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ORGANISATIONAL FACTORS AFFECTING IT INNOVATION ADOPTION IN THE FINNISH EARLY CHILDHOOD EDUCATION

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Abstract

Continuous technological development has created new ways of utilising IT in the public sector. However, the use of information technology is still to a large degree in its infancy in early childhood education. The study focuses on the adoption of IT innovations within early childhood education context in Finland. IT innovations can be used for instance in communication between different actors in early childhood education, in rationalisation of day care management and in support of the child's healthy growth. The study examines the organisational factors that enhance or hinder organisational innovativeness. A qualitative multiple case study approach was selected in order to understand the adoption processes in different organisations.

Keywords: Adoption, Public Sector IS/IT Resource Management, Case Studies of Real-world IS Deployment.

1 INTRODUCTION

Public sector is pursuing to improve its productivity and effectiveness by rethinking missions, re-engineering processes and implementing information technology solutions (Kamal 2006). Pressure concerns the whole public sector, but social care sector is not yet a great user of information technology and it is therefore behind for instance health care sector in using different IT solutions. This paper examines the use of IT innovations within early childhood education in Finland, which is still to a large degree in its infancy: prior research on information technology usage in early childhood education has mostly focused on assessing the impact of different educational games on children's learning (Järveläinen, Kestilä et al. 2006).

In order to hasten the development of Finnish information society, the Finnish Government launched a policy programme called "Government Information Society Programme" in 2003. The aim of the programme is to improve competitiveness and productivity, to promote social and regional equality and to improve citizens' well-being and quality of life through effective use of information and communications technologies (Harjuhahto-Madetoja, Ahonen et al. 2007). These aims concern also the Finnish day care and early childhood education development. Early childhood education should be involved in the development of the Finnish information society and in the transformation of operational environment. Information technology enables for example new working practices in day care, more effective communication between different early childhood education actors and better quality education.

Finland is often been ranked as one of the leader countries in exploiting information and communication technology to revise its economy and to reform its public administration (OECD 2003; Accenture 2004; Accenture 2007), but for some reason early childhood education has not been at the head of this development. However, after the launch of 'Government Information Society Program' in 2003, the development of Finnish e-government has been spread to early childhood education area as well, and many e-government development projects have taken wind under their wings.

In Finland, every child has a statutory subjective right to receive public day care and the municipalities are responsible to organise day care according to the demand. The concept early childhood education (ECE) refers to the care of children under compulsory school age (ages 0–6). Early childhood education emphasises the importance of co-operation between different administrations in relation to the organisation of early childhood education and care services for children and parents as well as the educational partnership of parents and personnel (Ministry of Social Affairs and Health 2002).

Day care takes place mostly in day-care centres (approx. 70 % of the children) or in family day care, which offer full day, full year service, including evening, night and weekend childcare for children whose parents are either working or studying. The main goal in day care is to promote child's healthy growth, development and learning skills. Day care should also support parents raising their children (Day care Act 36/1973). Early childhood education in Finland is a well-developed system and much appreciated by parents. Early childhood education is assured by public investments, and quality regulations are clear and strictly enforced. According to a recent study, there were approximately 186 000 children in day care, which represents over 50 per cent of the children under compulsory school age. In 2005, municipal day care employed 57 000 employees. In all, Finnish social care employed 101 000 employees in 2005, thus day care workers represent a considerable proportion of municipal workforce (Färkkilä, Kahiluoto et al. 2006).

The overall situation in the Finnish early childhood education is good: day care has been organised extensively, personnel is well educated and the premises are of good quality, but at the same time there are some concerns. The number of children in day care groups has risen at the same time as the number of personnel has decreased, which results to a situation where teachers have less time to educate children and they have to spend more time on administrative tasks. Another concern is the health of the children and the need for early childhood special education. Day-care centres are nowadays also accountable units in municipalities which causes some changes in every day work. Current challenges and needs for improvements are also linked to the teamwork of early childhood education personnel and parents (Ministry of Social Affairs and Health 2002; Ikola-Norrbacka 2004).

