

## **The Nature of Change and Innovation in Five Innovative Schools**

by

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## Abstract

In this study we investigated the change processes in five innovative Canadian schools to determine why these schools were innovative. To better answer these questions we used a mixed-methods methodology to: (1) examine the initiation, implementation and institutionalization of change and innovation, (2) investigate the nature of professional learning, (3) investigate how being a part of a virtual community facilitates collaborative (organizational) learning; (4) assess the impact that being part of a national Network has had on participating schools, and, (5) study the nature of leadership in these innovative schools. The paper outlines what we have learned about innovation and change from these schools and how they were able to move innovative ideas about teaching and the integration of ICT into everyday practice (implementation).

**Keywords:** Educational change, professional learning, innovative schools, strategies, technology

## Introduction

As a consequence of a fast-changing global economy, Canadian schools and school districts are facing increasingly turbulent times (Dibbon, 1999; Leithwood, 2000; Rait, 1996; Fullan, 1993 & 2001; Stoll and Fink, 1996; Leithwood and Aitken, 1995; Prestine, 1994; Leithwood, Janzi, and Seinback, 2000). Changes in our economic environment brought on by government restructuring, and the rapid growth and expansion in information and communication technologies (ICT) has made it necessary for Canadian schools to be innovative in their approach to preparing students for success in a modern world (Government of Canada, 1995 & 2002a; Conference Board of Canada, 2001).

In this context innovative is defined as “*adopting an idea, practice or object that is perceived as new...*” (Rogers, 1995) and, success refers to *the skills that graduates need to enter, stay in and progress in the world of work* (Conference Board of Canada, 2001). These skills can also be applied beyond the workplace in a large range of daily activities (e.g., family life, post-secondary education) and are considered desirable for all members of our society (Conference Board of Canada, 2001).

The increased speed of technological change and the rapid growth of knowledge are creating unprecedented new opportunities for prosperity and growth, as well as contributing to major social, cultural and personal change. At the present time we do not know enough about the management of change in preparing schools for the knowledge economy. This paper on *networked* innovative schools will enhance both the breadth and depth of knowledge as it pertains to learning and innovation in Canadian schools.

## The Challenge

*Governments, businesses and their associations, academic commentators and research institutions share the view that innovation is essential to improving overall economic performance (Government of Canada, 2002a p. 22).*

As a result of this focus on innovation, increasing *innovative capacity* has become somewhat of a mantra throughout Canadian society over the past couple of years. The Conference Board of Canada (2001) has stated that: “Improvements in our innovative capacity are critical to productivity growth and wealth creation (p. 2). It is also clear that the Government of Canada has made innovation a priority. In *Achieving Excellence – Investing in People, Knowledge and Opportunity: Canada’s Innovation Strategy*, the authors quote The Honourable Paul Martin, then Minister of Finance: “One of the most consistent threads that runs through our policies in recent

years has been a recognition that innovation is a key to both the strength of our economy and to the quality of our lives (Government of Canada, 2002a, p.26).

In response to calls from the public and the business community for increased accountability in education, the call for innovation has also spread to public education systems (Fullan, 2001). And the Government of Canada (2002a), notes that shifting skill demands and changing learning expectations have led provinces and territories to initiate reform of their elementary and secondary education systems. However, in spite of these calls for reform and innovations, concerns about schooling quality and outcomes still exist (Government of Canada, 2002 b, p.17).

Recognizing that education is key to the labour market success of young Canadians and that we can no longer assume that the skills acquired in elementary and secondary school will carry workers through their adult lives, the Government of Canada (2002b) believes it is critical that school aged children be well equipped to become lifelong learners and to adapt to a continuously evolving workplace. They go on to say that if Canada is to meet the economic and social challenges of the knowledge-based economy and if we are to remain competitive and keep up with the accelerating pace of technological change, then it is critical that our elementary and secondary students and teachers have the opportunity to develop the technological literacy skills necessary for lifelong learning (p. 23). This has been one of the objectives of Industry Canada's SchoolNet.

SchoolNet is a collaborative partnership with provincial and territorial governments, the education community and the private sector that encourages the integration of information technology into Canada's education system (Government of Canada, 2002b, p.21), and over the past decade they have introduced many innovative programs aimed at helping students acquire digital literacy skills and experience in using the Internet for research and communication. One of these programs, the SchoolNet Network of Innovative Schools (NIS), was launched in 1998 and as of 2004, over 100 schools were selected to be part of this Network and each was provided with a modest financial grant (\$10,000 per year for three years) to facilitate their innovation plans.

