A Model for Understanding IT Support in Schools

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Abstract

The field of IT infrastructure support is only lightly considered within the academic literature (Kanstrup & Bertelsen, 2006). Schools have significant IT infrastructures, many approximating a typical large business. This paper describes the development of a model or taxonomy that will aid an understanding of the infrastructure support within schools.

Keywords: technical support, schools, K-12, ITIL

1 IT Infrastructure in Schools

Over the last decade there has been a large IT investment in schools. This has come largely from the government, but community contributions from the community have also been significant. For example, the Community Trust of Otago has donated over $4 million to Otago schools to aid e-learning (Lai & Pratt, 2004).

This investment has seen schools achieve a ratio of one computer to every 4 students in secondary school, and one computer to every 5 students in primary schools (Johnson, Kazakov, & Švehla, 2005). The use of IT for school administration and teachers has also increased. The Ministry of Education's "Laptops for Teachers Scheme", known as TELA, has been very well received by teachers; allowing them to continue working at home. This has been reported as "a very popular initiative" (Wilkinson, Beavis, Ingvarson, & Kleinhenz, 2005). Today, all schools have access to the internet (however, a single computer with a modem counts as "access"); and more than two thirds of schools can be described as having a network infrastructure (Johnson, Kazakov, & Švehla, 2005). This is a marked improvement over a report five years earlier which found only about 30% of schools to be networked (ERO, 2000)

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The census reports on computers in schools do not identify the number of computers in schools, but focus on the ratio of computers to students. However, as the average secondary school (Year 7-15 and Year 9-15 schools) has 659 students (Min. Education, 2007), then we can extrapolate, using a 1:4 computer to student ratio, to infer that the average school will have approximately 165 computers, for student use alone. This is a sizable IT infrastructure!

Comparing schools with businesses, where IT support needs are better understood, allows us to gain an understanding of the IT support needs of schools. To allow a view of a business that approximates the infrastructure of a school, consider an enterprise with 165 staff, each with a single PC. Each staff member having their own PC is not unusual in an office based organization. Very few businesses would have more than one computer per staff, many would have less. A business of this size would be considered a large one, as Statistics NZ define a small business as having two to less than 20 employees, a medium business as having a staff of 20 - 49, and a large business as having 50 or more employees (Statistics N.Z., 2006).

At the crude measure of "computer screens", the average school has a volume of equipment not found outside of a large business. It is possible that the comparisons end there. However, current Ministry of Education requirements for networking a school (Min. Education, 2005) are based on the industry standard AS/NZS3080. Schools also use databases to maintain school records, email for communication both within school and outside (Parr & Ward, 2005), host websites (Johnson, Kazakov, & Švehla, 2005), and appear to implement every aspect of IT that would be found in a large business. The applications may differ (a business CRM versus MUSAC to manage student records), but similarities in the infrastructure exist.

Another need that is shared between a business and a school is that the computers should be operational and able to perform the required tasks (Johnson, 2003; Ronnkvist, Dexter, & Anderson, 2000). Hovell (2003) notes that

> It is a simple fact that for teachers to use computers, the computers must be working. Technical glitches create discouragement especially when teachers are working with their class when something happens and they do not know what to do. If schools expect to see ICT integrated into classroom programmes, they

> must have systems in place to deal with technical issues that arise (p.34)

Within the business world, this was echoed in the controversial paper "IT Doesn't Matter" (Carr, 2003). Carr was attempting to make the point that for the vast majority of businesses, IT does not give a competitive advantage, but instead acts as a hygiene factor. Much like water or electricity, if a business is to be sustainable then the IT infrastructure must work. It can be seen, that businesses and schools share many of the same IT support needs.

2 Technical Support in Schools

The field of IT technical support is an increasingly important and yet a rather unexplored field (Kanstrup & Bertelsen, 2006). This is true both within business and schools.

Previous studies of IT in schools (Lai, Trewern, & Pratt, 2002; Marcovitz, 2000; Reilly, 1999; Strudler, 1996) have indicated that teachers with the role of ICT Co-ordinator often maintained a school's equipment and network.

