

## Contents

### Chapter 7: Findings: School leadership and its effect on teachers' ability to innovate

7.1. Introduction .....	345
7.2. ICTs, innovation and school leadership .....	345
7.3. School leadership and ICT management at Wilding College ..	346
7.4. ICTs, innovation and school leadership .....	347
7.4.1. Leadership perceptions of ICTs .....	348
7.4.2. Curriculum change .....	350
7.4.3. Curriculum innovation .....	354
7.4.4. Working together .....	356
7.4.5. ICTs and innovation .....	358
7.4.6. Constraints to ICT integration .....	361
7.4.7. Encouraging teachers to integrate ICTs .....	364
7.4.8. Perceptions of the future .....	366
7.4.9. Preliminary findings: school leadership .....	368
7.5. Summary of Chapter 7 .....	371

## Chapter 7

### Findings: school leadership and its effect on teachers' ability to innovate

#### 7.1 Introduction

The previous three chapters provided teacher perspectives on organisational interactions, collegial and professional interactions and ICT interactions and their influence on teachers' ability to innovate. Against the background provided in these three chapters, this chapter will now describe the findings that emerged from the analysis of the interviews with three members of the school leadership. The question that this chapter addresses is therefore:

*How do leadership interactions influence teachers' ability to innovate and to sustain innovation in practice?*

#### 7.2 ICTs, innovation and school leadership

According to the literature, the involvement of school leadership in the integration of ICTs is critical (Breuleux 2002, p.7; Otto & Albion 2002 p.1; Sharma 2005, p.53; Staples et al 2005 p.301). Alongside alignment with the curriculum and mission, school leadership is the key to integrating ICTs in a school. The school leadership needs to identify and determine how technology growth and development goals will serve curricular goals, with each intertwined in reciprocal supportive roles (Staples, Pugach & Himes 2005, p.306-307).

The school leadership also needs to understand the difference between traditional and productive use of technology and the differing implications of each. Acquisition of ICTs is fundamental, but should not be privileged over professional development; rather they should be planned for and happen simultaneously (Staples et al 2005, p.306). This point is emphasised by Staples et al (2005, p.305-306) in their call for "*a nuanced understanding of*

*what it means to provide leadership and professional development at a school site*". The beliefs that the leadership holds have a significant impact on the culture that supports the creative integration of ICTs for teaching and learning and determine the interpretation of the vision for learning through either action or inaction (Otto & Albion 2002, p.3-4). Their arguments support the contention that the resulting school culture has a greater effect on the adoption of ICTs by teachers than the influence of ICTs on educational reform.

Mandated change is conveyed and communicated by the leadership through top-down procedures, but actual implementation occurs through bottom-up innovation in day-to-day practice. In order for mandated change to succeed various conditions are required. These conditions include supportive leadership; collaborative teams rather than strongly hierarchical structures; access to resources; effective group processes and decision-making practices; a clear outline of organisational goals and objectives; mutual concern for quality; and positive support (Sharma 2005, p.54-56). Whilst resources are essential to innovation, an abundance of resources does not guarantee innovation: group processes and mutual concern are far more important.

The structures that govern the leadership and ICT leadership in particular at Wilding College will now be explained.

### **7.3 School leadership and ICT management at Wilding College**

The executive leadership team at Wilding College consists of a principal and three deputy principals. The three deputies each have responsibility for one of three areas: administration, student affairs and academic. The academic role incorporates responsibility for ICTs. An executive committee consists of the principal and the deputies together with eleven other key staff members. The academic Heads of Department, including the teacher-librarian as HOD (Resources), report to the academic deputy and the House Directors who oversee the tutor system and pastoral care of students report to the student

The effect of context on teachers' ability to innovate with information and communication technologies in secondary schools

affairs deputy. Various committees that meet 1-3 times in each of the three terms serve the partnership of schools. The partnership Technology Committee was established in 2007 and comprises the IT Director together with the academic deputy and one other representative from each of the partner schools. Any decision on new technology has first to be approved by this committee.

Given the emphasis in the literature on the importance of the leadership role in ICT integration and in innovation, three members of Wilding College's executive leadership were interviewed. They were interviewed for the following reasons:

- to provide a further perspective and one that is integral to the context
- to establish their understanding of and involvement in ICT integration at the school given the emphasis on the critical roles of leadership in the literature as outlined above
- to seek convergence between their perspectives and those of the teachers.

For ethical reasons the contributions of these three members will not be identified with any particular role due to the sample number relative to the leadership team size; instead their views will be compared and contrasted generically between each other and with those of the teachers using the notation LA, LB and LC. The findings from the analysis of the data gleaned in these three interviews follows.

#### **7.4 ICTs, innovation and school leadership**

During the data-collection phase for this study, changes were happening in the leadership structure of Wilding College. Interviews were eventually held with three people, including previous and present incumbents. Questions put to the leadership were aligned to the questions posed to the teachers but, given the nature of the different roles, were not identical. The interviews were overall less structured than the teacher interviews in that their purpose was to

The effect of context on teachers' ability to innovate with information and communication technologies in secondary schools

understand and explore the leadership perceptions of and involvement in ICT integration and innovation in the school as a whole. The interviews were therefore guided by the questions in Appendix 3.2, Leadership questionnaire. The findings will be reported in terms of themes that emerged from the analysis:

- Leadership perceptions of ICTs
- Curriculum change
- Curriculum innovation
- Working together
- ICTs and innovation
- Constraints to ICT integration
- Encouraging teachers to integrate ICTs
- Perceptions of the future

These themes will be discussed in turn in Sections 7.4.1 to 7.4.8.

#### **7.4.1 Leadership perceptions of ICTs**

ICTs are one of many competing priorities at Wilding College. The broader curriculum is based on six 'pillars': Academics, Culture, Service, Sport, Spiritual and Leadership. LB contextualises the significance of ICTs in the school in the following extracts, providing both a current and an historical perspective:

*LB65: Ja, ja ... [long pause] from the school's perspective as a whole ... big picture ... OK ... What I think we've achieved ... I think of what we've achieved as a school, I wouldn't rank ICT in the top three I don't think. I'd put ... service, inclusion, leadership, those kind of aspects as higher profile than ICTs.*

*LB69: [...] If I go back to whenever we were talking about the laptop programme. I think then, if you were to ask people about Wilding College and technology, I think we would have been right there. I seem to remember writing things in an article [...] in the mid-90's. I think it's taken a back seat to what we've done.*

\*\*\*\*\*

*LB101: I think it's an ongoing debate. I think we have had debate in the College about learning 'cause it's the big thing. You know, what's the point of this stuff if it*

The effect of context on teachers' ability to innovate with information and communication technologies in secondary schools

*doesn't enhance learning? I mean, why bother? You know ... But, there's a lot ... a long way to go, for sure. [...] I'm not sure that what happens in our classrooms today, if the learning is any better than it was five years ago. I'm not sure.*

Whether there has been an improvement in learning in classrooms is an unknown factor. How then could such an improvement be measured? As Pang, Kim & Kim ask (2001, p.1) "*Are the indicators specific enough to measure what to measure?*" This is again similar to Bronwyn's lack of a benchmark (BK2: Ch.4 Section 4.4.6, p.151) in evaluating their curriculum units. How do you measure if there is no benchmark against which to measure? A benchmark therefore needs to be established through trial and error. LB suggests that an evaluation should be run for each ICT product innovation provided in order to establish what is effective:

**LB103:** *[Pause] ... I'm not sure how you judge whether it's any better, because it's very difficult. If I go back to that black box thing that I'm often talking about these days, what actually happens in the classroom ... it's really hard to find out ... actually, actually. [...] but what actually happens in the black box intrigues me. And that's why I think our focus has been on values and beliefs. So if you believe technology can make a difference, it's going to make a difference in your classroom. If you don't, it's not, no matter what you've got, whatever hardware you've got. It's not going to make a difference. [...] I suspect that it hasn't had the impact in the classroom that we would have liked, that we would like it to have. When we look across the board and you see that a kid is doing all of these things, I think it is watered down [...] But then it's just a feeling I have, nothing ... no data to back that up, actually.*

\*\*\*\*\*

**LB147:** *[...] What would be interesting now is ... OK, so you've got this projector in the classroom, and you've got this fancy machine ... what's happened? You know, How's it changed your teaching ... from the kids' perspective? Is it any better? Or, is it just instead of the teacher drawing whatever on the board, it's now ooh, here's a picture. What's the difference? Are the kids more involved and stuff? I'd be interested.*

The beliefs that the leadership holds have a significant effect on how ICTs are integrated into the learning process (Otto & Albion 2002 p.3-4). LB advocates that belief in technology will assist teachers in integrating ICTs, but that the

assumption should not be made that any change is necessarily an improvement:

*LB55: [...] whereas what you're actually doing in the classroom might actually be worse than what you were doing before.*

It is apparent from the above views that during LB's incumbency the school has gone through a cycle of implementation of ICTs beginning with excitement at the potential of the new, then plateauing into the realisation that there is more to ICT implementation than *'the wow factor'* and now, finally recognising the need to come to terms with the improvement in student learning. In the context of the holistic school programme ICTs have found a balanced place rather than a central place. The new curriculum has provided the opportunity for an evaluation of the role of ICTs as described in the next section.