The objective of this program was to identify innovative schools in the K-12 system that were successfully integrating ICT into the curriculum and provide them with modest levels of support so they could continue to explore and develop innovative uses of ICT in the school. The purpose of the Network was, among other things, to establish a "network of schools" capable of learning from one another and mentoring other schools in online learning communities.

Initiatives of this nature are large-scale (Mohrman, Wohlstetter & Associates, 1994) and large-scale change initiatives have two characteristics that make them distinct from the small adjustments and minor changes that occur continuously in schools - if they are successful they are pervasive and they are deep. Deep change affects the most fundamental aspects of an organization: the beliefs, assumptions and values that guide behaviour. Change of this nature challenges educators to think differently about how they perform their work and calls for a reculturing rather than a restructuring approach to change. That is what the Network of Innovative Schools was all about. In this paper, we report on the change processes in five of these innovative Canadian schools.

## **Methodology**

Because this study intended to provide insight into the phenomenon of integrating technology into teaching and learning under varying circumstances, a "collective case study" methodology was appropriate. As Stake (2000) explains, when there is less intrinsic interest in a single case a researcher may jointly study a number of cases in order to investigate a phenomenon, population or general condition. In a collective case study approach the individual cases may or may not be known in advance to manifest some common characteristics, however, in this study the common characteristic was that all schools were active members of the Network of Innovative

Schools – schools identified for their approach towards the innovative use of information and communications technologies<sup>1</sup>.

The school selection process was conducted in consultation with the staff of Industry Canada who recommended schools that were exemplary in their use of funding obtained from NIS and also for the progress they have made with integrating technology into teaching. The individual cases (five in total) were selected because the investigator believed that “*understanding them will lead to a better understanding, perhaps better theorizing about a still larger collection of cases*” (Stake 2000, p. 437). However, as this is a national study the sample is representative of geographical areas (at least one school from each region of the country – Atlantic Canada, Central Canada, Western Canada and British Columbia and the North). Consideration was also given to selecting cases that represented urban and rural schools as well as the different grade level configurations.

The principal of each of the schools was contacted and invited to participate in the study. Consent to proceed was obtained and arrangements were made to administer a survey among the professional staff. Also, interviews with a sample of school-based, professional staff and others associated with the schools were arranged and conducted by telephone (except for one site where it was convenient for a researcher to visit the school). Interviewees included teachers, the chairs of School Councils, superintendents and community partners. The latter groups were interviewed in order to get outside perspectives on what was happening in the school. The interview sample and survey return rate for each site are summarized in Table 1.

**Table 1: Schools in Sample**

Name	Location	Grade	# of Teachers	# of Interviews	# of Survey Responses
High School 1	Nova Scotia	10 – 12	51	8	17
High School 2	Ontario	7 – OAC	85	7	64
Elementary 1	Ontario	K – 5	18	11	12
Junior High	Alberta	7 – 9	32	10	13
Elementary 2	Yukon	K – 7	29	7	10

The number of interviewees at each site varies for several reasons. In some schools there were just more questions that needed to be answered so we continued the inquiry. At one site a new principal had just been assigned to the school so both the present and former principals were interviewed. At another site the researcher’s presence in the school allowed for easy access to more than one parent. This was the only site at which researchers were physically present. In all other cases the interview data were collected by telephone. The NIS website and the school websites were also sources of information used in this study.

The *School Innovative Capacity Survey* was sent to each teacher and required respondents to indicate their level of agreement on 60 items describing teacher professional learning and capacity for innovation on a 7-point scale. The scale ranged from ‘strongly disagree’ (1) to ‘strongly agree’ (6). A score of 0 meant ‘not applicable’. One hundred and sixteen responses out of 216 teachers were received for a response rate of approximately 53%.

Survey data were entered into the statistical analysis program SPSS and quantitatively analyzed. Frequencies and crosstabs were computed for each of the cases as well as for the group as a whole. The responses were also analyzed to determine overall reliability and the overall alpha score was .9436.

<sup>1</sup> Criteria for selection as an innovative school: (1) leadership for ICT by school administration, (2) involvement and commitment of teachers in the innovative use of technology, (3) the contribution of ICT to student-centered learning, and (4) how ICT is integrated across the school curriculum.

Interviews were audio taped and transcribed. Transcripts were examined visually for references to the conditions that are known to impact on innovation and learning in organizations. The results of the data collection procedures are reported using the framework for organizational change (Fullan, 2001), teacher leadership (Leithwood, Jantzi & Steinbach, 2000) and professional learning (Dibbon 1999 & 2000).