Such teachers (ICT Coordinators) often work excessive hours. Lai and Pratt (2005) identified a number of ICT coordinators who were regularly working more than 60 hours per week. This was never sustainable and recent anecdotal reports indicate that this practice has changed to more frequently involve the use of dedicated IT technicians. This is supported to some extent by the 2005 survey of IT in schools which reports that a technician is directly employed by 58% of primary schools and 74% of secondary schools (M. Johnson, Kazakov, & Švehla, 2005). That report lists a wide variety of sources of technical support ranging from the dedicated technician through to parent volunteers and managed services. It did not however consider staff working beyond their allocated hours, Lai and Pratt (2003, 2005) found to be a frequent occurrence.

The literature regarding the role of ICT coordinators in schools has historically advocated that a teacher should not be playing a technical role (Reilly, 1999), while acknowledging that wide spread practice showed that maintenance was indeed a significant workload factor. Sandholtz and Reilly (2004) observe that "it can be counterproductive to force teachers to be technicians and assume the role of supporting the technology in their classrooms" (p509). From the literature it is clear, then, that teachers should not be performing in a technician's role. What is less clear, however, is what form the IT support in schools should take.

3 IT Support Management Frameworks

The IT industry is young. There are few areas which would claim "maturity" (Lawson 2002). In ill disciplined or reactionary approach to implementation and maintenance can work on a small scale. But such an ad-hoc approach becomes chaotic when applied to a large enterprise with a significant IT infrastructure. As noted by the OGC (2002) in the opening to their volume on Infrastructure Management;

> the range of options now available, coupled with the lack of comprehensive ICT Management process standards, represents a daunting challenge for ICT Management. ICT components are increasingly deployed throughout the organisation which makes the management of such distributed resources both important and difficult (p1)

As IT departments have grown, and as the industry begins to mature, there has been the development of more formal methodologies. In the United States this has to some extent been driven by the need to comply with various legislations such as HIPPA (Health Insurance Portability and Accountability Act) and Sarbanes-Oxley (Cannon & Byers, 2006). A structured and formal approach to managing Information Technology is required to avoid serious penalties and censure (Robinson, 2005).

The United Kingdom has taken a different approach, but does have some compliance legislation of its own. A large amount of effort has been put into developing an infrastructure management methodology known as ITIL (Information Technology Infrastructure Library). ITIL has a heritage drawn from the Prince2 project management methodology which has been transformed to account for the non-finite nature of managing infrastructure. By the mid 1990's, ITIL was recognised as the de facto standard for IT infrastructure management (OGC, 2001).

The British Educational Communications and Technology Agency (BECTA) have adapted ITIL and developed a management framework specific for schools. This framework is known as FITS (Framework for ICT Technical Support). While BECTA and the FITS framework are government funded and supported, it is not widely implemented in UK schools. In 2005, only 7 percent of schools had implemented FITS with most schools having no plans to do so in the near future (Pittard, 2006). Formal management of IT in schools is very much in its infancy.

4 Development of a Model to Understand IT Support

We are currently engaged in a study to identify the actual structure of IT support in schools. The aim is to develop a picture and an understanding of the range of IT support frameworks that are in practice in Otago schools. We have developed a multi-faceted taxonomy to describe the IT infrastructure management in terms of process maturity, the Operating Environment for the technician and client satisfaction.

4.1 Process Maturity

Our analysis of the maturity of the IT support processes uses the *Process Maturity Framework* (Marquis, 2006). While this was developed by the OGC for ITIL, it is a reasonably generic tool for assessing process maturity.

The ITIL Process Maturity Framework has five levels (Pink Elephant 2004). Each level demonstrates a shift in focus, and an increase in the discipline practiced in the planning and implementing and maintaining the IT infrastructure.

- **Initial**: Processes are ad-hoc, chaotic, and reactive. Few processes are defined. Many of the processes are undocumented local practices known only to the current workers.
- **Repeatable**: Some basic processes exist and there is an attempt at being disciplined and to stick to the basic processes .
- **Defined**: A thorough and complete set of defined processes.
- **Managed:** The defined processes are measured by collecting detailed data.
- **Optimizing**: A practice of continuous process improvement is put in place using quantitative data and the piloting of new ideas and technologies.