In this paper we are interested in the organisational factors which affect to the adoption of IT innovations in the early childhood education context. The paper is organised as follows: in the next section, IT innovation and factors influencing innovation adoption in organisations are presented. Section 3 introduces methodology, cases and findings. Discussion of the findings takes place in section 4.

2 THEORETICAL FRAMEWORK AND CONCEPTS

2.1 IT Innovation Adoption

Rogers' (1995) Diffusion of Innovations (DOI) theory is widely used in information systems research to study user adoption of new technologies. Rogers defines diffusion as 'the process by which an innovation is communicated through certain channels over time among the members of a social society (Rogers 1995)'. An innovation is a new idea, new product or service, a new production process technology, a new structure or administrative system, or a new plan or program (Damanpour 1991; Rogers 1995) whereas IT innovation refers to administrative or operational ideas, practices or objects perceived as new by an organisational unit and whose underlying basis lies with information technology (Lind and Zmud 1991).

The four determinants of diffusion of innovation are therefore innovation, communication channel, time and social system. Rogers (1995) defines social system as a set of individuals, informal groups, organisations, and subsystems that are engaged in joint problem-solving to accomplish a common goal. This study concentrates on the organisational aspect of social system. All types of organisations

adopt innovations in order to respond to the changes in their external and internal environments (Damanpour 1991).

Innovativeness can be described as a degree to which an individual or an organisation is relatively earlier in adopting new ideas than other members of a system. Innovations have a great impact on different organisations' activities, which is why the organisational innovativeness is widely studied (Meyer and Goes 1988; Damanpour 1991; Rogers 1995; Mustonen-Ollila and Lyytinen 2003; Lee and Xia 2006). Despite the impressive amount of empirical studies on organisational innovativeness carried out, the findings are far from unequivocal (Meyer and Goes 1988; Damanpour 1992; Mustonen-Ollila and Lyytinen 2003) and the literature on organisational innovativeness has often been described contradictory (Downs and Mohr 1976; Moch and Morse 1977; Kimberly and Evanisko 1981; Damanpour 1991). This study utilises widely used Damanpour's (1991) meta-analytic review of the relationships between organisational innovativeness and its determinants.

2.2 Organisational Determinants and Organisational Innovativeness

2.2.1 Organisational Size

Organisational size has long been considered to be one of the most important determinants affecting innovation adoption. Kimberly and Evanisko (1981) define organisational size as organisation's resources, transaction volumes or workforce size. Organisational size is often held positively related to innovation adoption, but as for instance Lee and Xia (2006) point out, a consistent relationship between organisational size and innovation adoption has not been established. Researchers have found positive (Moch and Morse 1977; Kimberly and Evanisko 1981; Kennedy 1983; Dewar and Dutton 1986; Damanpour 1992; Fuller and Swanson 1992; Premkumar and Potter 1995; Rogers 1995; Aguila-Obra and Padilla-Meléndez 2006; Kamal 2006), negative (Utterback 1974; Hage 1980) and non-significant (Aiken, Bacharach et al. 1980; Grover and Goslar 1993) interdependencies. Inconsistent findings result firstly from the failure to control important contextual variables that might influence of the effect, and secondly the concept of organisational size has been defined in various ways by different researchers, which leads to capturing different aspects and dimensions of it (Damanpour 1992; Lee and Xia 2006).

There are many reasons why large organisations have been considered more innovative than smaller ones. Organisational size is considered important for its structure and processes: larger organisations are often associated with greater formalisation (Lee and Xia 2006), more decentralized decision making (Hage and Aiken 1967), more specific responsibilities (Blau 1970), greater controlling (Slappendel 1996) and more complex communications (Haveman 1993). All these characteristics can assist innovation adoption within an organisation. In addition, large organisations often have more complex and diversified resources, such as marketing skills, research activities, product development and financial resources, which contribute to organisational innovativeness (Damanpour 1992).