## **Change Processes in Innovative Schools**

Most researchers now see three broad phases to the change process (Fullan 2001; Hall and Hord, 2001; Evans 1996; Bridges 1993). Phase 1 is generally viewed as the initiation phase and this consists of the processes that lead up to and include the decision to proceed with the innovation. Phase 2 is the implementation phase and this phase involves the process of putting a change or innovation into action. Phase 3 is the institutionalization phase and this phase refers to whether the innovation or change gets built in as an ongoing part of the system or disappears from use altogether.

These same experts agree that the number and complexity of the factors that interact in the change process make calculating a formula for change next to impossible. Yet researchers and practitioners continue to study change and innovation in search of ways that we might be more efficient and effective at improvement. As Fullan (2001) notes, there are no hard and fast rules, but rather a set of suggestions or implications given the contingencies specific to local situations. And many researchers agree that the uniqueness of the individual setting is the critical factor – what works in one situation may or may not work in another. This is not to say that we cannot learn from studying change and innovation in these locations, however, lessons from these cases should be used less as a blueprint for application and more as a set of guidelines for helping practitioners and planners make sense of initiating, implementing and monitoring change and innovation. The major focus of this report will be on what actually happens in these innovative schools during the implementation phase.

## **Implementation**

Implementation refers to the process of putting into practice an idea, program or set of activities and structures new to people attempting or expected to change. The change may be externally imposed or voluntarily sought; explicitly defined in detail in advance or developed and adapted incrementally through use; designed to be used uniformly or deliberately so that users can make modifications according to their perceptions of the needs of the situation (Fullan, 2001, p. 69).

A considerable body of research in education and other policy fields lays out the difficulties in moving from initiation to practice (e.g., Fullan, 2001; Hall and Hord, 2001; Evans 1996; Levin, 2001; Bridges, 1993). Our interest here is in the model of implementation, if any, that innovative schools used to move innovative ideas about teaching and the integration of ICT into practice. As a result of the analysis, in the five schools studied, it is fair to say that a membership in the Network of Innovative Schools was a contributing factor to their success in adopting and implementing ICT for the enhancement of teaching and learning. However, other factors were at work as well and they will be explored in this study.

Innovation happens when a combination of circumstances converges at a time and place to nurture the ‘right’ conditions. Although each site is unique in many respects-- geography, size, demographics, etc.-- it is possible to discern from this study several common conditions or characteristics that are the hallmarks of successful innovation. Yet, as already indicated, the experience is never exactly the same in each school. We are not able to say that if certain conditions exist then innovation will occur, but we can be fairly confident that if certain conditions do not exist, then innovation will not be easy. By documenting the process that this sample of schools went through to adopt ICT into teaching and learning we provide some guidelines for decision-makers, policy makers and practitioners if they want to increase their chances of successful implementation. In this section, we describe underlying conditions and factors that facilitated the implementation of ICT in the schools studied.

These conditions are: *district initiative and support, parents and community involvement, external factors, school related factors, leadership and professional learning.*

### **District initiative and support**

Since just about all public schools belong to a school district one would think that it would be easy to document the impact that districts have on their member schools. However, “there have been few studies of just how school districts help build the internal capacity of schools” (Elliott, 2000, p.163). Elliott goes on to question the general lack of interest in school districts by the research community, as he claims, most research tends to focus on the school or the classroom as the unit of change. Whatever the reason, he concludes that the failure to fully appreciate the district context is a consistent pattern in educational research.

In this study we found evidence of district policies, structures and resources directed toward supporting schools in their efforts to implement ICT. The nature of district supports was generally in the form of direct financial assistance, material resources, professional expertise, leadership, release time and training. One district office representative told about an advocacy role at school board meetings on behalf of a school that was taking a leading position on ICT integration. In another case the school board supplied a new computer laboratory in support of the school’s emphasis on ICT. Although the perception is that never enough time is available, districts provided release time to teachers to learn new skills in technology. Release time is an expensive item, as often a replacement teacher has to be called in to take over the regular teacher’s school-based duties.

Each of the districts had technical and professional staff that worked directly and indirectly with teachers to develop programs, plan in-service, initiate projects, and supply training. District technology teams provided specialized functions that impacted directly on schools’ ability to deliver programs using technology. Typically those teams were drawn, in part, from school staffs and included people with technical skills and others with program knowledge. These district teams were able to provide support and advice for the school based teams and, to some degree, they were able to help the district achieve a certain degree of technology coherence between schools.

