THE DEVELOPMENT OF ELEMENTARY SCHOOL' S POSITION IN THE IT -STRATEGIC GRID IN A MODERN IT - BASED TEACHING ENVIRONMENT

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Abstract*:*

The estimation of the impact of using information technology (IT) has become a major concern in industrial and business organizations. It is seen important because of e.g. the following reasons: 1) to increase the knowledge about IT, 2) to estimate the significance of IT, and 3) to analyze the right method of information management. In this paper, a modification of a theoretical framework (IT -strategic grid) from information systems management science to estimate the impact of IT, is introduced. Also, a developed modification of the introduced framework to estimate the impact of using IT in education, i.e. computer teaching, is introduced.

Empirical results of a research about the development of the elementary school's position in the IT -strategic grid based on the teachers' estimates about the impact of computer teaching in a modern IT -based teaching environment, are reported. The empirical research problem was the following*: **How does the school's position in the IT -strategic grid develop in a modern IT-based teaching environment according to the teachers' estimates about the impact of computer teaching?***

The Teacher Training School in Rauma (TTSR) (elementary school with about 260 pupils and 19 teachers, Faculty of Education, University of Turku) can be regarded as a strongly IT - oriented school. The school received in the summer 1997 a new school building with lots of modern information and communication technology. In connection with this research, a pretest about the teachers ideas about the impact of computer teaching was arranged in the school (February -97). A followup posttest about the same features was arranged two years later (March -99).

From the empirical results it seems evident, that no significant development occurs in the teachers' ideas about the impact of computer teaching in a modern IT -based teaching environment. Thus, the school's position in the IT strategic grid doesn't develop significantly. This may be due to that two years is too short a time period to get the effects, especially when there has been other kinds of innovative activities in the school, too. On the other hand, there is some indications about that the information management has been a little bit too fragmentary in the school. A further followup study is necessary.

1. IT -strategic grid

McFarlan et. al (1983, according to Earl 1987) introduces a method, in which subjective estimates by the organization members about the significance of IT's existing and future applications serve as a basis for positioning the organization into an IT -strategic grid. The significance of both current and future applications are estimated in a low-high – scale by answering two questions: 1) What is the strategic importance of existing IT -applications to the organization? and 2) what is that of future applications? As a result, organizations fall into one out of four possible categories, for which McFarlan uses metaphors: support, factory, turnaround and strategic. (Fig. 1)

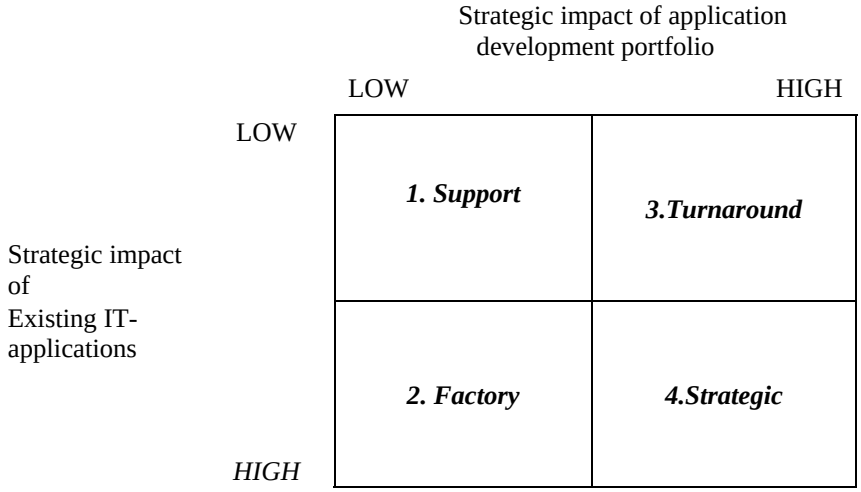

Fig. 1: IT -strategic grid (McFarlan et al. 1983)