#### **7.4.2 Curriculum change**

The immensity of the new curriculum, its impact and its implications for teachers and students alike are described by LA using words that evoke strong emotions such as *'crisis point'*, *'critical'*, *'a lot of stress'* and *'gravity ... has hit home'*. LA recognises the complexity of the institution and concedes that *'something's got to give, somewhere'*. LA describes the situation in these two extracts:

*LA8: Well, we're at an interesting point because I think we're at a crisis point with the new curriculum Grade 12 coming in, in 2008. Because suddenly the gravity of this new curriculum is ... has hit home, I think, to all teachers and they ... they're clearly struggling, which is understandable, because we are, as an institution, trying to juggle a very rich programme beyond the classroom. [...] Something's got to give somewhere, because we can't keep it all afloat any more [...]. The boys are being stretched far too thin. [...] Add onto that all of the increased demands of the new curriculum – and they are increased demands. Every single subject it's more and more and more and more, not less and less. We're having to re-look very carefully now exactly how we're going to go forward and manage a holistic education programme, but still to be able to do justice to all the things that we think are important. And in the academic arena I think our first point of call is to start macro-planning which we haven't done yet as a school [...] particularly at the FET level. We*

The effect of context on teachers' ability to innovate with information and communication technologies in secondary schools

*have not macro-planned because we've kind of done lots of micro and meso and different departments are at different places, different teachers are at different places with the new curriculum.*

\*\*\*\*\*

**LA33:** *[...] And it's ... its resulting in a lot of stress in three main subject areas we've identified now through the IEB: Mathematics, Physical Science, Life Science. Those are all experiencing syllabus overload, where the new syllabus has just gone over the top with content. Instead of reducing the content, they've added a whole lot of new – exciting content, given. But what's the point of skimming over the surface of a whole lot of content when the FET is designed to drill down into depth of knowledge and understanding? So that's been the debate and the ... and the frustration is that there's been such a lot of bulk of content that you've ... you've only been able to skim over the surface of it and not really engage with the content the way we should be at FET level.*

The critical situation is ascribed to three interacting factors: an overload of content within the curricula; the fact that few teachers had attended the Assessors' course; and that curriculum planning at the macro level had not occurred. LA acknowledges the overload and resultant stress that the teachers are under, as expressed openly by Magriet (MD29 Ch. 4 Section 4.5.2, p.165). An underlying problem is that the school is lacking the inter-departmental co-operation that would allow such macro-planning, which concurs with what was found in the cases of Arthur and of Henry. LA describes the critical role of inter-departmental curriculum mapping:

**LA10:** *Yes. Ja. That curriculum mapping for me is critical ... critical ... so that we can start to identify those areas of overlap ... of overlap where we can start saying "hang on a minute, you can help me with this assessment item and I can help you". And hopefully also reduce the load then on the boys at the same time because they ... they're going to be in an increasingly difficult position. We've seen it already in the Grade 10s and 11s where they have this assessment overload and I'm not talking about the ... the traditional summative assessment stuff, because that's quite well managed as we can see now in our exam timetable. Its ... it's the formative assessment stuff where every department is just loading on more and more and more and more assessment items. Because its good and we need to be doing it, but hang on a minute, we're not looking at ... between the departments, how we can actually help one another.*



The effect of context on teachers' ability to innovate with information and communication technologies in secondary schools

From these responses it is clear that LA not only recognises the immensity of the impact of the curriculum and its effect on teachers, but also has empathy for the situation that the teachers (and the boys) are in. LA admits that the teachers are insufficiently trained in the pedagogical aspects of delivering the new curriculum. He pins his hopes on the forthcoming Assessors' course as a potential breakthrough in the impasse and hopes that more collaboration will result. He suggests curriculum mapping as a solution, but does not suggest how this process will happen. LA believes that more and more workshops will also assist:

*LA43: I think the biggest thing for me has been the realisation that before we can really launch further with this whole thing is that we've got a whole critical mass of teachers that haven't been trained properly for the new curriculum so my first priority has been to say "OK. Let's make this assessors' course happen and let's actually get everybody like-minded". Because we've ... we've got people all over the place in terms of their journey ... you know, it is a journey and the enlightened few who've seen the light and seen the road ahead and been through ... one way or another either as IEB examiners or having done the assessors course and suddenly they see "Ah, the penny's dropped. This is what it's all about". And trying to be almost lone voices in the wilderness. And as we get more and more through the system and on board we'll be able to do more and more in terms of working with staff and HOD forum and what have you and having workshops and design workshops and collaborative workshops between subjects. [...] So there's a level at which we can all work together and then at a certain level we split up. But you can't do that until ... actually the teachers have been through the assessors and seen what it's all about, seen why.*

However, although LA recognises that such pedagogical workshops are the way forward, as the findings have shown, teachers have no remaining capacity (IG336 Ch.4 Section 4.5.1.4, p.160; MD11/25 Ch.4 Section 4.5.2.1, p.163) to incorporate such workshops, which links to LA's statement that '*something's got to give*'.

The clues as to how this situation has come about are contained in this extract:

The effect of context on teachers' ability to innovate with information and communication technologies in secondary schools

*LA45: To me, this assessors' course is the beginning of the changing of the mindset. [...] [Those who have done it] keep saying "I can now understand what these people have ... have spoken about all of the time". Because once you do assessors it opens up that whole world of what we're really trying to achieve ... you know ... with it. And we've pretty much gone the route of saying "OK, here's a new outcomes based curriculum. We're ... we've always been in this "We're OK Jack mode". We've tried to fit a new curriculum over an old. It's what we've been doing. And we've done it very successfully. Why? Because we've got good teachers. And ... and they ... their classroom practice has been superb. It's been ahead of itself. So what we've said here is "Because we know we've been ahead of ourselves, we've been doing all these good practices, let's just take this new curriculum and overlay it on top of what we've already been doing". But actually that's not ... that's only a short term fix. To really do justice to what the whole new curriculum is about, you've got to pull right back, go back to the start and actually work from that level and build it up again. [...] In your design as a teacher ... you're now not a teacher, you're actually a designer. It's your most important role. You're facilitating the classroom. That's not terribly challenging. You're facilitating discussion amongst children and you're guiding and ... you're not the fount of all knowledge. You're simply managing a group and they're discovering their own learning, but where you are critical as a professional is in your design. And that's going to make or break teachers in the future. And until you understand the principles of good design, designing up from your outcomes, from your assessment standards ... if you're just sommer<sup>1</sup> designing, and trying to patch everything in ... [???] you're not doing it correctly and you'll never see the beauty and the cleverness in the new curriculum. Because it is a very clever curriculum. It's very clever. It's been well thought out. It really has. Its sound, it's very, very sound.*

The first clue is apparent in the fact that the school was satisfied that with its high level of achievement, the implications of the new curriculum were not fully understood and that the '*hubris born of success*' (Collins 2009<sup>2</sup>) or complacency occurred. Accordingly, it was assumed that the new curriculum could be overlain over the old. Bronwyn had realised that this would not work as expressed in her words in describing how she started again from scratch '*we're like first year teachers again*' (BK2/4 Ch.4 Section 4.5.1.1, p.154). These words were also echoed by Arthur (AS38 Ch.4, Section 4.5.2.3, p.173).

---

<sup>1</sup> Sommer = Afrikaans word often used colloquially in South African English to mean 'just simply'.

<sup>2</sup> Collins, J. (2008) How the mighty fall. *When the rhetoric of success* ("We're successful because we do these specific things") replaces *penetrating understanding and insight* ("We're successful because we understand why we do these specific things and under what conditions they would no longer work"), *decline will very likely follow*. This comment is taken from the synopsis of the book at <http://theleanthinker.com>. This point came up for discussion in a start-of-term workshop, August 2009.

The second clue is contained in LA's reference to learning design as a critical aspect of the new role of teachers i.e. their role is not just facilitation but to design for and scaffold the learning process, which is what Beetham and Sharpe advocate (2007, p.8) in their call for a rethink of the implications of pedagogy. The fundamental change is the paradigm shift that underlies innovative thinking about the curriculum.

LB believes that teachers are conservative and tend to fall back on what they are familiar with. On this point he concurs with Arthur (AS11b Ch.4 Section 4.5.2.1, p.164) who indicated that this is indeed what happens when teachers do not understand the requirements of the new curriculum:

*LB49: [ ] ... but maybe teachers as a whole are ... are pretty conservative ... in ... in that, so one tends to fall back on other stuff. But sure, but I think they ... they need to be shown I think ...*

There is convergence between the leadership view expressed here on the magnitude of the new curriculum and the views of the teachers expressed throughout Chapter 4. The next section explains the curriculum innovations that the leadership was aware of.

### **7.4.3 Curriculum innovation**

On arrival at the school LC's expectations of what might have been happening in both ICT integration and curriculum development exceeded what he actually encountered. He describes the school at the time as totally without innovation (LC26) and that he was '*absolutely gob-smacked with the lack of any form of educational creativity on the staff*', attributing this problem, in his opinion, to the exclusivity of the former student selection process. This confirms what Henry complained of (HN33c: Ch.4 Section 4.5.3, p.176), although the time periods are different. A further factor was the apparent lack of educational debate in the HOD forum at that time. However, LC believes that ICTs have been a huge part of developing the curriculum, beginning with the introduction of the laptop programme and the network and then continuing with the provision of a PC for each classroom.

The effect of context on teachers' ability to innovate with information and communication technologies in secondary schools

LC provides two gauges of the degree of development through which the school has progressed. The first is a measure of curriculum (LC24) and the second a measure of inclusion (LC32):

***LC24:** ...and in terms of curriculum. I remember my first ever HOD meeting here where the curriculum here was just buying whatever the text book was that whoever thought that we should be teaching and everyone was just following that textbook. There was no sense of having to create your own ... curriculum.*

***LC32:** They were all just doing ... more or less ... and, you see, the really clever kids ... that's why I virtually understood what had happened. Because, they were choosing the kids, 80 from a 1,000 that would come into Grade 8 and the kids were really clever. So you could get passable results without doing anything with them. They just used to do quite well.*

LA was not aware of any particular innovations that had resulted from the implementation of the new curriculum. There was 'nothing that stands out particularly' (LA21). Instead he was aware of small incremental steps or a change of emphasis, described as follows:

***LA21:** Nothing that stands out particularly. You know there, there a number of sort of, smaller things. I don't know if I'd even call them innovations ... trying a few odds and ends differently, but nothing major in terms of what we haven't done before. Maybe a shift in emphasis and balance ... but nothing new, per se, that's come, you know, brand new, that we've never done before. We've maybe done something before, but not, you know, spent a lot of time on it. And now, maybe it's strengthened and we're doing a lot more of it. [...] values arena, is quite a different place because its been strengthened tremendously to be on a par with knowledge and theory, whereas before, it was theory and you did a little bit of prac to back up the theory.*

The question that arises here is, if innovations are occurring, how are they being communicated either upwards or laterally between departments in order to share and diffuse ideas of what works and what does not. As the findings in Chapters 4-6 have shown, the teachers all provide some evidence of what they consider to be innovations in their practice but, in this instance, the leadership was either unaware of them, did not consider the innovations of significance or possibly they did not come to mind at the time.

Diffusing information about teacher innovation is essential if there is to be wider benefit, therefore how teachers work together needs to be understood. The next section explains the leadership perceptions of how teachers work together.

#### **7.4.4 Working together**

According to LA there has been co-operation within large departments where each teacher has taken on responsibility for a particular grade or section and there has also been more co-operation than previously within the clusters. LA believes that the Cluster Groups, especially the active ones, play a role in alerting teachers to new innovations, which has been significant in his own subject area. LA is aware that subject-specific email networks, the IEB and the national assessment body have also contributed to the dissemination of ideas.

