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Development Of A Stage Theory For ICT Planning In Schools

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ABSTRACT

This paper reports on a study that examines ICT planning in schools and proposes a four-stage model that seeks to explain the evolution of ICT planning maturity in schools. The model emerges from case studies conducted among eight New Zealand primary schools and provides insight into the nature of ICT planning in schools and the factors that contribute to growth in planning maturity.

INTRODUCTION

The importance of information systems (IS) planning and of linking this with the strategic goals of the organization is well recognised as a key factor in the successful use of technology in an organisation. However, in the context of IS planning for schools (more commonly referred to as *information and communication technology* (ICT) planning) research is still in the early stages. Indeed, Telem (1991) suggested that the issue of information technology in educational administration had been a neglected area of research and lacked an underlying knowledge base. Although there has since been an increased focus on information technology in educational management, much of the research has focused on management information systems, computerized school information systems, and specific applications of information technology (e.g. Barta, et al, 1995; Fung, et al, 1997).

This study examines the evolution of ICT planning in schools and identifies a set of factors that define the integration between ICT planning and educational strategy planning. The results suggest a common evolutionary pathway for ICT planning in schools and provide a foundation on which to propose a stages of growth model for ICT planning in schools.

Literature Review

Although ICT has become pervasive in the educational context, schools are described as "prime examples of businesses where IT can still be in its infancy" (Latham, 1998). In order for schools to function effectively, it is incumbent that they plan for the development and use of ICT. In examining ICT development in schools it can be expected that, like businesses, schools would also progress through a set of evolutionary stages in the development and alignment of ICT strategy with educational strategy towards realizing their potential for strategic gain through the integration of IS in schools.

Stages of Growth

This notion that organizations progress through various evolutionary stages of development over time has been encapsulated in various "Stages of Growth" models, which are widely used in both organizational and IS research. Stages of growth models in IS literature are based on the premise that organizations will move through various stages of maturity in the use and management of IS (Nolan & Gibson, 1974; Huff, et al., 1988). For example, King and Teo (1997) proposed a four-stage model conceptualizing the integration of information systems planning (ISP) and business planning (BP) over time, to better enable the effective support of business strategies. These four stages comprise: (1) Separate planning with administrative integration; (2) One-way linked planning with sequential integration; (3) Two-way linked planning with reciprocal integration; and (4) Integrated planning with full integration between business planning and IS planning. Although researchers debate the accuracy and completeness of the various stage models proposed in IS theory, nevertheless stage theory provides useful benchmarks for assessing an organization's current state of maturity and, planning for future growth.

ICT Planning in Schools

The complexity of the educational environment provides an interesting context in which to study ICT planning. Firstly, unlike businesses, schools tend to focus on the use of ICT to support learning objectives rather than business objectives, yet, like businesses they work wih limited resources and financing. Secondly, the adoption of technology in schools is not always well established (Latham, 1998) and schools therefore provide a contemporary context in which the ICT evolution can be examined. Thirdly, the integration of ICT plans and schools' strategic plans is a relatively unexplored concept within educational management. Much of the work undertaken in education has focused on large tertiary institutions with very different organizational structures, complex information systems needs, and specialist IT staff (e.g. Barta et al, 1995; Fung et al 1997; Rice & Miller, 2001). The application of these studies to primary schools is not particularly clear.

It is expected that an examination of ICT planning maturity in schools will yield a stage theory and benchmark characteristics for each stage that provides an understanding of the factors contributing to ICT-strategic planning integration, and enable schools to better plan for successful ICT integration.

METHODOLOGY

Background

In 1999, the New Zealand government provided funding for ICT comprising a one-off grant of $24.716 million plus an annual operational fund of $10 million - this funding would only be available to schools with approved ICT plans. The learning technologies planning guide for schools stated that effective integration of learning technologies requires schools to develop "a shared understanding of teaching and learning, a comprehensive learning technologies plan; and re-engineering of teaching and learning and of school administration processes" (MOE, 1999). Hence achieving effective integration of ICT within the educational process was clearly a complex undertaking, encompassing educational and administrative goals. A key initiative to support schools in their planning and implementation of ICT was the provision of the *Principals First: First Principles* workshops (ITAG, 2000).