In the innovative schools that were included in this study there was evidence that districts were directly involved in the school development/improvement process and that this often meant that there were specific goals for the use and integration of ICT. The innovative schools in districts where this type of plan was in place were much more aware of and appreciative of district level interventions. For example, in the Yukon the district had implemented a school improvement plan that all schools were expected to follow. One of the teachers in one of the innovative schools explained how the district vision had impacted her school and the integration of ICT.

Every school goes through the YSIP [Yukon School Improvement Process] once every five years . . . . The school has to identify priorities and design a plan to deal with the issues. Schools have to come up with four workable goals . . . goals are reassessed each year and they may change. Technology integration is a goal for our school and when we do our long-term plan we have to indicate how we will utilize technology.

In this study we found evidence to support the notion that if there is a district wide plan (vision) and adequate resources for schools, district support can provide the leverage to get schools over the “tipping point” when it comes to implementing innovative programs related to ICT. Also, we know from experience and research (Dibbon, 2002 & 2003; Fullan, 2001; Elliott, 2000; Schlechty, 1997; Louis, Kruse & Raywid, 1996) that individual teachers and single schools can bring about innovation and change. We also know that many of these innovative schools and classrooms remain isolated pockets of innovation and have very little impact on system wide change (Elmore, 1995). Taking these innovations to scale (Elmore, 1995) so that they diffuse throughout the entire organization and result in system wide change is a huge challenge, and Fullan (2001) claims that it is unlikely to happen without the support of district administration. A lack of tangible district support may indeed be one of the reasons why the overall integration of ICT into teaching and learning has been a slow process.

## **Parents and Community Involvement**

The role of the community in making the school vital is just as important as the role of the school itself. For in a community where schools are looked upon as isolated institutions, as a necessary convention, the school will remain so in spite of the most skilful methods of teaching (Dewey and Dewey, 1962, p.128).

Increasingly, educators are beginning to see the interconnections that exist between the school and its community. The business community has long understood the benefits to creating strategic alliances with other organizations, recognizing that partners can bring specific skills and expertise to the enterprise, offer a different perspective on issues, increase available resources, serve as a source of support in difficult times and help to achieve mutual goals. When a community and a school work collaboratively to improve a school there is no reason why the partnership cannot produce the same benefits for schools. Lately, many researchers and authors (e.g., Fullan, 2001 & 1997; Dufour & Eaker, 1998; Schlechty, 1997; Bruebacher, Case & Reagan, 1994; Elliott, 2000) view closer and more extensive relationships between districts, schools and their communities as the central pillar of many school improvement initiatives and we found evidence to support this in our study.

At the Elementary School included in this study, parents and other community members were invited to help enrich the school curriculum by participating in the many after school enrichment programs. About one third of the parents have taken advantage of after school reading and music programs that enabled them to collaborate with each other, and the staff. One teacher viewed this collaboration as critical to student achievement as he noted, "having parents, teachers and students work as partners is a prerequisite for improving student achievement." This involves more than just a superficial sharing of information; it involves educators and community members strategically working together, to improve educational opportunities for children.

In situations where this was the norm, implementation of ICT was proceeding smoothly as teachers and parents formed a strong supportive community and they saw the benefits for students as obvious. These relationships created a synergy that facilitated the implementation process; but as Fullan (2001) acknowledges, "it is very difficult given the uniqueness of communities, to generalize about their role . . . vis-à-vis the implementation of an innovation" (p.82).

To create system wide change and to facilitate the diffusion of innovative teaching and the use of ICT there is no doubt that there is considerable leverage to be gained by building strong coalitions of parents, teachers, students, districts, community organizations and partners from the business community. When educators make a systematic effort to link the school with these communities they are building a support system for both enhanced student achievement and an effective learning community. But, these forms of involvement do not happen by accident or even invitation. They happen by "explicit strategic intervention" (Fullan 1997, p, 42-43). The initiatives taking place in these schools are examples of such a strategic intervention.

## **External Factors**

Another set of factors that influences implementation places the school in the context of the broader society (Fullan 2001). In Canada this can mean their relationships with the offices of the department or ministries of education in most provinces, other governmental organizations and faculties of education. In this report, I will refer specifically to the impact that the Network of Innovative Schools program has had on creating a culture of innovation that has resulted in the adoption and use of ICT, in the five schools that were part of this study.

There is no doubt that the NIS program has added momentum to a culture of technological innovation that existed in the schools prior to membership and has had a positive impact on the ability of member schools to implement innovative uses of ICT into their school curriculum. Ninety percent of the teachers in this study agreed that being a member of NIS facilitated initiatives in ICT and just over 80 percent indicated that their

students regularly use technology to do their school work, while 84 percent indicated that using technology as a teaching/learning tool enabled them to be more effective in their teaching. These teachers and students were engaged in all sorts of activities ranging from web page construction, doing paperless assignments, collaborating online with other students, using digital video, using software to help with reading, and collecting real time data in science classes.