In referring to internal team-work, LA is describing essentially the module system of load sharing that the larger departments use, as referred to by almost all teachers interviewed:

*LA27: I've observed different departments working differently and being in different places. But, in terms of broaching the new curriculum, the teamwork and not only within the team of teachers here at the school, but within our Cluster Group as well ... so I've seen cluster groups operating more effectively ... where it's not only the Wilding teachers who are saying "Hang on a minute, we're all at sixes and sevens with this new thing, we try to help one another, but actually, lets go beyond the schools and actually start working with teachers within our Cluster because this ones got a worksheet, this ones got an idea that's worked". And so they have worked more collaboratively.*

*LA29: And I think the key has been within bigger departments where different teachers have taken on different grades and been responsible for a grade as the innovator of that ... for that grade. [...] [T]hey've been the person driving the development within that grade. So last year Grade 10 was brand new, the first new Grade 10. This year it's been Grade 11, but that doesn't mean that Grade 10 was packed away. So whoever was doing last's years Grade 10 had to revisit it and evaluate what worked well and what didn't and fix it up and get better. Because it's*

The effect of context on teachers' ability to innovate with information and communication technologies in secondary schools

*not a quick fix, you know. We're going to be hammering away at this for the next five, six years ... minimum before we're quite comfortable with it. Ja. And as we become comfortable don't forget the state keeps pulling the rug out from under our feet and saying "Well, we've had a rethink so ... we've changed again".*

Two levels of co-operation are described in the above extract. The first is intra-departmental and the second is at Cluster Group level. HODs alone attend the Cluster meetings. There is no evidence of inter-departmental co-operation at teacher level other than what was described in Chapter 5 (AS119 Section 5.6.2, p.228) and both of these initiatives failed albeit for different reasons. The question that arises is how teachers understand each other's curriculum in order to be able to initiate a sharing process<sup>3</sup>.

At the end of LA27 he refers to teachers working '*more collaboratively*'. The level of collaboration referred to here appears to consist of sharing resources but not true collaboration in terms of a community of practice (Wenger 2008, p.2) that would allow a cross-departmental free-flow of ideas between individuals.

LA refers also to the evaluation that is necessary for each new unit of work in order for the unit developer to understand what worked well. However, as indicated in Chapter 4, teachers lack a benchmark (BK2/4: Ch.4 Section 4.5.1.1, p.154) against which to evaluate and lacking time, an intended evaluation does not always proceed as planned (AS 28/30 and TL62: Ch.5 Section 5.6.1, p.224, 225). If evaluation occurs it is after the learning event; relies on 'gut-feel' or 'ad hoc' rather than an empirical process; and is not secured within a systematic learning design process. Having such measures in place might assist in making collaboration become more effective.

The next section will describe leadership perceptions of ICTs in the context of innovation at the school.

---

<sup>3</sup> An example of the paucity of inter-departmental understanding is evidenced in a recent informal conversation with Richard. I referred to a teacher in another department. Richard had no idea who I was referring to. While this is very likely to be an exception, not everyone has the chance to work across departments as I do in my role, which made me realise the uniqueness of my situation. It cannot be assumed that each teacher knows another well enough to be able to sit down and work with them without having some form of established relationship.

#### **7.4.5 ICTs and innovation**

Developments in ICT innovation are described by the leadership in terms of the ICTs themselves, but not in terms of their innovative use (LB41). The improvements in service include the number of labs and computers (LA105/106), the speed of the network (LA105/106) and the original laptop programme for teachers (LB29). The *Pencil Box* administration system (MD 156: Ch.6 Section 6.4.2.2, p.291) has been upgraded to align reporting to new ways of assessment (LC 106). Specialised software has been purchased for certain departments e.g. graphing packages for Mathematics (LC74). Developments also include later improvements such as the introduction of the first electronic whiteboard and a tablet laptop (LB29).

However, there is little evidence of supporting teachers in the innovative use of ICTs other than providing the tools as innovations in themselves. LA responded with the following examples which relate to software. His view concurs with teacher-mentioned uses, but still does not refer to the innovative use of the ICTs in the learning process or what teachers are doing differently with ICTs:

*LA108: I see some departments using quite specific software, like the Accounting stuff, the QuickBooks stuff that we're trying ... that we're having such trouble with now, the Multi-media Science in the sciences certainly. It was hardly used when I arrived here and it was the very beginning, the very first programme and every ... you know, they've bought more and more sophisticated stuff.*

A further example provided is the research tasks that students undertake and the difficulties, such as plagiarism that arise with that type of use, which concurs with what Thabo complained of (TL167/169 Ch.6 Section 6.4.2.3, p. 294):

*LA112: I think certainly the way that they're doing their research now on the Internet particularly has got better and better. Because I know, that when ... when I came here it was just a sort of ... quite a loose open thing. "Ja, if you want to go onto a couple of websites and you know". Now I've seen departments actually, when they give a task actually list. "Go ... try these websites". You know, they've actually focused in on a particular few that they know will help them with a particular task and*

The effect of context on teachers' ability to innovate with information and communication technologies in secondary schools

*what have you. It's not this loose general thing "Oh, and go onto the World Wide Web". You know. That, I think is, in terms of Internet-based research has been a lot better. But, of course, now we're grappling with all of the difficulties with the plagiarism of the Internet based research and what have you. We're trying to get our heads around that with various strategies, because that has been a ... become a huge thing ... a huge, huge thing. So I think that's our challenge with ... with what the boys are doing now.*

Here again, access to the Internet is the product innovation. The learning process, while there has been some improvements in approach, is not described as a scaffolded process that ensures understanding which is the intention of the anti-plagiarism policy (Appendix 6.1).

LB concedes that there is tension between the ICT hardware and its use. The impact on the educational process has been less than anticipated and instead, the focus has been on getting the hardware right:

**LB35:** *OK. I think we've struggled with that. I would say if you go back to the laptop programme: that was our high point in terms of teacher usage of technology in terms of staff development ...*

**LB41:** *[...]... but in terms of the impact it has on the educational process – which I guess is where we ... what we've got to get to here ... I think we've still got a long way to go in terms of how we use the stuff that's available to impact on the learning of children, rather than seeing it as just a demo in the classroom or seeing it as a computer room so you go to the computer room and take your class there and do stuff. I don't think it's really had the impact I would like it to have on the learning of the children ... would be my take. I mean, its quite complicated ... I think ... in terms of how one best uses technology to improve learning and we've been a bit hindered by the old curriculum so the new curriculum has lots of opportunity ...whether we've got the teachers who can do that is interesting. [...]*

**LB43:** *OK. I think there's always a tension between the hardware side and the use of it. I know that maybe [we've] focused too much on the hardware, but trying to get that right has been a priority.*



The effect of context on teachers' ability to innovate with information and communication technologies in secondary schools

LA also concedes that there is scope for more generative use of ICTs by students, but the teachers' ability to implement creative ideas in this respect is constrained by the overload that the new curriculum has brought:

**MR121:** [...] but we're not actually looking at a more creative level of work yet? From your observation?

**LA122:** I think there's lots of scope ... scope for that, but I don't see it. I don't see it. I think we're also in a ... at a threshold where there's lots ... I'm aware of bubbling under the surface waiting to break free ... lots of ideas and excitement from different quarters, but I'm ... I haven't seen the output yet.

**MR123:** What do you think holds that back?

**LA124:** A combination of things. Um ... teacher fatigue ... just where the teachers are just keeping their head above water with this new curriculum and the planning and the ... what have you. They're half getting into all of these exciting areas ... and then hitting their heads against the wall and just finding that there are barriers to them moving forward with ... with these things and so there's not enough energy to go around. They're so exhausted with trying to keep up with the new curriculum that the bit of energy they've got to put into that and then they hit a barrier and it just kills it straight away. So, I think ... I think teachers right now are stretched to the limit so that creative energy is ebbing at a bit of a low as they try to cope with implementing the new syllabus. They're just surviving that.

A 'Catch-22'<sup>4</sup> situation arises here in that teachers need the space and time to develop creative ideas in order to be able to implement the new curriculum. However, even though they have the tools at their disposal, they are unable to find that time. Instead, they are bound into the rut of traditional ways while they try and implement the new curriculum as a single entity. The leadership acknowledges the situation, but as yet a solution to the problem is not forthcoming.

LB gets to the heart of the matter in this extract, encapsulating perfectly the conundrum in the intertwining of ICTs and the learning process:

---

<sup>4</sup> A "Catch 22 situation" is one in which: no matter which way you go, there is an undesired result or outcome ([www.answerbag.com](http://www.answerbag.com)). The expression originates in the 1961 book of the same title: Heller, J. (1961) Catch-22. New York: Simon & Schuster

## The effect of context on teachers' ability to innovate with information and communication technologies in secondary schools

**MR46:** *And what do you think the challenge is there? Is the challenge the technology or is the challenge really changing the curriculum?*

**LB47:** *I think its both. I think ... before ... you've got to know what the technology can do. But you've got to have a good understanding of the curriculum to know how you can best use the technology once you know what the technology can do. So, I'm not convinced that at this stage we know enough about what the technology can do and because the curriculum's changing, its kind of hard to know how best to use the technology.*

Despite the extensive ICT infrastructure, the school is still unsure of what the technology can do. The question here is how the school discovers what the technology can do in terms of what the curriculum requires.

Apart from the constraints on innovation identified in this section, there are further constraints that the leadership is aware of. These will now be described.

### **7.4.6 Constraints to ICT integration**

LC outlines the development of the ICT infrastructure at Wilding and the political battles that ensued from development of the partnership (LC96). He identifies cost and technical back-up as ongoing issues (*'are always issues'*) while *'the rest is just like any learning: its people stuff, its relationship stuff'* (LC96).

Whilst there are good working relationships between the network management and the academic staff, there are unresolved and fundamental differences between them in outlook and in the decision making processes that affect classroom practice. LB sums up the problem and provides an example:

**LB121/123:** *They still don't really understand what we're talking about in terms of learning. [...] We want the learning to work. They want the machines to work.*

**LB125/127:** *[I've] got XP, but nobody else ... I don't know why I got it, but anyway ... there has to be a hierarchy in the network [peoples] ideas. So the [principal] get[s] in*

## The effect of context on teachers' ability to innovate with information and communication technologies in secondary schools

*first and then the deputies and then the guys who really use it the most don't get it at all. . . Whereas teachers ... we know the guy in the black box is the one who's done everything, that's the person who needs to get the stuff. We need to get it to him ... use it on whatever they want, we need to get it to him and ... and it's one of those ironies that we ... we struggle with every time we meet. [...] And it's a relationship thing. We've worked hard on it, hey? [...] And that's the tension that's always going to be there. So a network guy will not understand it seems to me. He doesn't even believe that! He doesn't believe that's the way, actually.*

The options available to schools are to choose between technological expertise in running the ICT infrastructure and educational expertise in supporting the pedagogical aspects of ICT integration or, alternatively to find the balance. It would appear from the above, that this balance had not yet been established at the time of the interviews. Currently, whilst there have been improvements brought about through the recently-formed partnership ICT Committee, fundamental differences still remain.