Establishing a strategic ICT plan was the most common action taken by principals[1] following workshop attendance. However, reports suggest that ICT development in schools is still in its infancy and that activity has centered on the visible aspects of technology in

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schools such as acquiring equipment and establishing internet access, and on professional development (ERO, 2000; ITAG, 2000). It would seem that schools are still in the early stages of technology adoption (Knezek & Christensen, 1999) where teachers are learning how to use ICT and are gaining confidence in the technology. The later stages of adoption, characterized by the adaptation of technology to new contexts and creatively using ICT in curriculum integration were not common (ITAG, 2000). ERO (2000) reports that integrating ICT into the curriculum to improve teaching and learning is proving difficult and "many schools are unable to point to specific improvements in teaching and learning that have been brought about through the use of ICT".

Data Collection

Case evidence was gathered using retrospective interviews and document analysis. School principals were the primary source of information regarding ICT planning in schools since they had participated in the workshops on ICT planning and were involved in the development of ICT plans and strategic plans for their schools. Seven of the eight schools provided copies of their ICT plans and supporting documents, as well as excerpts or copies of the schools' strategic plan.

The participating schools were all state primary schools (ages 5-12) and ranged in size from a small 2-teacher rural school (of 37 students) to a large 20-teacher urban school (of 550 students) with decile ratings ranging from 3 to 10. The principals rated themselves across the range of experience in ICT planning from those who were "just beginning to get on board with ICT planning" through to those who perceived themselves as leaders in their adoption and implementation of ICT in schools.

RESULTS AND DISCUSSION

An evaluation of the schools' strategic plans and ICT plans, along with the interpretations of meanings gleaned from the interviews identified characteristics that suggest an evolutionary progression through stages of planning over time. The results suggested that internal factors have a greater effect on ICT planning sophistication than external factors, as all schools were state primary schools operating within similar parameters, yet they demonstrated different characteristics in their attitude to, and implementation of, ICT. The retrospective nature of the interviews also identified some of the drivers that enabled the schools to move from one phase to a successive one.

Four-Stage Model of ICT Planning

The patterns emerging across the schools indicated that planning generally evolved from an unplanned state through varying degrees of clarity and coherence. This provided a basis for proposing a four-stage model of ICT planning. The model (Figure 1) also identifies benchmark variables that correspond to each of the four stages.

Analysis of the research findings suggested the following four stages:

Stage 1: Little or No Planning. While most schools had established an ICT budget, the emphasis was on equipment acquisition (technical) and operations. Stage 1 schools had technical goals such as establishing and operating an ICT network, providing internet access, having a computer in every classroom; and achieving targets such as a reasonable computer: student ratio. Schools at this stage had not yet considered how ICT would be used to support the educational goals of the school. Strategic planning was therefore negligible or non-existent and there were no links between ICT planning and school strategic planning.

Stage 2: Early Formal Planning. This stage signals the beginning of formal links between ICT planning and educational strategy, and indicates a shift in focus from technical aspects to the educational value of ICT.

Stage 3: Focused Formal Planning. Schools begin to recognize the value of ICT to enhance administrative and communication functions as well as teaching and learning. Here, there is evidence of a more comprehensive understanding of the potential of ICT to contribute to the school's strategic objectives. This stage is also characterized by the adoption of ICT to modify or even re-engineer some of the processes within the school. Strategic educational planning reciprocally identifies and promotes these processes.

Stage 4: Mature Integrated Planning. Stage 4 indicates a stage of maturity in which planning acknowledges the integral role ICT plays in supporting or enhancing the wider school objectives. ICT planning is aligned with, and integral to the school strategic planning process. The innovative or creative development of ICT within the school contributes significantly to the school goals.

The model (Figure 1) also identifies benchmarks that characterize each stage across the categories of *curriculum*, *professional development*, *ICT infrastructure*, and *administrative support*.

The case evidence also suggested that the four stages are not discrete, but are better represented as points of identification along a continuum of maturity in ICT planning. Figure 2 summarizes the factors that seem to enable schools to mature in their ICT planning.