Membership in the NIS has increased the capacity of the teachers in the member schools to integrate ICT into teaching and learning activities primarily by providing: (1) access to resources (financial, technological and human), (2) access to state-of-the art professional development and (3) a boost in the confidence and self esteem of teachers.

**(1) Access to Resources:** Membership in the NIS has provided schools with a degree of financial independence that most public schools in Canada do not enjoy. Members in the NIS schools have access to \$30,000 dollars (3 yearly grants of \$10,000) that they can spend as they see fit as long as it enhances the implementation of ICT in the school community. Almost as important as the financial grant itself is the independence that accompanies the award. This independence provides schools with the autonomy to make their own decisions as to how the resources can be best utilized in their building. And we know from research that change initiatives must be customized to the local school if there is to be any chance for school-wide implementation.

Many of the schools in the Network have chosen to use their financial resources to equip their building and classrooms with modern state-of-the-art technology (e.g., networks, wireless networks, computers, digital cameras). The acquisition of modern computer and communications technology equipment alone, doesn't guarantee the integration of ICT into the teaching and learning environment, but one can be sure that without the proper tools for teachers, ICT integration will not occur. In these schools over 85 percent of teachers indicated that they had adequate access to computer technology and that this access has increased the capacity for teachers and students alike to utilize ICT. Teachers were appreciative of the increased access to the technology and responded by increasing their use of ICT in the classroom. Many of the teachers indicated that this was because the equipment was operational and reliable. As one teacher claimed, "If you go to the lab and the equipment doesn't work you're not likely to go back there soon".

If access to the technology was an empowering factor then it was access to the human resources to help with the implementation of ICT initiatives that was the real enabler. Leaders in these schools were cognizant that they had to invest in the human resource development of their teachers and many were able to allocate a portion of their funding to acquire technology support in the form of part-time teachers or by hiring substitute teachers while regular teachers were doing professional development. In two of these schools a teacher had a portion of his or her teaching assignment dedicated to coaching and mentoring teachers on the integration of ICT. Teachers were adamant that this type of help was critical for successful and school-wide implementation. Many of the teachers claimed that they were able to acquire the skills and confidence to use the technology in the classroom as a result of working directly with the resource person or by attending in-school training sessions that had been arranged by him or her. One of the resource teachers claimed:

We do have a lot of good things in place here at . . . we do a lot of inservicing informally in-house. I work collaboratively with some teachers when they are in class and others drop by after school and we work on things or they might need to know how to do something. I usually help them out and they are on their way. The other important thing I do is to keep the technology working. If you try to do this [show teacher how to use the technology] and you don't have equipment that works, then it is dead in the water.

**(2) Access to state-of-the-art professional development:** School administrators recognized that proper professional development for teachers was critical to the implementation of ICT initiatives in their school and some had allocated some portion of their NIS resources to professional development. Many approaches were being used and these included, on the job coaching, in-house workshops, attending local conferences, returning



to university, providing teachers with release time to visit other schools and classrooms, and attending national conferences.

All of the administrators and many of the teachers indicated that the annual NIS conference was invaluable because it provided exposure to state-of-the-art research. Also, having the opportunity to interact with and discuss the potential of these new ideas with other NIS members was a powerful learning experience and that the benefits were easily transferred back to their school.

**(3) Increased Confidence and Self-esteem:** To facilitate the diffusion of new ideas about teaching and learning and the use of ICT across the curriculum it is important to have a strong external standard for innovative teaching practice (Elmore, 1995). Membership in the NIS has provided this standard for NIS schools. As a result of meeting this standard, teachers (over 84%) reported high levels of confidence in the use of ICT for teaching and learning and most of the people interviewed indicated that it was a boost to the reputation of the school in the community.

We couldn't have done it [integrate technology into the teaching and learning process] without the support of NIS. A sense of pride is felt by students and teachers – it's on our home page and gets communicated regularly through things like newsletters. These sorts of programs help to overcome some of the disadvantages associated with geographical isolation and marginalization.

One of the district office representatives saw the following advantages for the school in his district:

They have already moved their technology plan forward by years. This was a motivator for the staff. They could see the progress in short periods of time. What they felt would take four to five years was happening in twelve months. There was a sense of pride amongst the staff as a result of the award.