There are specific systemic limitations in the provision of ICTs at Wilding College. LA identifies these in the following extract:

**LA129:** *[...] You know, the biggest fear is the network security: that there's going to be hacking in ... stuffs going to go down ... you know. It's going to get lost. It's going to be abused. It's going to get hacked into. And of course that's a very real threat because you know, all the time the network is exposed to that and so very often its quite difficult to bring in something new because it doesn't quite configure with the way that our system's firewall is set up to prevent the hacking. It doesn't allow us then a lot of freedom to experiment with new stuff in that way. So, I think it's that give-and-take and that yo-yoing backwards and forwards. [...] So we've got a huge problem there.*

**MR130:** *So, in fact what we're looking at is possibly the need for creative ... creative or innovative solutions to those sorts of problems.*

**LA131:** *Ja. And they're quite difficult ones to grapple with. Because, I mean ... sometimes it means that perhaps some of the machines need to stand alone, come out of the network, then that's logistically a problem, because you take systems out of the network ... it means that centrally you can't then control them anymore from the ... you know, centralised network administration. So you've got a group of machines*

## The effect of context on teachers' ability to innovate with information and communication technologies in secondary schools

*sitting somewhere [...] where you have to physically send somebody when there's a problem because you can't, from the network administration system, track and log and re ... because you can do all the re-ghosting and everything from a central location – apparently – because our system is sophisticated. But, when you pull them out of a networked environment, it puts a whole new dimension on it.*

**MR132:** *Is it too sophisticated for our needs?*

**LA135:** *Well, it's hugely sophisticated because ... that's ... that's what, I think, allows it to be run by a relatively small department [...] is ... is its sophistication because its techno ... you know, it is sophisticated it means that a small group can run it quite efficiently. You've basically got one administrator and one technician who's running out and doing stuff when ... when you can't do it from the desktop.*

The evidence here suggests that while the network is run with remarkable efficiency given its size and use, the result is that it limits the learning purposes which it is designed to serve. It is accepted that security is a real risk, but there is as much danger in students hacking out to use the Internet as they need to for curriculum purposes, as there is a danger of outsiders hacking in for arbitrary reasons. Richard had raised the point of these limitations on access (RL95 Ch 4. p.48) in describing the ensuing problems as *'like watching paint dry'*. My observations in the Library have confirmed this. The challenge is to find the balance and to work from customised need rather than from a generic network perspective.

Cost was a factor in the decision to end the laptop programme in the late 1990s. Whilst the cost of the original set of laptops for staff was carried by parents' association funding, the programme was scrapped because it was unviable in terms of the costs to students at that time. Funding remains a constraining factor in providing, maintaining and upgrading the network and ICT infrastructure. However, consideration does not appear to have been given to the idea of less costly alternatives. The cost of ever more powerful mobile technology is decreasing and it is becoming more common to find students with Internet enabled technology in their pockets<sup>5</sup>.

---

<sup>5</sup> I have observed students in the Library by-passing the network to make use of their own more efficient mobile technology.

Although there is consistent support for the ICT infrastructure itself, the leaders were questioned on how they supported or encouraged teachers to make use of it.

#### **7.4.7 Encouraging teachers to integrate ICTs**

The onus is on school leadership to support the parallel development of curricular and ICT goals. The extensive infrastructure is evidence that the ICT provision goals have been supported. The curricular goals are being accelerated with the Assessors' course. However, no evidence was forthcoming of support for teachers in achieving pedagogical goals through the use of ICTs. The *Intel Teach to the Future* course was run on a voluntary attendance basis in 2003 and attended by a number of teachers from the partnership schools. However, in 2008 it was offered again in one of the partner schools on a voluntary attendance basis. No Wilding College teachers attended this later course<sup>6</sup>. LB has run workshops in his department and for the IEB in using what he terms '*package-related software*' (LB97) to encourage the use of ICTs. He has also provided laptops for teachers in the occasional instance or specialised software for specific departments. However, besides this technological support, there is no further evidence from either leader of pedagogical support for teachers in the use of ICTs. Although a comfortable user of ICTs, LB has not capitalised on his ability beyond his own subject department in order to help teachers change their practice. He explains:

*LB89/91: I've done lots of workshops, but its more to do with examining stuff, new curriculum [...] not necessarily how one uses say, computer stuff in the new curriculum. We're still trying to get a handle on the new curriculum itself.*

In his response LC indicates that he understands the potential for using *Pencil Box* for its value-added features<sup>7</sup>, yet predicts that it will be a further decade before this value is realised:

---

<sup>6</sup> Confirmed by telephone with course facilitator July 2009

<sup>7</sup> Lewis, J. (1999) Leading the learning community – a new role for teachers. Handout from the author, 2001. In this paper Lewis describes the development of the *Schoolmate* learning management system

The effect of context on teachers' ability to innovate with information and communication technologies in secondary schools

**LC54:** *Well, right across the departments in recent years we have been trying to get the whole reporting and recording of the learning ... and we're still not even close to where we should be. That process has started and it's being done by all of them. So I would think in ten years from now, this place will be doing some extraordinary stuff in terms of how it's recording and reporting on each individual in a different way.*

LC has ensured that departments such as Music and Science have received specialised ICT equipment such as simulators, but is unsure if they are being used. He refers to it in this extract:

**LC56:** *She also bought all that software in the Science department where you could do ... any form of simulation with various physics and chemistry bits of learning in the curriculum. And I don't know if they use ... I know its here ... I know we've got it and I'm not quite sure where we are so I can't keep contact. But we have got very high-tech capacity in terms of that. [...]*

Two questions arise. If the equipment is bought and possibly not used, is it bought in response to need or as a 'nice-to-have'? Secondly, if, as LC states, he is unsure if it used, how is the use of such ICTs evaluated and reported? The question of evaluation is tricky. Prior evaluation of any ICT from a functional perspective is common sense; however, without pedagogical evaluation once implemented, it is impossible to judge the effect on student learning or to establish if the effect is even positive or negative. Pedagogical evaluation should be conducted in terms of the identified need or purpose and that need should arise from the design of the learning process, not only from the teaching process.

Although his role in ICTs is pivotal, LA admits that he is not up to date with technological developments and devolves that role:

**LA153/155:** *I don't think I'm very good in that arena to be quite honest with you. I am a bit of a dinosaur with ICT, I feel. I'm excited by new technologies and new innovations and things that are happening, but I don't think ... I think I err on the side ... I don't think I keep myself abreast of all those things [...] so I don't think I'm the best person. I know who is [laughter] ... and I think I'm good at supporting ...*

---

based on her innovative practice at Noumea School in Sydney, Australia. See <http://www.schoolmate.net.au/>. Schoolmate was introduced by me to the Wilding leadership in 2001.

Thesis submitted by Mary Elizabeth Reynolds in partial fulfilment of the requirements for the degree **365** of Philosophiae Doctor (Computer Integrated Education) in the Department of Curriculum Studies, Faculty of Education, University of Pretoria, August 2009.

The effect of context on teachers' ability to innovate with information and communication technologies in secondary schools

*LA157/159: ... but I don't think I'm the person to bring the message to the school, just because I'm ... I acknowledge that I'm not in the best position to. And I don't put myself in the best position to. [...] That's it, that's it. So, I'm not going to be the best, but I will support the best. That's how I see my role then. Not to ... to actually be out there getting all the information and the ideas, but being able to put weight behind the person who is.*

The situation that arises here is that while the ICT role within the leadership portfolio is specified, the ICT role within the teacher-librarian portfolio (i.e. the participant-researcher's role) referred to in the words "*I know who is*" (LA153) is assumed, with a consequent disjuncture between expectation and responsibility in terms of workload.

The beliefs that the leadership holds have a significant impact on the culture that supports the creative integration of ICTs for teaching and learning and determine the interpretation of the vision for learning through either action or inaction (Otto & Albion 2002, p.3-4). In the light of this statement, the leadership was asked about their vision for education.

#### **7.4.8 Perceptions of the future**

In order to establish what vision for the future that the leadership might have they were asked the broad question "What should education look like?" While LC focused on the potential of the HODs at the time, LA provided a broader view. These are their views:

*LC98/102: I think that finally it's there because there's probably even more energy in the departments. There are a lot of very exciting people in the departments and so I think it's not us against them it's just how do we co-ordinate all this? You see, again, it's not possible without IT [??] because it's too complicated. There's too much stuff. And so, without our IT we'd not be able to structure it and manage it. But we have all that, it's all in place. [...] But I think, if you look at the HODs [...] Certainly, in the group, there's enough in the group now to self-manage so I do not think ... I think they'll continue to initiate new things. [...] It's just an unbelievable bunch of innovators ... and that wasn't there, and now it is, now you can't stop it. So I'm going to be very excited to see what they do in the next 5 or 10 years.*

The effect of context on teachers' ability to innovate with information and communication technologies in secondary schools

If Wilding's HODs are an '*unbelievable bunch of innovators*', then there should be ample evidence of this. However, little evidence could be provided by the leadership as to what pedagogic innovations had occurred. The evidence of pockets of innovation, although not consistent across departments was found to exist from the teacher interviews, therefore it appears that insufficient evidence is being communicated transparently.

LA responded to the same question in the following way:

*LA172/174: Quite wild and woolly. But seriously quite wild and woolly. Not as structured as I think we're used to it, you know. Our model has been a very structured educational model and I think the way it should be looking more and more is less structured ... um ... quite fragmented in a way. On the outside it probably would appear more disorganised because of the fact we're dealing with this multi-level learning environment where we've got learners working semi-individually at different levels, different stages of their journey within the classroom ... um ... engaging in a variety of different activities within one learning environment. Um ... I think we really need to look at this whole moving from classroom to classroom in a timetabled manner. It's ... its not ... it's not going to work for us into the future. I can see that. I can see we're going to hit a crisis soon where our very structured timetable day of moving from classroom to classroom to classroom is no longer going to work ... um ... and the new curriculum almost seems to start warning us that that's not going to be [...] We're going to become in the high school more like preparatory school teachers. The group on the mat ... a group at the computers, a group up at the board with the teacher, a group working on their own in tutorials. There're going to be ... pockets of learning happening all over the place. [...] No, that excites me. That excites me a lot, it really does. Um ... It's a ... but, the transition is a very difficult transition because the model that has worked so well for so many years is so entrenched. I know that even when we just try and break free a little bit from a timetabled day to try a timetable ... whoa, it's difficult! It's difficult! And until we start making that more and more common practice we're not going to let go of this safe, timetabled, structured learning place that we're in. And yet I can see that it's ... it's not ... it's not going to be helping us in the future. Ja ...*

With these words LA concedes that the structure of the school and the needs of the learners and the curriculum are in conflict. He confirms the obstacles that were raised as '*grammar of schooling*' factors (Ch.2, Section 2.4.6, p.75) and acknowledges the necessity to address these issues.