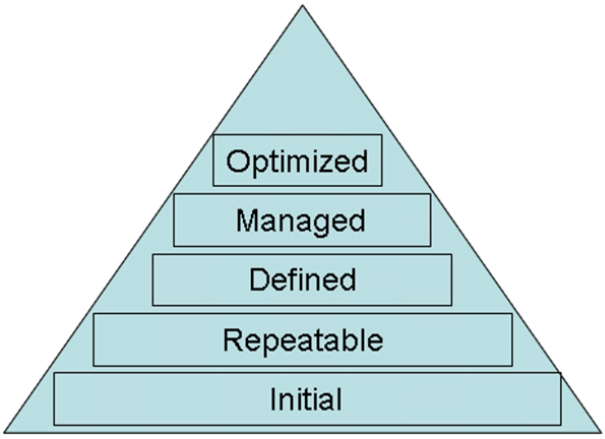

Figure 1 The ITIL Process Maturity Model

4.2 Operating Environment

ITIL, or any similar framework, focuses on the administration and design of IT infrastructure support. The attention is on the process, not the implementation. The criteria of "Operating Environment" looks at the ICT support from the practitioners viewpoint as opposed to the manager.

This area is not as formalised as process maturity. An approach which is being taken within this study ranks the Operating Environment with a number of levels, each contributing toe the technician and engineer being more able to undertake the work which is being asked of them

- **Death March:** (Yourdon, 2003) The technician is faced with unrealistic expectations in scheduling, quantity of work and difficulty of task. They are often faced with inappropriate documentation, a lack of necessary tools, and often lack access any sort of relevant training. Characterised by despondent technicians futilely working on ever growing task lists.
- **Heroic Efforts:** The ICT infrastructure is able to be minimally maintained, but only through heroic efforts on the part of the technicians. There is a lack of resources (staff and tools) to adequately complete all tasks in a reasonable day. However, with exceptional effort the infrastructure is able to limp on. This is not sustainable and depends on a level of commitment from the technician which can not be reasonably expected.
- **Adequate:** Staff are employed at a sufficient level and expertise to adequately maintain the ICT infrastructure to a minimal standard. Sufficient tools are present to allow the necessary activities to be successful. Resources are sufficient for reactive maintenance of the infrastructure.
- **Well Resourced:** The technical staff are able to be proactive in their maintenance of the infrastructure. Time and tools exist to analyse trends and perform real problem analysis and resolution
- **Innovative:** The technical staff have the management of the infrastructure well in hand. They have excellent access to professional development and tools. Time is able to be devoted to creating new and innovative solutions to meet the business needs.

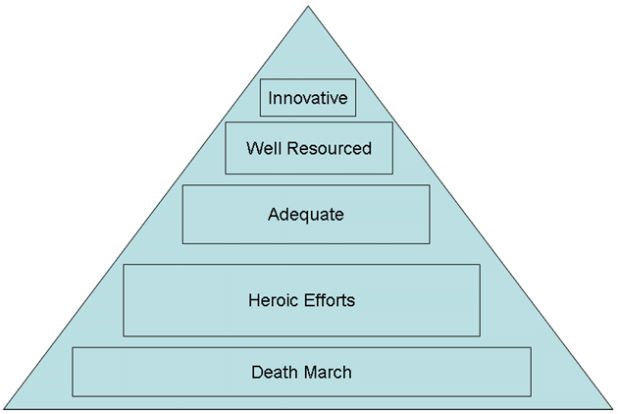

Figure 2 Operating Environment

4.3 Client Satisfaction

The maturity and detail of the processes and procedures do not tell the whole story. The clients, in this case the teaching and administrative staff, as well as the students, should be considered. From their perspective, is the IT infrastructure suitable? Does it allow and support them to do their work?

Rather than develop another hierarchy for customer satisfaction, it is ranked as a continuum ranging from complete dissatisfaction through to exceedingly satisfied.