In **support** organizations the significance of existing and future applications is seen low and reactive (ad hoc) IT -management is prevailing. In **factory** -organizations the significance of existing applications is high but that of future applications is low. The organization is in a sort of state of equilibrium, and it is believed to carry on with its activities unchanged so that no new applications are needed. A stable IT –management is characteristic this kind of organizations. In **turnaround** –organizations, the significance of existing applications is low but the expectations for the future applications are high. The organizations in this category are moving to a new environment and a predicting, novelty seeking and creative IT management is suitable for them. In **strategic** organizations the significance of both existing and future applications are estimated to be high. The organizations in this category need constantly to watch and predict the future and for them a novelty seeking and creative IT -management culture fits the bill. (Earl 1987)

The IT -strategic grid is an example of so called positioning frameworks *«developed to help executives assess the strategic importance of IT for their business with a view to understanding how the information systems function should be managed*" (Earl 1987). As examples of typical organizations in different categories Earl (1987) gives the following: 1) cement company (support), 2) steelworks (factory), 3) retailer (turn-around) and 4) credit card company (strategic). In addition, Earl says, that the organization's position in the IT-strategic grid is dynamic, so the analysis should be renewed periodically.

We have been trying to find appropriate measures to estimate the strategic importance of IT in education. The IT -strategic grid model presented above in this paper is just another attempt to borrow a method from information management science, where IT can be said to as its best.

To apply the IT -strategic grid analysis in the use of IT in teaching, subjective estimates about the significance of using IT in teaching are given by answering the following questions: 1) How significant are the existing applications of using IT in teaching? and 2) how significant will the future application developments of using IT be in teaching?

In this paper, we try to clarify **how does the position of a school in the IT -strategic grid develop in a modern IT -based teaching environment in elementary school as estimated by the teachers?** Our hypothesis is that a school with a modern IT -based teaching environment, moves along in the direction: support factory turnaround strategic. As an empirical case, we present the IT -strategic grid analysis executed in the Teacher Training School in Rauma (Faculty of Eduation, University of Turku, Finland). As a control school is Pyynpaa Elementary School in Rauma.

Teacher Training School in Rauma (TTSR) is an elementary school with about 260 pupils (7 - 13 years of age) and 19 teachers. The school has a specialty of serving as a training school for about 200 class teacher students yearly.

2. IT in TTSR

In the school year 96-97 TTSR was working in a temporary school building. Some classes had a computer. Most of these computers were old 386 machines. In the ADB -laboratory class there were 13 computers of various brands and processor generations (286 - Pentium). A part of the machines was connected to the University of Turku network. With these machines Internet and email work was possible. Only few of the computers in the classes were connected to the network. A limited amount of tutoring about the very basic elements of word processing, graphics etc. programs was available to the teachers during the schoolyear 96-97.

Now (May -99) the school has operated almost two school years in the new school building with lots of modern IT and communication equipment and the school can be considered to have a modern IT -based teaching environment. The following classification of computers is applied in the school: 1) basic workstations, 2) special workstations, 3) portables and 4) servers. Two basic workstations are located in each classroom, in every teacher's tutoring/counseling

room, special rooms and for administrative staff. Totally, there are about 120 basic workstations. In addition, there are special workstations for video-editing, the canteen, one tutoring room, and the copying and material room. There is also one server machine in the school. Portables count 24.

The configuration of basic workstations is the following: 150 Mhz Pentium processor, 2 Gb HD, 32 Mb RAM, 17" high quality monitor, soundcard, network connection and CD-ROM station. The special workstations are of the following configuration: 200 Mhz PentiumPro processor, 4 - 8 Gb HD, 64 Mb RAM and 17" - 21" high quality monitor. In addition, the special workstations have soundcard, video-card, network connection, DVD-ROM, ISDN connection and modem and video conferencing camera. For the portables the processor is 75 - 120 Mhz Pentium, 1 - 2 Gb HD, 16 - 32 Mb RAM and activematrix color screen. The server machine has 2 x 200 Mhz PentiumPro processor, 10 - 20 Gb HD, 128 Mb RAM and a high quality 17« monitor. In addition, the server has network connection, DVD -ROM multidisc reader and UPS facility. Software acquisitions include MS -Office97 package plus various tools for image, text and sound manipulation. In addition, a large amount of instructional programs is available. (Alajääski & Palviainen 1999)

3. Empirical problems

The empirical problems derived from the research problem, are the following:

1. What is the position of TTSR in the IT-strategic grid compared to the control school?
2. How has the position of TTSR in IT-strategic grid developed in the period from 1997 to 1999?