#### **7.4.9 Summary and preliminary findings: school leadership**

The intention of this chapter has been to establish an understanding of the extent of the involvement in ICTs of the leadership; to discover if and where there is convergence between the views of the leadership on ICT integration and those of the teachers; and to provide a further perspective that is integral to the context of the school. Table 7.1 (p.355) summarises the factors raised by the leadership according to the themes and shows where there is convergence with the teachers' views. Certain factors were present in the school and others were identified by the leadership as not present (e.g. curriculum mapping). The purpose of the table is to give a summary and not an absolute measure given the complex inter-relatedness of the issues. Where individual teacher's views differed, these are indicated as such.

LB and LC provided a relatively historical perspective in that they were able to describe the position from which not only the school ICTs, but the school itself moved. This position reflected the '*hubris born of success*' (footnote 2, p.345). That there has been significant movement is evident. However, the movement appears to have been largely in the provision of ICTs as tools to enable practice rather than in the development of a changed pedagogy through the use of ICTs. This concomitant development of the pedagogical aspects has not, according to the evidence, occurred. This correlates with the findings of the teachers' views in Chapters 4 and 6.

The curriculum crisis as LA terms it is acknowledged and was due to have been addressed through the Assessors' course and macro-planning. However, although most teachers have now completed the Assessors' course, the macro-planning process has only just begun (July 2009). Design of learning processes is proposed as part of the solution.



The effect of context on teachers' ability to innovate with information and communication technologies in secondary schools

Table 7.1: Convergence between leadership and teacher roles

Factor	Present	Not present	Convergence with teacher views	Disconvergence with teacher views
<b>Leadership perceptions</b>				
importance of ICTs	X		X	
importance of ICT pedagogy benchmark	X		X	
		X	X	
<b>Curriculum Change</b>				
content overload	X		X	
assessors' course		X	?	
macro planning		X	X	
inter-departmental co-operation		X	X	
learning design		X	X	X
complacency	X			X
fall-back on familiar	X		X	
<b>Curriculum innovation</b>				
lack of teacher capacity	X		X	
need for workshops		X	X	
no history of innovation	X		X	X
inclusive practice	X		X	
incremental steps	X		X	
<b>Working together</b>				
external co-operation	X		X	X
internal co-operation	X		X	X
knowledge of each others curriculum		X	X	
<b>ICTs &amp; innovation</b>				
evaluation		X	X	
learning design process		X	X	X
<b>ICT development</b>				
connectivity	X		X	
improved access	X		X	X
improved efficiency	X		X	X
user support	X			X
research skills (students)		X	X	
application skills (students)	?		X	X
<b>Constraints</b>				
cost	X		X	
perceptual differences IT Dept	X		X	
security	X			X
<b>Encouragement to use ICTs</b>				
Intel course	X			X
Pencil Box added value	X		X	
support role	X		X	X

Whilst LC claimed that prior to the mid-1990s there was no innovation at Wilding, this is not correlated by any other view, although Arthur's evidence

The effect of context on teachers' ability to innovate with information and communication technologies in secondary schools

(AS11b: Ch.4, Section 4.5.2.1, p.164) indicated that, faced with the challenges of the new curriculum, teachers may also resort to the familiar rather than explore the new. Secondly, the fact that communication that enables diffusion of innovation is limited, may be a contributing factor. The diffusion of innovation or at least innovative ideas is premised on such communication which needs to be part of a community of practice or culture of collaborative sharing. The leadership findings show that intra-departmental communication is happening and there is sharing between clusters, but there is no apparent inter-departmental collaboration. Evaluation of innovations is raised. Evaluation should be part of any development process but there does not appear to be any model or means in place to either evaluate an innovation or share the results of the evaluation. If evaluation occurs, for whom is the evaluation intended?

The innovation that the leadership is aware of, apart from the provision of ICTs, is described as small incremental steps rather than wholesale innovation. This is consistent with Whitehurst's (2009, p.1) description of incremental change and Clarke *et al.*'s findings (2000, p.6-7).

ICT innovations specifically, from the leadership perspective, have been limited to the provision of the hardware and the occasional intra-departmental workshop. There is tension between the provision of hardware and its use. While the anti-plagiarism policy requires a scaffolded learning process, there is no evidence of this process occurring. On the other hand, the curriculum overload is recognised as a deterrent to creative use of ICTs.

The *Intel Teach-to-the Future* course was offered recently to the partnership schools on a voluntary attendance basis, but no Wilding teachers attended. Given that so few teachers have completed their assessor's portfolios and the *Intel* course also requires attendees to produce a portfolio, it may have been avoided for this reason.

The perceptual difference between the needs of the academic teachers and the technical expertise of the IT Director is acknowledged as a significant

constraint by all three leaders. This dichotomy is being addressed in part through the partnership IT Committee, but also needs to be taken up as a separate issue at leadership level.

LA's description of the future that he envisions is one that should be debated and explored as offering the release for, as he expresses it '*something's got to give*' (LA8 p.6) LA is clearly aware of the problems that the teachers face and the need to find a solution. There is convergence between the leadership perceptions of what was happening at the time of the interviews and those of the teachers. There is disconvergence between the leadership perceptions of ICTs as tools or innovations within themselves and the needs of the teachers in the classrooms. Improving lateral inter-departmental communication and collaboration opportunities as well as hierarchical communication channels would enable the diffusion of innovative ideas and support extensiveness of teacher innovation.

## **7.5 Summary of Chapter 7**

This chapter has provided the leadership perspective on teachers' ability to innovate in their classroom practice and on their ability to innovate with ICTs in particular. The chapter provided a brief overview of the literature that links leadership, ICTs and innovation. It described the school leadership and ICT management structures at Wilding College. The chapter then used the themes evident from the data analysis to describe the perceptions of the school leadership and their support for innovative use of ICTs in the school and drew preliminary conclusions. The next chapter will draw together the findings of Chapters 4 to 7 with the literature reviewed in Chapter 2 and offer conclusions to the study and recommendations.

## Contents

### Chapter 8: Discussion of findings; conclusions and recommendations

8.1. Introduction .....	373
8.2. Synoptic overview of the study .....	373
8.3. Discussion of the findings from a theoretical perspective .....	380
8.3.1. The study of complex contexts .....	381
8.3.1.1. The context of Wilding College .....	381
8.3.1.2. Complexity & the context of Wilding College .....	382
8.3.2. Innovation .....	384
8.3.3. Professional learning .....	388
8.4. Discussion of the findings from an empirical point of view .....	390
8.4.1. The effect of organisational interactions .....	389
8.4.2. The effect of collegial and professional interactions .....	394
8.4.3. The effect of ICTs on teachers' ability to innovate .....	400
8.4.3.1. From an organisational perspective .....	400
8.4.3.2. From a pedagogic perspective .....	402
8.4.3.3. From a relationship perspective .....	404
8.4.4. The effect of leadership interactions .....	405
8.5. The effect of context on teachers' ability to innovate with ICTs .....	409
8.6. Conclusions .....	411
8.7. Reflection .....	412
8.7.1. Methodological reflection .....	412
8.7.2. Scientific reflection .....	414
8.7.3. Substantive reflection .....	415
8.7.4. Personal reflection .....	416
8.8. Recommendations .....	416
8.8.1. Recommendations for policy and practice .....	417
8.8.2. Recommendations for further research .....	418
8.9. Limitations of the study .....	418
8.10. Conclusion .....	419

## Chapter 8

### Discussion of the findings; conclusions and recommendations

#### **8.1 Introduction**

This Chapter begins with a synopsis of the research presented in this study. Following the synopsis the findings that emerged in Chapters 4 to 8 will be discussed with reference to the literature reviewed in Chapter 2 and with reference to the conceptual framework that has underpinned the study. This discussion will take two viewpoints. The first viewpoint is the theoretical perspective in which the findings will be discussed in terms of theory. Thereafter, the main findings will be discussed and concluded in answer to the sub-questions and the empirical evidence gleaned in response to these questions. The Chapter will conclude with recommendations for further research and a reflection on the study.

#### **8.2 Synoptic overview of the study**

This study has described and documented the interaction between secondary school teachers and their context as they respond to multiple simultaneous changes in the school environment by innovating in their classroom practice, including innovating with information and communication technologies (ICTs). These interactions have been analysed and described in terms of three critical processes: convergence, mutuality and extensiveness.

##### **8.2.1 Chapter 1**

Chapter 1 provided a background to the study from five different perspectives that form the context of the school that is the subject of this case study. These perspectives are the educational-cultural perspective; the national policy perspective; the technology transformation perspective; the school perspective and the researcher's perspective. These perspectives were

distilled into a focus that encapsulated the research problem. The problem was identified from my personal experience as a participant-researcher at Wilding College and from calls for research into contextual factors such as those made by Breuleux (2001, p.7) and Windschitl (1998, p.28). The problem was to understand how complex contextual factors influenced teacher innovation in secondary schools and innovation with ICTs in particular. These contextual interactions were examined in terms of three critical processes: convergence, mutuality and extensiveness as defined by Sherry and Gibson (2005, p.6) which permeate the boundaries between different levels of a school system and are therefore essential to the sustainability of innovations. The research question that derived from this problem was:

*How do teachers innovate in the face of complex, simultaneous and ongoing changes and, in particular, how do they innovate with ICTs amidst such changes?*

This question was broken down into four sub-questions that were each dealt with separately in Chapters 4 to 7.

Chapter 1 also provided an overview of the scope of the study, the research methodology and the issues of trustworthiness, ethical considerations, limitations of the study and an introduction to the literature.

### **8.2.2 Chapter 2**

Chapter 2 drew together the literature from different perspectives. These perspectives were the ICT perspective, complexity perspective and the innovation perspective. The literature review was able to show the inter-relationships between these differing perspectives. Embedded in the review were complexities within the use of the terminology themselves. An understanding of these perspectives is fundamental to understanding what comprises context in a 21<sup>st</sup> Century school.

From the ICT perspective the review followed a pathway through functional and integrative practice to transformative practice borrowing from Brackett's terminology (2000, p.3). Intertwined with this perspective was the transformation perspective which relates to the top-down processes of educational reform (Glatter *et al.* 2005, p.390; Hargreaves 2000, p.54) and the bottom-up processes of changes or innovations that teachers need to make in their practice to respond to such reforms. Criteria for 21<sup>st</sup> Century student competencies (OECD 2005, p.10-15) need to be met with similar competencies on the part of teachers.