On the other hand, some scholars argue on the contrary. They allege, that large organisational size does not necessarily mean greater organisational innovativeness. Small organisations can be more innovative because of their flexibility and their ability to adapt their actions to the rapid changes in their environment (Utterback 1974; Damanpour 1992). Innovations also generally require close collaboration and coordination, which can be easier achieved in smaller organisations (Lee and Xia 2006).

2.2.2 Specialisation and Complexity

Studies show, that it is often easier for large organisations to employ specialists than it is for smaller organisations. By employing specialists, organisations acquire new ideas, practices and technical skills, which are prerequisites for adopting innovations (Moch and Morse 1977). Organisational

specialisation therefore represents the different specialities found in an organisation (Kimberly and Evanisko 1981; Damanpour 1991). Specialisation is often considered to be positively correlated with organisational innovativeness (Moch and Morse 1977; Kimberly and Evanisko 1981; Damanpour 1991; Frambach 1993).

Organisational size also contributes to organisational complexity (Blau 1970), which furthermore has a positive effect on organisational innovativeness (Moch and Morse 1977; Kimberly and Evanisko 1981; Meyer and Goes 1988; Damanpour 1991; Frambach 1993). Complexity is typically measured by the degree of knowledge and expertise organisation's members possess (Hage and Aiken 1967; Zaltman, Duncan et al. 1973). Complexity encourages organisation's members to plan and propose innovations (Kimberly and Evanisko 1981; Rogers 1995) and exchange ideas with each others (Kimberly and Evanisko 1981).

2.2.3 Functional Differentiation and Managerial Attitude towards Change

Functional differentiation refers to the degree to which an organisation is divided into smaller units (Aiken, Bacharach et al. 1980). Functional differentiation is often seen to lead to increased organisational innovativeness (Moch and Morse 1977; Kimberly and Evanisko 1981; Damanpour 1991). The rationale behind such a hypothesis is that problems of coordination and controlling often occur in organisations that are divided into large number of subunits and innovations are used to solve these kinds of problems (Kimberly and Evanisko 1981).

Managerial attitude towards change has also been considered an important facilitator to organisational innovativeness (Dewar and Dutton 1986; Grover 1993). Top management's active involvement and support provide strategic vision and direction, and send signals of the importance of the innovation to other members of the organisation. Managerial support also ensures the adequate resources to be allocated to innovation adoption (Premkumar and Potter 1995). Positive managerial attitude towards change thus generally leads to organisational innovativeness (Damanpour 1991; Premkumar and Potter 1995; Rogers 1995; Aguila-Obra and Padilla-Meléndez 2006).

2.2.4 Slack and Technical Knowledge Resources

Organisation's slack resources refer to the degree to which uncommitted resources are available to an organisation (Rogers 1995). This contains all the resources an organisation has in its possession in addition to the capacity it has to maintain its critical operations (Hage and Aiken 1967). Slack resources are often measured by financial indicators, such as organisation's budget or the source of finance, or by the changes in expenditures for the organisation's main activity (Hage and Aiken 1967; Damanpour 1991). This factor is therefore positively related to organisational innovativeness (Damanpour 1991; Fuller and Swanson 1992; Rogers 1995).

Technical knowledge resources represent organisation's technical resources and technical potential. It is measured by the presence of technological equipment and personnel with technical experience (Dewar and Dutton 1986; Mustonen-Ollila and Lyytinen 2003). Without technical resources it is impossible to introduce technological innovations into an organisation (Premkumar and Potter 1995). Therefore there is a positive relationship between technical knowledge resources and organisational innovativeness (Huff and Munro 1985; Damanpour 1991; Premkumar and Potter 1995; Mustonen-Ollila and Lyytinen 2003; Aguila-Obra and Padilla-Meléndez 2006).

2.2.5 Internal and External Communication

Internal communication reflects the extent of communication among organisation's units or groups. It is measured for instance by the number of committees within the organisation and the frequency of their meetings (Hage and Aiken 1967), the number of face-to-face contacts (Aiken, Bacharach et al. 1980) and the degree in which different units make common decisions (Damanpour 1991). External

communication refers to organisation's ability to communicate and interact with its external environment. This is measured by the involvement of organisation's members in extraorganisational professional events (Damanpour 1991). Both internal and external communication are held positively interconnected to organisational innovativeness (Huff and Munro 1985; Nilakanta and Scamell 1990; Damanpour 1991; Prescott and Conger 1995; Rogers 1995).