One of the most significant findings in this study is the *lack of vision* on the potential for ICT to facilitate and enhance administrative, communication and collaborative functions within the school system. The implementation of systems and processes that facilitate individual and collaborative planning by teachers, shared access to resources, and communication between colleagues both within the school and between schools, can potentially yield significant benefits in terms of administrative and educational efficiency and effectiveness. Similarly, the potential for ICT to improve the data collection, analysis and reporting of student progress and achievement appears to be an under-developed area in many schools. The study suggests that as schools develop skills in planning for ICT they tend to identify opportunities to enhance the core business of teaching and learning through the innovative use of ICT in administrative, collaborative, and support roles.

CONCLUSION

Achieving effective integration of ICT within the educational process is a complex undertaking encompassing both educational and administrative areas. While individual schools address these issues differently, and may make quite different decisions regarding infrastructure, professional development needs, and areas of priority, this study highlighted common planning characteristics and identified some of the drivers which enable schools to move forward in their planning and implementation of ICT.

The evidence suggested an evolutionary trend progressing from unformulated ICT plans with piecemeal implementation of hardware and software, through to the development of coherent and focused plans that support the strategic goals of the school. Although the external requirement for funding prompted *Early Formal Planning* (Stage 2), the study suggests internal factors are more likely to influence the movement from one stage to the next. Attitudes and beliefs about ICT, experience in the use of ICT, and knowledge about its potential are also likely contributors to ICT planning maturity.

The development of a stage model of ICT planning provides schools with a tool for analyzing their current planning processes, and assessing their level of planning maturity vis-à-vis each of the planning categories proposed by the model. The model descriptors provide benchmarks for highlighting areas of deficiency, assessing future directions, and providing assurance to school leaders that they are progressing along a pathway towards planning maturity. The phase drivers go beyond the basic model to provide direction for principals and boards of trustees who are addressing the issue of how to align ICT planning with the educational goals of the school.

This study is a first step in examining the stages of maturity of ICT planning in schools. The proposed model provides a tool that can be used to assess ICT planning maturity in schools and provide direction for growth in planning maturity. Although the model provides a useful platform for further study of the development and use of ICT in

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Figure 1: Four-stage model of CIT planning in schools

	STAGE 1: LITTLE OR NO PLANNING	STAGE 2: EARLY FORMAL PLANNING	STAGE 3: FOCUSED FORMAL PLANNING	STAGE 4: MATURE INTEGRATED PLANNING
Descriptor	*Planning has a technical and operational focus. Plans may be informal and not well documented.*	*Formal planning and a shift in focus from the technical aspects to the educational value of ICT.*	*Planning begins to recognize the value of ICT to facilitate the school's strategic objectives, and is characterized by the adoption of ICT to modify or re-engineer school processes.*	*ICT planning is aligned with, and integ school strategic planning process. The or creative development of ICT within t contributes significantly to the school g*
CATEGORIES **USE OF ICT ACROSS THE CURRICULUM**	Few, if any, links exist between ICT use and curriculum objectives. Emphasis on providing students with opportunities to use computer applications in the classroom	Beginning to focus on how ICT can be used to support teaching and learning. Some emphasis on developing students' ICT skills in different applications and/or using curriculum specific software.	Maturing understanding of how ICT can support and enhance teaching and learning across curriculum areas. A shift from isolated skills acquisition to a more contextual approach. Understanding of ICT broadens to include associated technologies.	ICT is an integral tool in the teaching a learning process. The use of ICT is plan does not dominate curriculum objective Students use a wide range of technologi the curriculum areas, as ICT becomes a thinking and learning.
STAFF COMPETENCY ANI PROFESSIONAL DEVELOPMENT (PD)	High proportion of novice ICT users. PD is focused on developing basic computing skills and confidence.	Staff are at different levels of competency and confidence, with a number of beginners. PD may be targeted to staff needs and is beginning to link skill development with possible curriculum applications.	Increasing levels of staff competency across a range of technologies and software applications. Targeted PD is likely to focus on contextual skill development and curriculum application as teachers and trainers recognize the importance of linking new skills to curriculum areas.	A reasonable proportion of the staff hav developed ICT skills and confidently us of technologies. PD is likely to become increasingly cus and specific. PD may have a strong curr focus, or may develop skills to support school objectives.
ICT INFRASTRUCTURE	Piecemeal accumulation of technology. Computers are likely to be standalone.	Infrastructure is more planned with an increased emphasis on compatibility, upgradability and connectivity. The school may be considering networking, and the physical arrangement of computers in pods or suites.	The ICT infrastructure is taking shape. Planning for ICT infrastructure is formal and linked to other school plans eg. property development. Long-term plans for ICT replacements and acquisitions complement the existing infrastructure and the school vision for future ICT use.	A highly developed infrastructure is in established networks and adequate reso The school may be exploring new and i technologies to enhance existing capabi
ICT AND SCHOOL ADMINISTRATION	Basic office functions are computerized.	Additional administrative functions are computerised. Increasing awareness of the potential of ICT to enhance communication.	The school begins to explore additional administrative applications to enhance efficiency and effectiveness of administrative systems.	Teachers and administrative staff use IC enhance communication, resource shari student record management, analysis of needs, and reporting. The school identifies and implements ir ICT solutions.