However, as Fullan indicated (1991, p.4), teachers do not resist change for the sake of it, but rather because they cannot make sense of it. The work of Tearle (2004) and others on ICT integration emphasised the focus on pedagogical factors and the need for professional learning support for teachers. Hargreaves and Goodson (2006, p.4) pointed out the complexity of secondary schools in particular and the difficulties teachers face in sustaining innovation in the face of such complexity. Scrimshaw (2003, p.93) locates ICT integration within curriculum innovation. The innovation pathway led through the work of Cros (2000) and into the diffusion of innovations (Rogers 1995; Venezky & Davis 2002) and the need to understand human interactions and the means of communication through networks (Steiner 2004) and communities of practice (Senge 1990; Wenger 1998; Sharma 2005). This pathway culminated in a review of the Israeli studies on ICTs and innovation in schools (Mioduser *et al.* 2003; Nachmias *et al.* 2004 and Tubin *et al.* 2003).

The innovation pathway provided a link to Clarke *et al.* (2000) and to Sherry and Gibson's work (2002), with Gibson having worked with both Clarke and Sherry. Clarke *et al.* opened the door to complexity theory and the complexity of organisational behaviour (Webb & Lettice c.2005, p.2); the complex processes of learning (Davis & Sumara 2005, p.458; Doolittle 2001, p.5); complexity and schools (e.g. Phelps & Hase 2002; Mehan *et al.* 2005) and complexity and ICTs (Scrimshaw 2003; Staples *et al.* (2005). The work of Sherry and Gibson (2002) provided the key to the conceptual framework



development in the form of the three critical processes, namely convergence, mutuality and extensiveness which underlie the sustainability of innovations.

The theoretical terminology that Sherry and Gibson provided differed from that of other authors. Whilst these authors derived, defined and described factors that affect innovation and ICT integration, Sherry and Gibson's concepts concerned the *interaction* between the factors (2002, p.9). The conceptual framework for the study was then built on this terminology to enable the study of contextual interactions that affect teachers' ability to innovate. The study of the particular case at Wilding College as a study of context was also indicated by the fact that almost all research on ICTs in schools had focused on primary schools, on specific subjects or on exemplary projects in secondary schools. Such studies had acknowledged that little work had been undertaken in the majority of schools, i.e. those considered as not exemplary in their use of ICTs. This research opportunity provided the angle from which to view the context of Wilding College.

### **8.2.3 Chapter 3**

The research methodology that emerged from the background to the study and the conceptual framework was described in Chapter 3. The understanding of context from a teacher's point of view involves the interaction of policy, practice, individual beliefs and relationships, the organisation and the systems that comprise the school as a complex entity. To describe this context required a methodology aligned to the complexities of human experiences that considered the teachers' world holistically (Rossman & Rallis 2003, p.9) and in which the participant's voices would come to the fore (Cohen *et al.* 2000, p.22) without discounting the researcher's voice. This duality was accounted for by the choice of a qualitative case study that reflects the epistemological and ontological assumptions of the researcher (Burrell & Morgan 1979, p.22). The chosen approach was therefore subjective-interpretivist based on a phenomenological philosophy. Such an approach accepts that differing realities exist and that assumptions of

meaning cannot be made. The intention of the study was therefore to describe or investigate the lived experience of the participants and to interpret their experiences and thereby make sense of the investigation (van Manen 1990, p.2). The construction of the study was based on the socio-constructivist learning theory in which three levels of learning operated: the organisational learning provided by the contextual study itself; the professional learning that emerges for all participants and the personal learning on the part of the researcher.

The research methodology section argued for the choice of a case study and provided details of the educational setting as the unit of analysis. The data collection, transcription and coding methods were described. The in-depth interviews were supported by observations from day-to-day experience and documented supporting evidence. Data transcription and coding methods were described and issues of validity and reliability were addressed. The limitations of the study and specific ethical issues arising from the participant-researcher perspective concluded the chapter.

#### **8.2.4 Chapter 4**

Chapter 4 provided an introduction to the findings and dealt specifically with the first research sub-question:

*How do organisational interactions influence teachers' ability to innovate and to sustain innovation in practice?*

In order to describe the relationship between innovation and context, the chapter first introduced Wilding College and the teachers, making use of pseudonyms in order to preserve anonymity. Following this description, the main themes that emerged from the data analysis were outlined. These themes were: curriculum change; inclusive practice; professional learning; the nature of the learning area; systemic factors; teacher beliefs; student beliefs and attitudes; and societal and parental factors. The sequence of interviews

was followed as the most appropriate solution to the challenge of maintaining integrity of the data in relation to their context as each individual situation was unique. Each teacher's situation could not be separated from its subject-specific background, although within subject areas differences were found.

The purpose of the study was to describe the effect of context, not to provide a model of an ideal context. The findings were therefore not aggregated into specific overall patterns. However, using the terminology of convergence enabled the illustration of the unique patterns in which differing factors interacted in each situation. Preliminary conclusions were drawn for each interview and for the chapter as a whole.

A further theme to emerge which related to the concept of mutuality was collegial and professional relationships. This theme was addressed in Chapter 5.

### **8.2.5 Chapter 5**

Chapter 5 addressed the second sub-question of the study:

*How do collegial and professional interactions influence teachers' ability to innovate and to sustain innovation in practice?*

The chapter provided an overview of the concepts of professional learning communities and formal networking structures which underlie collegial and professional relationships within schools. Thereafter the findings were described, again following the interview sequence. The findings drew on the narrative of the interviews, observations during the interviews and descriptions provided by the participants of their networking and collaborative involvement. The findings which related to mutual benefits through collaboration or sharing were illustrated using the same frameworks as for organisational interactions. Where extensiveness was found to be present, this was indicated on the

same figures. Preliminary conclusions were drawn for each interview and for the chapter as a whole.

In order to contextualise ICT interactions against the background provided in Chapters 4 and 5, these were addressed in Chapter 6.

### **8.2.6 Chapter 6**

Chapter 6 focused on interactions with ICTs in response to the third sub-question:

*How do ICTs influence teachers' ability to innovate and to sustain innovation in practice?*

The chapter provided a brief overview of the literature relating to innovation and ICTs and the complex connectedness between the two concepts. The need to focus on pedagogical goals as process innovations rather than ICTs as product innovations was emphasised. The chapter described the ICT infrastructure at Wilding College and then followed the interview sequence to explore the ICT-related interactions in teachers' experiences. The same method was used to illustrate convergent and disconvergent factors relating to ICTs as in the previous two chapters. Preliminary conclusions were drawn for each interview and for the chapter as a whole.

To provide a further perspective, three members of the school leadership team were interviewed and their views on innovation and ICT integration were reported in Chapter 7.

### **8.2.7 Chapter 7**

Chapter 7 provided a differing perspective to that of the teachers yet one that, according to the literature, is critical to successful ICT integration. Alongside alignment with the curriculum and mission, school leadership is the key to integrating ICTs in a school. The school leadership needs to identify and

determine how technology growth and development goals will serve curricular goals, with each intertwined in reciprocal supportive roles (Staples, Pugach & Himes 2005, p.306-307). This leadership perspective was obtained in order to seek convergence with the perspectives of the teachers and to understand the leadership level of involvement in the context of teacher innovation and ICT integration. Chapter 7 therefore addressed the following sub-question:

*How do leadership interactions influence teachers' ability to innovate and to sustain innovation in practice?*

In contrast to the teacher interviews, the findings of the leadership interviews were described according to the themes that emerged from the analysis. These themes were:

- Leadership perceptions of ICTs
- Curriculum change
- Curriculum innovation
- Working together
- ICTs and innovation
- Constraints to ICT integration
- Encouraging teachers to integrate ICTs
- Perceptions of the future

A summary indicating convergence and disconvergence between teacher and leadership views was provided. Preliminary conclusions were drawn for the chapter as a whole.

The findings of Chapters 4-7 will be discussed in the following two sections from a theoretical perspective and from an empirical perspective respectively.

### **8.3 Discussion of the findings from a theoretical perspective**

The study of complex contexts, by its very nature defies summarisation in that reductionism implies "*channelling the uncertainty*" of complexity (Lissack 1999, p.120-121). Rather, this discussion will first argue from the point of

theory and its applicability to the case, drawing on examples from the findings to show "*understanding of the uncertainty*" of complexity.

### **8.3.1 The study of complex contexts**

The intention of this study was not to draw a direct relationship between ICTs and contextual factors, but rather to look at the effect of contextual factors on teachers' ability to innovate, including innovating using ICTs. In order to understand this effect, the context itself and the teachers' ability to innovate needed to be explored. The context was explored through seeking evidence of three processes: convergence, mutuality and extensiveness (Sherry & Gibson 2002, p.7) which describe the interactions that enable or inhibit teacher innovation. During the data analysis phase it emerged that there was not only convergence of factors that had a positive effect on teachers' ability to innovate but also convergence of factors that had a negative effect, as illustrated in the figures that accompany Chapters 4-6. In order to differentiate between the two, the term 'disconvergence' was coined to refer to the convergence of negative factors.

#### **8.3.1.1 The context of Wilding College**

Many studies have identified contextual factors that affect teachers' ability to integrate ICTs but they do not identify the characteristics of such factors, their applied contexts, nor the relationship amongst the factors (Chen 2006, p.157; Zhao *et al.* 2002, p.484). The term 'context' is used loosely in the literature and I have avoided defining the term up until this point. The argument for this is that context is not a fixed entity, but a set of circumstances that occur in a particular place at a particular time and therefore the meaning of 'context' in this case needed to emerge from the study itself. To study the effects of context is to understand the circumstances of a particular place and time relative to a particular perspective. The temporal nature of circumstances is acknowledged: circumstances are not constant but changing and context is therefore not a constant but is temporal.

The study of Wilding College has found that the term 'context' has referred to circumstances that incorporate a range of factors from personal history and experience inside and outside of teaching, through subject-related factors to roles, relationships and competencies and to the ecology of the system within its societal and cultural domain. Each teacher therefore interacts within a unique context from their perspective. During the period in which this study has taken place there have been various changes in circumstances relating to, *inter alia*, curriculum and staff turnover. The further curriculum change involved Life Sciences and in terms of staff, four participating teachers and leaders left the school. If context is temporal is there value in trying to understand context? I return to Hennie's words quoted at the beginning of the findings '*It's forever changing ... as we go along*' (HJ5 Ch.4 Section 4.3, p.141). The temporal nature of reality is one that teachers are constantly dealing with and has therefore to be accepted as a regular and common condition in educational contexts.

If, as Hargreaves and Goodson (2006, p.4) contend, secondary schools are particularly complex and teachers face difficulty in sustaining innovation in the face of dynamic complexity, how does this apply to Wilding College?