The NIS program provides evidence of at least one externally funded program that had a direct impact on the ICT implementation process. By moving beyond a series of episodic events and developing professional relationships (Fullan 2001) with each other, the funding agency and the schools were able to work cooperatively, over time, to ensure that implementation was a well-planned process and not a series of single events.

### **School Related Factors**

In this section, we report on the conditions, prevailing in schools, which appear to facilitate the implementation process. Starting with the work of Fullan (2001) and Leithwood, Jantzi and Steinbach (2000) and my own work on professional learning (Dibbon 1999 & 2000) this study associated such conditions with the schools' culture, vision, structure, decision making, strategies and resources that facilitate leadership and professional learning.

#### ***Collaborative School Cultures:***

Culture is the underground stream of norms, values, beliefs, traditions and rituals that has built up over time as people work together, solve problems and confront challenges. This set of informal expectations and values shapes how people think, feel and act in schools (Deal and Peterson, 1998, p. 28).

At the heart of technological innovation in these schools is a pervasive belief among teachers in what they are doing – not only do most of these teachers know what they are doing, they are also keenly aware of why they are doing it. Teachers in each of the case studies frequently identified specifics of their school's culture that facilitated the implementation process. These teachers described their schools as being collaborative and collegial although at the secondary school level there was some evidence that school structures encouraged teachers to work somewhat in isolation. Over 85 percent of the participants in this study indicated that they shared a similar set of beliefs and attitudes related to teaching and learning as their colleagues. Norms of mutual

support among teachers, respect for colleagues' ideas and a willingness and openness to take risks and try new ideas were aspects of the culture that teachers identified as facilitative of the integration of ICT.

***Flattened Organizational Structure:*** The form or structure of many schools prevents them from ever becoming an innovative school (Dibbon, 1999); this was not the case in the schools studied. In these schools the organizational structure was flattened to allow for the necessary free, fast and unimpeded flow of knowledge that is essential for innovation. There was strong evidence of individuals and groups having significant and meaningful input into decision-making. The survey revealed that 94% of respondents agreed that they take leadership responsibility for various functions in the school. For example, a technology team was in place in some schools and these individuals gave direction to and support for ICT initiatives taking responsibility for determining needs, recommending purchases, arranging for training and forming a liaison with district offices and other schools. There was also evidence that the structure facilitated teams and groups of teachers working together on teaching and learning initiatives and 70 percent of the teachers indicated that they sometimes work collaboratively across grade levels.

For the most part, the school structures that had the most impact on the implementation of ICT initiatives were those that allowed for greater participation in the decision-making process. This participation was not restricted only to teachers as in some instances it was shared with other stakeholder groups. For example, because principals were keen to seek advice from their school council members it was obvious that parents had a voice in the decision making process, they were also committed to keeping them informed on what was happening in the school. This updating occurred through regular meetings, publications on the school web site and newsletters.

***A Yearly Innovation Plan:*** A requirement of membership in the Network was that schools had to produce a yearly innovation plan where they outlined how their school was going to integrate technology into their program. Each of these schools had developed their plan and was working on the implementation process. In each of these schools innovation was intertwined with their school improvement plans. This is how the process unfolded in one of the schools:

Every school goes through the [School Improvement] process once every five years. . . . From that, the school has to identify priorities and design a plan to deal with them. Schools have to come up with four workable goals, they are reassessed each year and they may change. Technology is a goal for our school and when we do our long-term plan we have to indicate how we will utilize technology. . . . A lot of our staff has been here for a long time and there is not a lot of turnover so the vision can remain constant.

***Ongoing Research:*** Each of the schools was actively engaged in some form of research that related to their innovation plan. For example, two of the schools were researching the impact that wireless networking would have in their schools and another school had partnered with a faculty of education and they were collaborating to investigate the impact and the effect of the school's digital music program on students, teachers and parents.

***Commitment to Professional Development:*** Generally speaking the more opportunities that exist for learning, the more learning occurs and the more innovative teachers are likely to be. Each of the five schools had in place, comprehensive professional development plans that were aimed at providing teachers with ongoing ICT support and up-to-date professional development. Many of these PD sessions focused on introducing teachers to new technologies and providing support for those who were ready to integrate these into their teaching. Experts and specialists from both inside and outside the organization were called upon to deliver these sessions.

***Networking and Collaborative Learning:***

We have engaged in on-line conferencing within the school and with other NIS schools. As well, we established through NIS, contacts with a special needs institution in Nova Scotia via on-line conferencing. . . . The purpose of this connection is to facilitate the sharing of knowledge,

equipment and research dealing with special needs students. We established another integrated technology connection with a third elementary school.