4. Method

Subjects. The subjects of the empirical study are the teachers in TTSR plus teachers in the control school. In the Alajääski (1999) study, in the pretest in February -97, all the teachers (n = 19) in TTSR participated. 7 of the teachers were males and 12 of them females. The age distribution was as follows: 1 teacher was 25 - 30 years of age, 3 teachers 31-40 years, 8 teachers 41 - 50 years and 7 teachers over 50 years of age. 14 of the teachers were class teachers and 5 subject-teachers (languages, technical work, textile work). In the posttest in March -99, the same teachers participated with two exceptions: two of the pretest teachers had moved to another school and they were replaced in the posttest by their successors in TTSR. In the Vasama study (1999) correspondingly, 11 teachers of the TTSR and 12 teachers of the control school (Pyynpaa Elementary School in Rauma) participated. The teachers in TTSR were quite familiar with such application areas of IT as wordprocessing, email and www. On the contrary, spreadsheet, databases and data communication were not so familiar to the teachers. In the Pyynpaa school the teachers' IT experience is similar to that of teachers in TTSR.

Data Collection and Variables. The design of the research is the following:

	Feb. 97		Mar. 99	May 99
R_1:	Y_{11}	X	Y_{12}	
R_2:		X	Y_{22}	
R_3:				Y_{32}

where R_1 consists of the teachers in TTSR (n = 19) studied by Alajääski (Alajääski 1999), R_2 is a sample of the same teachers (n = 11) and R_3 a sample of teachers in the control group (n = 12) studied by Vasama (Vasama 1999). The independent variable X is the working in a modern IT -based teaching environment. The dependent variable Y is the position of the school in the IT -strategic grid. The measurements were done for the group R_1 in February -97 (Y_{11}) and in March -99 (Y_{12}) by Alajääski and for the groups R_2 and R_3 in May -99 (Y_{22} and Y_{32}) by Vasama.

The measurements were made by presenting a questionnaire to the subjects. The teachers were asked to give their own estimates about the significance of using existing and future applications of IT in teaching different school subjects. The school subjects were: mother tongue, mathematics, music, history, biology/geography, environmental studies, physical education, technical work/textilework and fine arts. Also, the significance of different fields of IT for teaching was asked. The fields were wordprocessing, spreadsheet, databases, data communication, graphics, w3, email and games.

Alajääski asked the estimates in the scale 1 - 5 (very low - low - medium - high - very high), while Vasama used binary scale (low - high).

Data Analysis, Reliability and Validity. The data was analyzed calculating descriptive statistics,: median, lower and upper quartiles and means of the teachers' estimates about significance of existing and future applications in teaching. The independent variable is measured in an ordinal scale (1 - 5). So, strictly theoretically speaking, the best descriptive statistics are the median and the quartiles while the means are not appropriate. However, in this study, a pragmatic stand was taken and the means are thought to give a «common view". Alajääski (1999) calculated the Cronbach-coefficients for his data. The coefficients varied in the scale 0.7 - 0.95, so the reliability of the data can be regarded as good. Also, the validity of the study is considered to be Ok. All the school subjects in the Finnish elementary school are included and so are all appropriate subfields of IT.

5. TTSR in IT strategic grid

Vasama (1999) tried to clarify the position of TTSR in the IT -strategic grid compared to the control school. It appeared, that in the TTSR the mode was the strategic -category (with 55%; support 18%, factory 0% and turnaround 27%) while the control school fell by mode into the support -category (50%; factory 0%, turnaround 33% and strategic 17%).

In the following figure (Fig. 2), the positions (by subject and by application area) of TTSR in IT-strategic grid both in -97 and in -99 as clarified by Alajääski (1999), are shown.