### **8.3.1.2 Complexity and the context of Wilding College**

Change in complex systems is dynamic (Clarke *et al.* 2000, p.17; Klein 2004, p.4; Morris 1997, p.24). There is ample evidence of complexity and of ongoing change. Common to all schools is the annual change of student population and the imperative for each individual to be afforded equitable opportunities that cannot be repeated in that each student passes once through the school, and Wilding College is no exception. The school is complex in its holistic philosophy of supporting the six pillars of education (Ch.7 Section 7.4.1, p.348). It is also complex in terms of its partnership links and complex in its operation. The impact of multiple simultaneous changes (Fullan & Hargreaves 1992, p.4) challenges every teacher although only two of these changes dominated the interviews. The school is also complex in the multitude of ways in which interactions occur as demonstrated in the figures in

The effect of context on teachers' ability to innovate with information and communication technologies in secondary schools

Chapters 4 to 6, differing from one teacher to the next. To draw on an obvious metaphor, each teacher is a juggler having to maintain so many balls in the air at the same time and yet needing to 'remain on the bus'<sup>1</sup> in line with the curricular vision and goals of the school.

Complexity is characterised by emergent order in disorderly systems (McElroy 2000, p.196). The underlying systems or the "*grammar of schooling*" (Ch.2, Section 2.4.6, p.75) on which a school traditionally operates is highly structured and orderly. However, in contrast to this orderliness, the evidence shows that the tensions that exist in the interactions that affect each teacher's ability to innovate in practice are unpredictable (Davis & Sumara 2005, p.455) and emergent (Lissack 1999, p.112; Davis & Sumara 2005, p.455) or self-organising (Davis & Sumara 2005, p.455). Self-organising implies that teachers as agents within the complex system need to find a way to constantly adapt to the challenges of innovation and change on their own (Webb & Lettice 2004, p.2). This is indeed what happens at Wilding. However, in order for the teachers to cope with such complexity, the environment needs to be fully enabling (Webb and Lettice 2004, p.2).

Experience and collegial relationships appear to be enabling factors at Wilding in that the more experienced teachers are able to cope with the challenges i.e. they are enabled by their individual strengths although, as expressed by Bronwyn (Ch.5 Section 5.5, p.215), they would appreciate more affirmation from the leadership. This affirmation is forthcoming in the cases of Maria (MW95 Ch.5 Section 5.9.1, p.253) and Francois (FP57/59 Ch.5 Section 5.10.2, p.258) in response to their particular challenges with new subject areas. Less experienced teachers (e.g. Magriet) require more enabling pedagogical and collegial support which, as the evidence shows, is inadequate. The interactions are unpredictable in the sense that no matter what is tried by the teachers, they are often at the mercy of the system. Two examples are the negative effects of unstreamed classes on teachers'

---

<sup>1</sup> Terminology used by the principal at the time of the 2001 Muse vision building exercise with teachers to establish the way forward with the new curriculum. He told teachers that they had to be 'on the bus'. Recalled in a leadership interview (LB: MR146).



intentions (TL18: Ch.4. Section 4.4.2, p.146) and the stymieing of pedagogic intent by lack of access to ICTs (IG232, Ch.6 Section 6.4.1.3, p.283). The complex characteristic of emergence appears in that most teachers are continually trying to find new ways around the challenges with which they are presented e.g. Francois' creative thinking in mentally planning a 'tour' to solve the access problem (FP78: Ch.6 Section 6.4.6.2, p.337).

The unbridled stimulation of creative energy can lead to chaos or weakening of its tensile strength (Clarke *et al.* 2000, p.18). Clarke *et al.*'s contention would appear to apply in the case of Wilding in that the impact of the multiple simultaneous changes results in an over-production of creative and physical energy in trying to cope with the challenges of context, but an under-production of effectiveness. This point is evidenced in the fact that the teachers are too busy to comply with mandated training requirements (e.g. the Assessors' course) that underlie the effectiveness of what they are compelled to achieve in terms of the curriculum change or to attend courses such as the 2008 *Intel* course which was offered. This is the 'Catch 22' referred to in Chapter 7 (Section 7.4.5, p.360) and which LA refers to in terms of 'something's got to give' to break out of the conundrum (LA8: Ch.7 Section 7.4.2, p.350).

Given the above, Hargreaves and Goodson's (2006, p.4) contention that secondary schools are particularly complex and teachers face difficulty in sustaining innovation in the face of such complexity, would certainly appear to apply to Wilding College. The broader question of exactly what innovation is within the context of Wilding College requires elucidation.

### **8.3.2 Innovation**

In Chapter 2 the following definition of innovation was derived from the literature:

*Multiple perspectives and interpretations of innovation therefore exist, particularly within the context of change or reform in schools. However, for the purposes of this study innovation is used in the sense of a*

The effect of context on teachers' ability to innovate with information and communication technologies in secondary schools

*bottom-up incremental process of beneficial changes in teacher practices at a particular time and in a particular context as a response to multiple simultaneous, top-down, mandated, policy-based changes.*

This definition was used in that the study sought the effect of context on teachers' ability to innovate and in the light of the findings, this definition applies. While this definition was appropriate to teacher innovation, it was found that at Wilding 'innovation' had other implications that are bound to teachers' ability to innovate.

The focus found in the leadership interviews was clearly on providing ICTs as innovations in themselves as admitted by both LA and LB (Ch.7, Section 7.4.5 LA 108 p.358 and LB41 p.359). None of the three leaders could identify ways in which they had encouraged innovative use of ICTs by teachers. This focus on the ICTs as product innovation was, however, not reflected overall in the teacher interviews. The exception was amongst the Physical Science teachers who desired to have a data projector and functioning PC in each classroom. It is the process innovation or new ways of using the tools that needs to be targeted for professional development (Whitehurst 2009, p.5).

Organisational innovation is described by Venezky (2004, p.5) as "*substantive planned change in a school system to solve a problem, without regard for whether the change resulted in the adoption of novel or traditional procedures*". Clarke *et al.* (2000, p.17) on the other hand describe innovation as resulting from such change. The cycle of innovation and change at Wilding was initiated by planned substantive *change* in the school system. All teachers acknowledged the influence of the new curriculum (national level policy change) and the change to inclusive practice (school level change) as the drivers of their attempts to innovate. In Richard's case, his creative background (Ch.4 Section 4.5.4.1, p.185) influenced him at least as much as did mandated change, but these two major changes still had an effect on his practice (RL4a Ch.4. Section 4.5.4.1, p.186). In Henry's case the presence of ICTs was enabling (HN60: Ch. 5 Section 5.7.1, p.244). In response to the

The effect of context on teachers' ability to innovate with information and communication technologies in secondary schools

new curriculum, teachers were trying things that were new to them although to different degrees. In the case of Bronwyn and Ineke, as well as that of Arthur, this meant trying things that were completely new, as evidenced in their comments about being like first year teachers again (BK4 Ch.4 Section 4.4.6, p.151; AS38 Section 4.5.2.3, p.173). In the case of Magriet and Thabo they envisioned where they wanted their practice to be, but still employed traditional methods. However, the continuation of traditional methods also resulted, at least in part, from their lack of access to ICTs rather than a lack of willingness to innovate. The findings therefore agree with Venezky's contention that substantive planned change plays a role, but not that substantive planned change is itself innovation. Rather, Clarke's view of innovation as resulting *from* change [my italics] is more appropriate in this case of Wilding.

Notwithstanding the above, the "islandness" phenomenon (Tubin *et al.* 2003, Ch. 2 Section 2.4.5, p.72) also plays a part. Examples of this phenomenon were found, for instance, in that teachers wished to use ICTs, the ICT labs or data projectors but competing demands restricted them instead to traditional methods. In these instances, the desire to innovate was there, the ICTs were present, but the isthmus connecting the two was submerged by systemic factors. Similarly, Venezky and Davis (2002, p.22) refer to examples of staff acquiring good personal ICT skills, but not integrating them into the teaching and learning process because of either a lack of professional development in this area, or lack of appropriate infrastructure or access to it. In the case of Wilding College this situation also applies. None of the teachers indicated that their own personal ICT competencies held them back from using them in their classroom practice. On the contrary, there was clear evidence of high competencies in most cases, similar to the findings Peck *et al.* (2002, p.53), but the teachers were unable to apply them as they wished.

In Chapter 2 I also wrote:

The effect of context on teachers' ability to innovate with information and communication technologies in secondary schools

*What is not clear from the literature is the cycle of innovation and change, that is, whether change (a condition) supports innovation, or whether innovation (a changed learning process) results in change.*

It would appear from the findings that the cycle of innovation and change is iterative. If change is a constant then the stimulus for innovation is always present. Using Venezky and Davis's argument (2002, p.13-14) on catalysts and levers, "*substantive planned change*" can either be planted as a catalyst with expected change or used to lever desired change. The difference is in the implementation. In the case of Wilding College, the new curriculum appears to have been planted as a catalyst achieving some of the desired results, but other undesired results as well e.g. teacher stress levels, overload and incomplete attainment of assessment requirements. To apply the new curriculum as a *lever* for change would mean envisioning where the school wants or needs to be and then creating a strategy and plan for achieving that end that incorporates all teachers. Using a strategic lever in this way might provide a solution to the mindset problem as described by Henry (HN52 Ch.5 Section 5.7.2, p.241) and ensure a more equitable and transparent introduction of methodologies. However, with hindsight and evidence, these points are more obvious than at the outset of such a major change.

If such a strategic lever were to be employed it needs to be asked what the effect might be on creative energy? Webb & Lettice (2004, p.2) argue that "*self-organisation means that the system organizes itself, i.e. that the single agents of the system find a structure bottom-up on their own, without having a master-plan or an observational guider telling them how to organise*". Does self-organisation counter the notion of a strategic lever? I believe that it does not because, as Webb and Lettice further state, "*self-organising behaviour is supported by an enabling environment*". In the case of curriculum change there are two levels of learning: organisational learning and professional learning. Contemporary learning theory requires the use of scaffolds. Just as students require enabling scaffolds, teachers also require scaffolds to support their construction of knowledge "*proceeding from the ground into the*

*atmosphere of the previously unknown. The scaffold is the environment the teacher creates, the instructional support, and the processes and language that are lent to the student in the context of approaching a task and developing the abilities to meet it*" (Wilhelm, Baker & Dube 2001). It is this strategic lever that I believe, and that the evidence indicates, that Wilding College lacks in the implementation of the new curriculum as well as in the pedagogic support of ICT use. In the case of professional learning, the organisation as represented by the leadership needs to provide the scaffold and the opportunity for teachers to proceed from the known to the unknown. This situation is consistent with what Rowan *et al.* (2005 p.19) describe as that in which teachers are given the aims such as "*authentic, learner-centered, interactive, continuous and inclusive learning*" but not the tools and are expected to rely on their own "*discovery learning*".