Each of these schools had used the resources of the Network (NIS) to develop some initial relationships with educators in other schools. While there were many plans for this strategy there was not a lot of evidence that this type of networking was having a powerful influence on what was happening in the schools. But, as we know, developing relationships take a long time; it is highly likely that these schools have laid the necessary foundation for more substantive online collaboration in the future.

***Communicating the Impact of ICT:*** These schools use a variety of methods to broadcast the impact of the innovations to their constituents. Each of these schools had developed a sophisticated web site that was used to communicate with their parents, students and other stakeholder groups.

***Providing Access to Technology:*** Providing equipment exclusively for teachers' use is a particularly high leverage move because it provides a virtual playground for teachers to experiment with the technology in a risk free environment. In these innovative schools providing teachers with access to the technology was a top priority for the school administrators. In schools where that was not possible teachers had access to a network of resources that they could access from anywhere in the school building, and in some schools they had access to a wireless network through portable computers.

***Staffing Policies:*** In these innovative schools there was a conscious decision by school administrators to recruit and hire new teachers who were willing to learn and integrate technology into their teaching. In one of the schools, there was a clearly articulated expectation that all teachers would share in the teaching of an introductory technology course that was provided for all junior high students.

## **Leadership**

All major research on innovation and school effectiveness shows that the principal strongly influences the likelihood of change, but it also indicates that most principals do not play instructional or change leadership roles. (Fullan, 2001, p. 82)

In this study, the role most often played by principals was that of active supporter, providing the necessary support for the teachers to make things happen. These principals were not highly skilled in the use of technology; however, they were instrumental in empowering and enabling other informal leaders (teachers) so that they could provide leadership for many of the change initiatives that were ongoing. In the integration of ICT, the influence of the *teacher leader* was much stronger than *principal leadership*, and reflected many of the aspects of transformational school leadership associated with successful school leaders (Leithwood, Jantzi & Steinbach, 2000). In the smaller schools it was more likely that the teacher leader was a single individual (at least at the beginning of the learning cycle) whereas in the larger schools it was more likely that more than one teacher provided the leadership for innovation.

The teacher leaders tended to be highly skilled in the use and application of technology and they were acknowledged as being the vision builders when it came to the innovative use of ICT in the school. They developed trusting relationships with their colleagues, supported other teachers' work, willingly coached and mentored them in the curricular use of technology and modeled the integration of technology in their own classes – a practice highly valued by the teachers in these schools.

## **Professional Learning**

How individuals learn is a well-researched topic that extends well beyond the scope of this study. However, it is widely believed that for organizations to learn (innovate) individuals must learn. As a result, understanding how individuals learn is at the core of understanding innovation and system-wide change (Dibbon, 1999). For

Fullan (2001) this is where the new insights of cognitive and organizational scientists converge – just as the former have discovered that learners must learn in context, the latter have concluded that improvement only occurs in context (p. 267). The context in this situation means teachers learning on the job.

These innovative schools each had a strong culture of learning that provided numerous opportunities for individuals to learn new skills and knowledge that could be utilized in the integration of ICT. In these innovative schools, learning occurred as a result of carefully planned in-service and professional development sessions as well as informally, on the job. Much of the learning occurred in informal ways: in the staffroom, during lunch break or in the corridor. These types of experiences often arose out of an immediate need so the learning was very specific. Typically teachers inquired about things that were important in their work; for example, how to use the student records program, how to prepare a science project, and how to use the data projector. One teacher, when asked what experiences helped her to implement ICT into her teaching commented that it was:

. . . mostly informal ones [sessions] with other teachers. We have had different people come and show us things once in a while . . . . A lot of times I found them hard to adapt to my classroom because it is someone external to our school. They don't know our issues; they don't know our kids; they don't know our resources; they don't know our time limitations, but sitting with the staff just one-on-one or a group of us, someone may happen to say 'Oh, I really like what you did there, can you show me how you did that?' That has been the most valuable. Our sharing session last week was amazing.

Access to professional expertise was largely structured around the concept that teachers need “just in time learning.” Professional expertise resided in these schools and in some instances additional expertise was available from district offices. These schools generally took responsibility for professional learning and took steps to ensure that opportunities were provided for teachers to learn new skills. These formal learning sessions took the form of after school and evening technology skills training sessions, scheduled professional development days, presentations at staff meetings and tutorials scheduled with technology support teachers.