2.2.6 *Centralisation and Formalisation*

Organisational centralisation is the extent to which decision making is concentrated only to a small group of people within an organisation. This variable is considered to be negatively associated with organisational innovativeness (Hage and Aiken 1967; Moch and Morse 1977; Kimberly and Evanisko 1981; Damanpour 1991; Grover and Goslar 1993; Rogers 1995). There seems to be consensus to the notion that high degree of participativeness in organisational decision making contributes to awareness, commitment and involvement among organisation's members (Pierce and Delbecq 1977). If decision making is concentrated only to a small group of people, it often prevents organisational innovativeness (Damanpour 1991). In centralized organisations the upper management is also often unaware of the problems in the operational level, and therefore unable to suggest relevant innovations to meet these problems (Kimberly and Evanisko 1981; Damanpour 1991; Rogers 1995).

Formalisation is the degree to which an organisation emphasizes following rules and procedures (Hage and Aiken 1967; Rogers 1995). Formalisation is measured by the number of different manuals and job descriptions used in organisation or more generally, to the degree of freedom available to organisation's members (Damanpour 1991). Therefore formalisation inhibits openness and organisational innovativeness (Hage and Aiken 1967; Zaltman, Duncan et al. 1973; Rogers 1995).

2.2.7 *Opinion Leaders and Change Agents*

There are members of organisations who act as opinion leaders. Opinion leaders provide information and advice about innovations to other members of the organisation. They have the ability to influence other people's attitudes or behaviour. The leadership is not based on a formal position in the organisation, but it is earned and maintained by individual's technical competence, social skills and conformity to systems' norms. Hence, they act as a proper model for the others. Organisations can have both innovative opinion leaders and leaders who oppose change. (Rogers 1995; Mustonen-Ollila and Lyytinen 2003).

A change agent is an individual who is external to organisation's systems but who influences organisation's innovation decisions in its own favour. Change agents usually use opinion leaders as their contributors (Rogers 1995; Mustonen-Ollila and Lyytinen 2003).

3 RESEARCH DESIGN

3.1 Data Collection

Because there is not much knowledge on IT innovations within early childhood education a qualitative case study was deemed applicable for this study. Yin (1994) defines case study as follows: A case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident. A multisite case study approach was followed in order to understand the adoption processes in different organisations.

Five IT development projects within early childhood education field were chosen to the study because they represent the most advanced use of IT within Finnish child care. The data for the study comes mainly from theme interviews, which were complemented with internal project documents. We

interviewed altogether eight early childhood education experts whose titles varied from Project Managers to Directors of day-care centre. This strategy had the advantage of exploiting different perspectives on the key issues. All the interviews were recorded for more detailed analysis. After the interviews, the audio material were listened and transliterated to enable comparison between cases. The data collection took place from November 2006 to June 2007.

3.2 Cases

Case 1: Regional child care services development project. A regional development project including nine municipalities in Central Finland was executed in 2005–2007. The idea was to respond to the growing need for day care services in the area. The objective was to produce day care services across municipalities, to clarify different regional day care management models, to develop parent guidance of different day care options, to strengthen service network, to introduce common use of day care information systems and to detect different costs.

One part of the project was a pilot which tested the consolidation of day care information system, municipal time card system and day care planning system. The idea behind the pilot was that basic personal information about children and personnel, and the time they have spent in day-care centres would be automatically transferred to day care information system and to the payroll. This data would then act as a basis for different statistics and invoicing the parents.

Different planning processes and compilation of statistics are really time-consuming tasks in day care, and along with the system these manual tasks would become much easier and efficient to handle. The director of the pilot day-care centre had calculated that the use of the pilot system would save them over 400 working hours per year.