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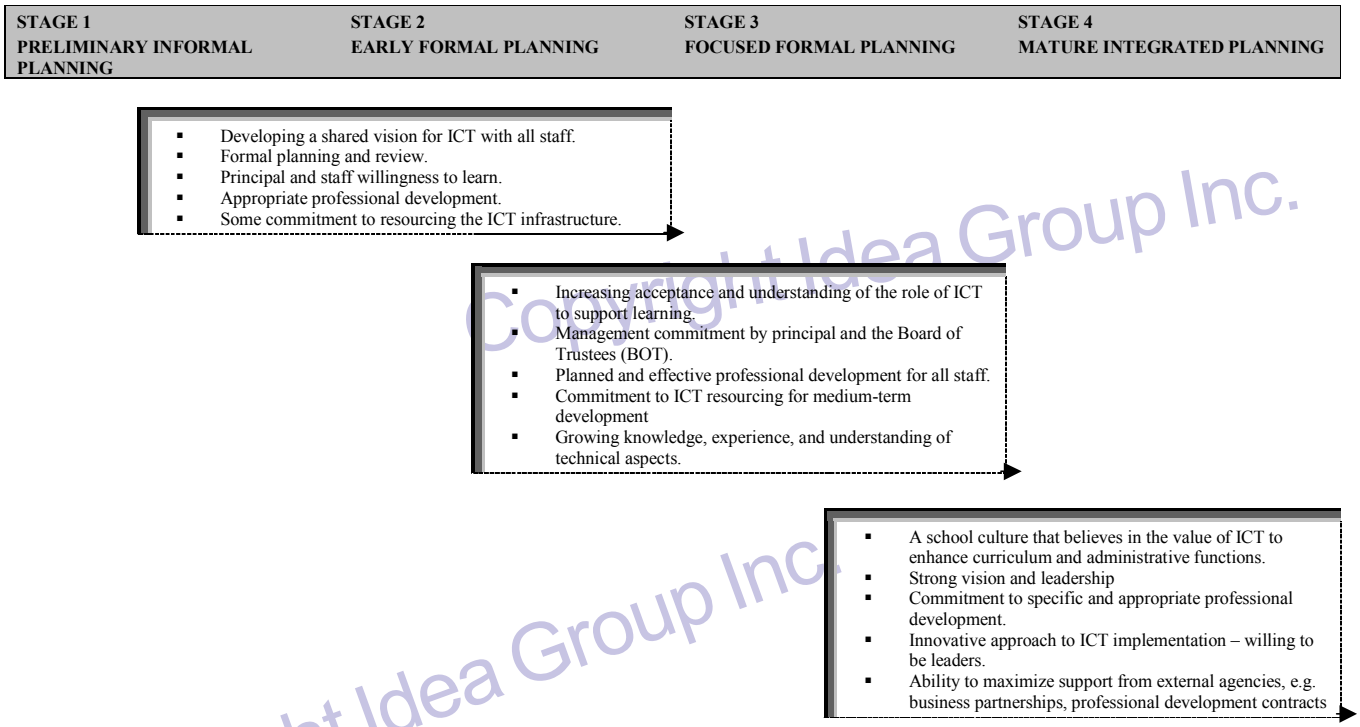
Figure 2: Summary of stage drivers



schools, there is a need for future research to confirm or refine the proposed stages of maturity, and provide further insight into the factors that enable ICT planning in schools to mature.

ENDNOTE

1 86% of primary principals and 75% of secondary principals indicated they had established a strategic ICT plan following the Principals First: First Principles workshop (ITAG, 2000, p 39).

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