Collective learning at the team/group level is also important if an organization is to be a learning organization capable of generating and implementing new knowledge and ideas. In this context a team is a group of people who come together because they need each other to explore complex issues and accomplish common goals (Dibbon, 1999). In this study we did find evidence of people coming together as groups (e.g., technology teams, professional development sessions) to engage in collaborative learning (groups of individuals learning collaboratively) but there was very little evidence that these schools were engaged in any deliberate attempt to foster learning at the team level. One of the major reasons for this, is that team learning demands high quality time, and 45 minutes at the end of the school day when the cognitive energy levels for most teachers is relatively low, just isn't adequate. To engage meaningfully in team learning activities, teachers need access to blocks of time where they can do some in depth thinking, research and planning around a complex issue. To accomplish this in most schools would require a restructuring of the school schedule, however, this would be a high leverage strategy for administrators wishing to take advantage of the capacities of groups of individuals.

Collective learning also occurs at the organizational level and by definition it refers to the acquisition of new knowledge by organizational members for the purpose of changing the patterns of organizational practice. When this happens and there is a change in practice we can say that whole-school learning (in this case) has occurred and that a new idea has been widely accepted and put into practice (full implementation). With respect to the use of ICT there was significant evidence that these schools had successfully implemented the use of technology into their teaching and learning routines. However, the extent and depth of this implementation varied from site to site. In each instance, though, there was significant evidence that the majority of the teachers in the schools were positively disposed towards the use of technology for teaching and learning.

## **Conclusion**

There is no doubt that the NIS program moved the innovation agenda forward. In these schools, a culture of innovation has been established and teachers and administrators are working collectively towards the integration of ICT into teaching and learning activities. In many instances there have been fundamental changes in the ways that teachers work and students learn but the fact that some teachers still do not possess the necessary skills and confidence to integrate ICT indicates that the implementation process is not yet complete. To be clear, though, the support provided by NIS has gone a long way to extending the skills, enthusiasm and energy levels of teachers in these innovative schools. Without this level of support to help them launch their innovation initiative these schools would probably still be in the early stages of initiation.

At this stage in the change process, these schools need continued support if they are to lead the charge towards reculturing of the teaching profession. Fullan (2000) notes that there are problems associated with pre-mature assumptions surrounding implementation claiming that when support is withdrawn too early in the change process there is a danger of superficial implementation. When that happens it only takes a short period of time for people to return to their old ways of doing things and most of the earlier gains are lost.

It was acknowledged earlier that individual teachers and schools can bring about change without the support of district administration, but it was also acknowledged that in the final analysis system-wide change would probably not occur. While the NIS has focused exclusively on the school as the unit of change, one way to continue supporting school-based innovation and the integration of technology while at the same time increasing system-wide capacity is to expand the focus of NIS to include the school district. There is sufficient evidence, in this study, to show that district office administrators can have a powerful and positive impact on the integration of ICT. Also, in schools where there is a strong and coherent district plan the implementation of ICT appears to be a seamless process.

Just as district, community and other external factors had a tremendous impact on the integration of ICT in these schools, there were many school-related factors that also had an impact on the process. Creating a collaborative work culture, working in a flattened organizational structure, developing strategies related to innovation, conducting research on the initiatives, providing professional development and networking opportunities, communicating the vision, providing access to technology and staffing wisely were all factors that contributed to the success of these schools. Teachers and principals engaging in innovation need to be aware of the impact that these conditions can have on the implementation process.

There is no doubt that being a member of a national Network of schools has proven to be beneficial for each of the schools in this study. Participants from each school acknowledged that the annual NIS Conference provided numerous opportunities for intellectual stimulation as well as the opportunity to network with other innovative teachers and administrators from all over the country. While there was significant evidence to show that members used this event to network with others, there was little evidence that being a part of a virtual NIS community facilitated collaborative learning among participants. However, this does not come as a total surprise, in fact it would be surprising if schools had reached this level of sophistication in such a short period of time. It is very likely, however, that as the capacity of the schools and the school systems continues to increase, virtual communities will begin to emerge. Finding ways to support the creation and development of such online communities should be a focus of the next generation of NIS.

In conclusion, the impact of the NIS cannot be over estimated. The innovative schools in this study are representative of places where teachers, administrators, students and parents work with the community for the implementation of positive changes to the culture of schools. They are using ICT in meaningful and imaginative ways to improve learning, and their capacity to do so increases each year. They are also contributing significantly to the advancement of the use of the Internet for the acquisition and utilization of ICT skills and its integration into the curriculum. While many of the teachers were integrating technology into their teaching there was also evidence that some teachers and their students had made the transition to working and learning in a connected classroom.

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