Case 2: Electronic Parental Services. An extensive project aiming to develop electronic services for day care and elementary school children's parents has been conducted in a large Finnish city. The purpose of the project was to improve service cost efficiency, quality, fastness and interaction. In other words, the aim is to provide valuable electronic services to little children's parents. Among the services are electronic application for day-care centres and elementary school, electronic notification of open day care places, electronic invoicing, possibility to change one's contact information electronically, electronic application of transfer to another day-care centre, and electronic cancellation of day care places. The goal is to reduce manual processing in day care management and provide better quality services for parents.

Case 3: "Mobile-kid". Mobile-kid is an electronic communication service which connects homes and day-care centres. It aims to ease the daily communication between home and day-care centres, and to provide real time information about day-care centres' activities. Mobile-kid exploits Internet, e-mail and SMS. At the moment Mobile-kid pilot is on trial in a relatively small municipality in Central Finland, but the pilot has gained a lot of attention around the country.

Case 4: Regional Internet services for day care. An entity of ten northern Finnish municipalities has striven to establish a regional day care operations model, which will provide the most advanced day care services in the whole country. The region is famous for its rapid growth in population, and the need for day care services across municipalities is strongly present. The aim is to manage the whole day care application process on the Internet. Families can also receive bills and browse their customer files electronically. In addition, the customers can send and receive information, such as notices of absence, via e-mail or SMS.

Case 5: Local e-Government services for early childhood education. Development work in this project has been done in the area of electronic day care services. It includes customer-oriented information and communications services, and internal information services for the day care personnel. The idea is to gather up fragmented information services of different actors in day care, and to clarify the electronic communication between them. These actions pursue to more efficient and

smooth processes within day care and helping families to find suitable services for their individual needs.

3.3 Findings

3.3.1 Organisational Size

The studied cases can be divided into two groups: on the Finnish scale, there were both large and small municipalities. On the grounds of the number of children and employees, the largest studied case was case 2 – Electronic Parental Services, which comprises over 6000 children and 1600 day care employees. On the other end was case 3 – "Mobile Kid" – which involves 1000 children and a few hundred day care employees. The findings are therefore quite analogous to the presented theoretical framework: organisational size alone can not predict organisational innovativeness.

3.3.2 Specialisation and Complexity

Specialisation was studied by inquiring the specialities found in an organisation. In Finland, day-care centres' personnel structure is legislated by law, so except for minor differences, the findings were quite similar in all the studied cases.

Complexity is usually measured by the degree of expertise organisation's members possess, therefore this determinant was studied by asking whether the day care personnel had taken part on any survey which would indicate their IT competencies. There were only two municipalities which had done IT capability surveys on their staff, but neither of them covered the whole day care personnel. Therefore the organisational complexity is difficult to assess.

3.3.3 Functional Differentiation and Managerial Attitude towards Change

Functional differentiation was studied by the number of subunits in day-care centres. The results showed that every day-care centre had several subunits, which can lead to problems in coordination and controlling. Technological innovations can help to solve these problems.

Managerial attitude towards change was studied by interviewees' opinions on their projects and whether they thought IT would ease or complicate their everyday work. All the respondents regarded IT innovations positively, and they thought that IT eases their daily tasks.

3.3.4 Slack and Technical Knowledge Resources

Organisational slack resources are often measured by financial indicators, so the interviewees were asked about the funding of their projects. All the studied cases were given external funding, which made it possible to commence with the projects altogether. Without the external funding none of the studied projects would have commenced.

Technical knowledge resources are measured by the presence of technological equipment in an organisation. All the studied organisations possessed several technical devices (computers, digital cameras, mobile phones, scanners, etc.), which assist organisational innovativeness.

3.3.5 Internal and External Communication

Internal and external communication was studied by asking the project's initiator. This illustrates organisation's ability to communicate and study its surroundings. The findings show that all the studied organisations had listened to the signals from their surroundings, and thus understood the need to develop technological solutions also in child care.

3.3.6 *Centralisation and Formalisation*

Centralisation refers to the extent to which decision making is concentrated only to a small group of people. The final decisions on the initiation of all the studied projects were done jointly with day care specialists and decision-makers.

