a core of highly motivated and skilled professionals within such organization has not been formed. Our proposal was meant to be a step towards that goal.

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Biographies

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