It can be seen, that in the pretest (-97), according to the teachers' average estimate means TTSR falls into turnaround category both by application field ($A_{mean,97}$ = (3,0; 3,5)) and by subject ($S_{mean,97}$ = (2,8; 3,5)). In the posttest (-99) respectively, the coordinates are $A_{mean,99}$ = (2,8; 3,5) and $S_{mean,99}$ = (2,7; 3,3).

So, no significant development in the TTSR's position can be concluded.

Theoretically, TTSR is in a state of novelty-seeking atmosphere and may be moving to a creative state.

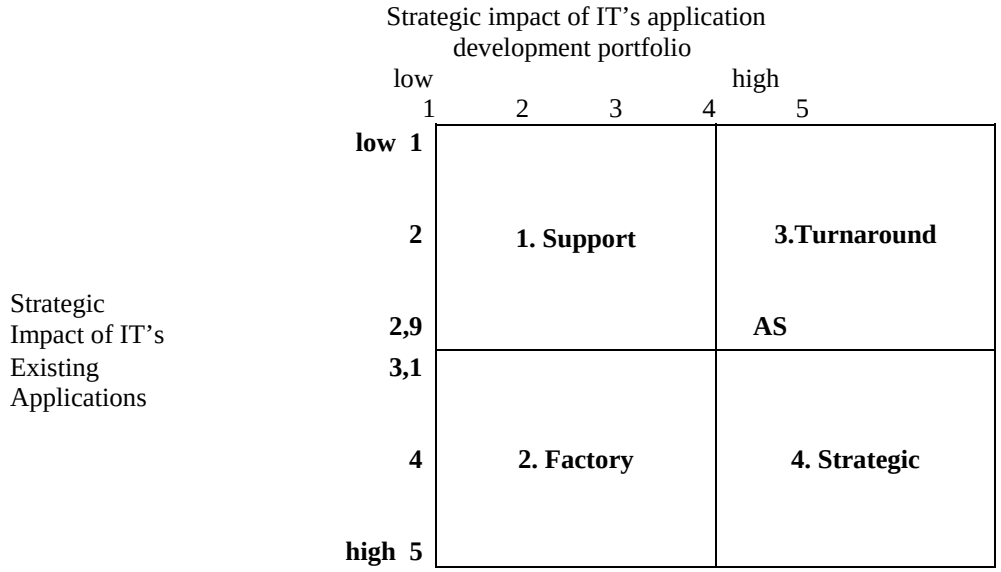

Fig. 2: The position of TTSR in IT-strategic grid by application field (A) and by subject (S) (Alajääski 1999)

6. Conclusion and the significance of the results

In conclusion then, the following seem to be the case:

1) compared to elementary schools in Finland, TTSR can be considered a strongly IT -oriented school.
2) no significant development in the position of TTSR in the grid is to be seen despite of the almost two years in the new modern IT -based teaching and learning environment.

The latter result may be due to, that the period of almost two school years is too short a period to achieve the effects. On the other hand, maybe the role of IT in the elementary school teaching, is not so significant as is generally thought (at least in Finland). In such case, the question has to be asked: Is there any rational reason to use IT widely in teaching in the elementary level?

No doubt, the IT based teaching does not replace and will not replace a teacher. Papert (1999) says that the modern digital technology creates new educational possibilities, but the best teacher in the world is still one who has a close and empathic relationship with students. In fact, the IT should still be seen as one educational tool among others. Natural learning always involves a complicated interaction between cognitive, motivational, social and situational interpretations (Lehtinen, Vauras, Salonen & Olkinuora 1995). The IT, such as educational software, 3D-design programs and simulations are good assistants and helpers for teaching and learning. Furthermore, the World Wide Web is also a great library and the source of information as well as the Internet and video conferences are excellent communication mediums. We believe, that the wide use of IT in teaching is advisable if it promotes students' active and natural learning through promlem-based tasks or projects.

Inevitably, further research in the area is needed. Another line of further studies is to clarify the positions of lower secondary schools and upper secondary schools in the IT -strategic grid.

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