Formalisation was studied by asking whether an organisation must follow a strict regional IT strategy or whether it is possible to decide the IT solutions independently. The findings show, that none of the studied organisations followed any strict regional IT strategy, which would affect the IT innovations on one's disposal.

3.3.7 *Opinion Leaders and Change Agents*

Opinion leaders, who provide information on innovations and who have the ability to influence other people's behaviour were found only in two of the studied organisations, whereas a particular change agent – a notable software company – was present in almost all the studied cases. The company had actively demonstrated its technical solutions for early childhood education in all the studied organisations, and many of them had taken the bait.

4 DISCUSSION

According to our research the most significant predictor of innovation adoption was somewhat surprisingly an external change agent, who tried to influence organisations' actions to its favourable direction. Research findings showed that not many of the studied organisations would have commenced their projects if there has not been present a notable software company which provides technical solutions for day care sector. This software vendor had a particular role in triggering all the studied projects by giving demonstrations on different technical solutions for current problems in early childhood education.

Another important predictor was organisation's slack resources. Slack resources are often measured by financial indicators and research findings revealed that all the organisations had gotten outside funding for their projects. The costs of the studied projects were relatively high so without external funding many of these projects would have not been executed. Other important determinants affecting organisational innovativeness in our research were functional differentiation, managerial attitude towards change, technical knowledge resources and external communication. All the studied organisations consist of several units, so they were functionally differentiated. There are often problems in coordination when an organisation is formally divided into large number of functional units. Technical innovations represent solutions to these problems. Our research also revealed that the day care management regard IT innovations positively. Management support helps other members of the organisation to understand the importance of technological innovations and therefore assists innovation adoption. On the grounds of the interviews it can also be stated that the studied organisations had listened to the outside signals in order to improve the quality of early childhood education. Therefore it can be said that external communication has contributed to the organisational innovativeness.

As discussed before, centralisation and formalisation can reduce organisational innovativeness. None of the organisations studied follows a strict regional IT strategy which could at the worst inhibit the organisational innovativeness. The final decision on the initiation of studied projects was also jointly made in all the organisations, which means that there is no centralisation present.

A special concern in this study focused on the interdependency between organisational size and innovation adoption. As noted earlier, there are little consensus on whether the organisational size is positively, negatively or non-significantly related to innovation adoption. According to our study, it is not possible to predict whether an organisation will adopt technological innovations just on the

grounds of its size. Large organisations tended to have bigger budgets for different development projects and easier accessibility to highly trained professionals to run those projects. It can be also alleged that larger organisations possess the critical mass which often justifies the acquisition of particular technological innovations. However, few of the cases show that smaller organisations can be more innovative because their operations are often more flexible and adaptable.

Based on our research it is difficult to assess the effects of many determinants mentioned in the theoretical part. These determinants include specialisation, complexity, internal communication and opinion leaders. The personnel structure is quite homogeneous in every Finnish day-care centre, so there were not discrepancies between the studied organisations. None of the studied organisations had executed any surveys which would have represented the day care professionals' IT competencies, so it is also impossible to assess the affect of organisational complexity. Examples of internal communication was only found in one organisation, therefore it is not possible to draw any conclusions on that determinant. Opinion leaders were found in only two of the organisations, so it is impossible to generalise the importance of that factor, either.

5 CONCLUSION

This paper analyses the organisational factors affecting IT innovations adoption within early childhood education. Research findings are quite consistent with the existing innovation adoption literature. The most important organisational factors affecting innovation adoption seemed to be change agents and organisation's slack resources. Nonetheless, the study also found many of the factors to be insignificant to innovation adoption.

It is clear that organisations are not alike and different factors in different situations affect to innovation diffusion and adoption. However, day care experts and municipal decision-makers should be aware of different factors affecting the diffusion and adoption of IT innovations within early childhood education so that they could better prepare themselves to the possible problems in IT innovation implementation. This study hopefully helps at least partly on the recognition of those factors.

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