4.4 Putting it all together

The three facets of process maturity, client satisfaction, and the operating environment, is used to develop a multi-dimensional taxonomy, or data-cube, similar to the analysis of Capstone Projects used by Mann (2006). This taxonomy allows a much better understanding of the challenges faced by schools in terms of supporting their IT, and of solutions to these challenges. It shows the interaction between the ICT management, the technical environment and the customer satisfaction.

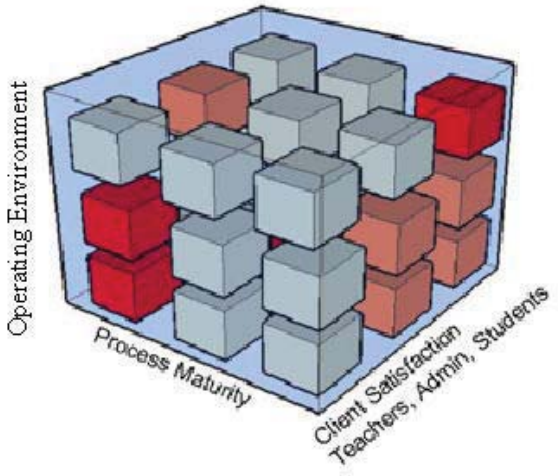

Figure 3 Multi-Facited Taxonomy of IT Support in Schools

The data-cube aids analysis of the interaction between all of the main participants in the IT infrastructure. Clusters will become apparent as the data from multiple schools are collected and analysed. The construction of the model categorised segments of the data cube based extreme absence or excellence in each attribute. We have begun to view this analysis as a journey between chaos and nirvana. In reality, organisations will fall between these extremes. However this demarcation helps group and identify the situation.

It is important to note that this table is ***not*** a linear progression. These points are taken as a binary progression based on the extreme value of each occurrence. The identified points exist at the corners of cube. Altering the order of the columns in Table 1 would produce a different order in the table.

Many of these points within the data-cube are recognisable. It is doubtful that any organisation exists in the highest octant of total Nirvana; and organisations at the opposite extreme of absolute "Disgruntled chaos" would probably not have a working infrastructure. The purpose of this categorisation is to aid the understanding of what is in reality a three dimensional continuum.

A full discussion of each octant is beyond the scope of this paper, but some aspects are worth noting.

Table 1 Octants within the Data Cube

Maturity	Environment	Satisfaction	Label
High	High	High	Nirvana
High	High	Low	Isolated
High	Low	High	Efficient Bureaucracy
High	Low	Low	Bureaucratic Starvation
High	High	High	Successful Fire-fighting
Low	High	Low	Unsuccessful Fire-fighting
Low	Low	High	Blissful Ignorance
Low	Low	Low	Disgruntled Chaos

General trends are common within this model. When one attribute advances, the others are often improved. As Potgieter, Botha, & Lew (2004) found, "both customer satisfaction and operational performance improve as the activities in the ITIL framework increases. Increased use of the ITIL framework is therefore likely to result in improvements to customer satisfaction and operational performance (p166).

However, this is not always the case. One author has observed an organisation where there was a reasonably high level of planning and process management, with technicians and engineers having reasonably adequate working environment, yet the technician's were almost lynched when we went for a tour of the organisation. Customer satisfaction was not high! We regard this organisation has having an "isolated" IT infrastructure. This is usually due to miscommunication between the IT support department and the end clients. Needs are not adequately conveyed nor understood.

An interesting quadrant is that comprised of high process maturity and low operating environment. Whether the client satisfaction is high or low, we regard this as a bureaucratic situation in which those implementing the processes are not resourced sufficiently. It may be that the clients expectations do not require the full implementation of the planned activities.

5 Conclusion

The model described in this paper is proving useful to understand the multiple dimensions of process maturity, operating environment and client satisfaction within the area of ICT support management. While the extreme levels within any dimension are rare, a categorisation that uses theses extremes helps understand the relative position of the organisation's actual ICT support environment. This model is being used in an ongoing research programme into the IT technical support management within schools.

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