### **8.3.3 Professional learning**

If scaffolding professional learning will help create a more enabling environment as surmised by Arthur (AS119 Ch.5 Section 5.6.2, p.228), then it should address the stress and overload that is evident in the findings. Cros (2000, p.67) argues that to sustain or institutionalise innovation it needs to become part of the culture of the organisation in which it occurs. The culture of the school not only enables student learning, but professional and organisational learning. From the cultural perspective professional learning needs to be viewed as the "*enabling resources made available to people to cope*" ... and is constantly "*concerned with constraints imposed on the process of education*" such as the organisation of schools and classrooms (Bruner 1996, pp.2-7). The means of creating this enabling environment are indicated in the literature as developing the notion of a community of practice or professional learning community (Senge 1990, p.308; Wenger 2008, p.2). In its ICT infrastructure, Wilding College has the means to support and enable such a community, but its power needs to be leveraged by the leadership.

The leadership vision for learning is evident in LA's words (LA172: Ch. 7 Section 7.4.8, p. 367) as used in Chapter 7:

The effect of context on teachers' ability to innovate with information and communication technologies in secondary schools

*“Quite wild and woolly. But seriously quite wild and woolly. Not as structured as I think we’re used to it, you know. Our model has been a very structured educational model and I think the way it should be looking more and more is less structured ... um ... quite fragmented in a way. On the outside it probably would appear more disorganised because of the fact we’re dealing with this multi-level learning environment where we’ve got learners working semi-individually at different levels, different stages of their journey within the classroom.”*

However, LA used these words in the context of student learning. I believe that they apply equally to professional learning and that rather than having teachers confined to the silos of their classrooms in the same way as students have been traditionally confined to their rows of desks, there should be:

*“The group on the mat ... a group at the computers, a group up at the board with the teacher, a group working on their own in tutorials.” (LA172)*

It is not only perceiving the future in terms of student learning, but also in terms of professional learning in this way that, as Senge (1990, p.308) states, a school in the complex knowledge society will become a learning organisation with innovative structures and processes that encourage the development of professional learning capacity to cope with unpredictable and changing environments. Professional learning communities are difficult to establish in secondary schools because of hierarchical administration and the strong subject-based structure that counters collaboration (Giles & Hargreaves 2006, p.127). These authors also identify the conflict between informal relationships in a professional community and formally established collaborative networks.

The relationship between context, complexity and innovation at Wilding College has been discussed from the point of view of theory and related to the concept of professional learning. The empirical evidence will now be interpreted in relation to the literature and in terms of the questions posed in this study.

#### **8.4 Discussion of the findings from an empirical point of view**

This section takes each sub-question (Ch. 1, Section 1.5, p.16) in turn and it's relevant chapter and discusses the findings. The distilling of the literature resulted in a conceptual framework as illustrated in Figure 2.5 (Chapter 2 Section 2.8.1, p.98) based on the principles convergence, mutuality and extensiveness (Ch.2 Section 2.5.2, p.84) which were applied to personal innovation in practice by teachers.

##### **8.4.1 The effect of organisational interactions**

The effect of organisational interactions was described in Chapter 4. The question that the chapter addressed was:

*How do organisational interactions influence teachers' ability to innovate and to sustain innovation in practice?*

The variety and complexity of interactions that occurred between convergent and disconvergent factors in the context of Wilding College is evident from the descriptions and the illustrations. The teacher responses provided as many different sets of interactions as the number of participants. Whilst common factors occurred in some interviews, it was often their interplay in each case that was different. It is therefore not possible to generalise factors from one individual or a pair of teachers to the next or from one subject department to the next. However, the *effects* of the factors can be generalised in some instances. For instance, a study of teacher beliefs may have found evidence of positive attitudes, but it is only in making explicit the interplay of factors that the powerful effect of the disconvergent factors in countering that belief emerges. The interplay of organisational factors is illustrated in Table 8.1 in which 'Y' represents a positive effect and 'X' a negative effect.

The first finding on organisational factors was that the mandated change to the OBE curriculum had a dominant effect in every case. Its presence was anticipated given that the research was conducted at a time when major curriculum change reached the penultimate year of its first cycle. Overall, the

The effect of context on teachers' ability to innovate with information and communication technologies in secondary schools

OBE curriculum had a positive effect in that it stimulated innovative thinking and all teachers had a positive attitude towards the curriculum. However, the OBE curriculum also had a negative effect in terms of the workload that it generated and the complexity that it added, particularly in the two new learning areas of Life Orientation (LO) and Accountancy. The fact that the curriculum itself was unsettled in three of the six subject areas represented by the teachers indicates the possible extent of this problem, although this effect cannot be generalised to all departments. On the other hand, curriculum change is an ongoing process with which teachers need to contend.

Table 8.1: Interplay of organisational factors

Factor	Bronwyn & Ineke	Arthur & Hennie	Magriet & Thabo	Henry	Richard	Maria	Francois
Curriculum change	Y X	Y X	Y X	Y	Y	Y	YX
Focus on student need	Y Y	Y Y	Y Y	Y	Y	Y	Y
Lack of skills			X X				
Lack of support			X X		X	X	
Class size			X X			X	
No streaming			X X				
Overload	X X	X X	X X		X	X	X
Lack of time	X X	X X	X X	(X)	X	X	X
Own nature				X			
Nature of subject					X		
Further change	X						
Conflicting changes			X X				
Experience	Y Y	Y Y	Y Y	Y	Y		
Collegiality	Y Y	Y Y	Y Y	X	Y	Y	Y
Student factors	Y Y			X	X		X
Creativity					(XY)		
Newness of subject						Y	Y

The second finding is that a focus on student needs arising from the inclusive philosophy of the school was prevalent in every case and, in Arthur's case, had a greater effect on his thinking than the new curriculum. The evidence



showed discordance between the tenets of inclusive practice and the reality of classroom experience. While teachers on the whole had internalised this philosophy, the complex innovation that it represents had not yet been fully institutionalised nine years into the change. The focus on student need and student-centred learning provides ongoing challenges to teachers who aspire to be inclusive in their practice, but appear to lack the time, the skills or sufficient support to differentiate in that practice. This may be attributed to a combination of three factors: the dearth of support for teachers as opposed to support for students, class size and a move away from streaming. Cros warns (2000, p.65) that if innovations do not become institutionalised, then burnout and a return to routine occurs. Although the Wilding teachers have tried to adapt, the overload or stress that was evident from the combination of factors is a very real problem that needs to be addressed.

Time, and in particular the need for teachers to manage time, has been identified as an increasingly predominant factor (Tearle 2004, p.338). The lack of time is the third predominant factor that is of common concern to all Wilding teachers except Henry, particularly in their desire to meet the needs of their students. Although the time factor does not appear to affect Henry he mentions that his departmental colleagues do not follow through on fieldwork due to a lack of time (HN60: Ch.5 Section 5.7.2, p.244). The time factor appears to be a direct consequence of both the new curriculum and the focus on inclusivity. There is convergence between the views of the teachers and those of the leadership on the matter of time shortage and its corollary: overload and stress. The lack of time possibly explains why so few teachers have completed their Assessor's course portfolios even though certification by completing the requirements of the course is compulsory and fundamental to implementing the new curriculum. The teachers are caught between desire and compulsion and cannot resolve the situation themselves without the intervention of the leadership, as Arthur states:

*AS70: I think generally [the leadership has] been fairly supportive in an indirect fashion. Just provided the background and some of the resources, but not all of the*

The effect of context on teachers' ability to innovate with information and communication technologies in secondary schools

*resources we need. But the main resource we need actually is time ... and that's the one that's got the most stretch on ... [chuckles]*

A further observation is that personal responses to mandated change are a contributing factor to a teacher's ability to innovate. The following interpretation extracted from the preliminary findings of Chapter 4 illustrates this point:

*Henry and Richard illustrate the dichotomy of personal responses to mandated changes. Henry attributes his acceptance of change to his own nature, whilst Richard attributes his to the nature of the subject. Bronwyn and Ineke have embraced change to the extent that they feel threatened by what they perceive to be retrogressive further changes in the curriculum. Thabo and Magriet have embraced the philosophy of inclusion and want to change their practice but are caught in a stressful cycle of conflicting changes that they appear unable to escape from. The experience of Hennie and Arthur helps them to rationalise change although they show some scepticism of how well the OBE curriculum is being implemented in their department. Henry is stifled by the lack of a like-minded colleague and intrigued by student factors that conflict with assumptions of a socially networked society. There is a paradoxical tension between Richard's creative nature and his realisation of socially-constructed knowledge in the practical component of his subject and the traditional delivery of the theoretical component which he has no time to explore. Maria and Francois deal with the immensity of the challenge of the new with remarkable fortitude.*

In each of the above cases, the response is unique to the individual.

Taken at surface level, the implementation of mandated changes has been systematic in that it has been incremental over one academic year at a time. However, in practice, the implementation process for the two major changes has manifested as much more ad hoc. Curriculum change in certain subjects has not proceeded in one linear direction, but first in one direction and then veering into another, sometimes reversing and sometimes without clear direction. Teachers have had to establish their own benchmarks; redesign their practice; and manage their own professional learning in real time; with little or no opportunity for planning workshops, peer demonstration,

observation and critique to assist iterative development of their practice. This point is conceded by LA (LA43: Ch.7 Sections 7.4.2, p.352).

Despite these challenges and limitations, positive convergence occurs to the extent that curriculum implementation is moving forward and academic standards are being maintained<sup>2</sup>, although some teachers acknowledge that their practice has regressed or that they have not been able to sustain innovation. Disconvergent factors are a reality that needs to be addressed at system, school and departmental levels.

The following was found in answer to the sub-question on organisational interactions and their effect on teachers' ability to innovate:

1. Curriculum change and the change to an inclusive philosophy stimulate innovation in teacher practice. At the same time disconvergent factors generated by the same changes combine with systemic factors resulting in a neutralising or retrogressive effect on teachers' ability to innovate.
2. The response of teachers to organisational level changes is unique to each individual set of circumstances and cannot be generalised.
3. Limited time or its corollary, overload, is a significant inhibitor to teacher innovation.

This section has addressed the question of the effect of organisational interactions on teacher's ability to innovate. The next section will address the second question in seeking evidence of mutuality and extensiveness in collegial and professional relationships.

#### ***8.4.2 The effect of collegial and professional interactions***

The effect of collegial and professional interactions was described in Chapter 5. This chapter elicited evidence of mutuality or the condition that allows the

---

<sup>2</sup> As indicated in the final Grade 12 results for the College.

<sup>5</sup>Thesis submitted by Mary Elizabeth Reynolds in partial fulfilment of the requirements for the degree of Philosophiae Doctor (Computer Integrated Education) in the Department of Curriculum Studies, Faculty of Education, University of Pretoria, August 2009.

The effect of context on teachers' ability to innovate with information and communication technologies in secondary schools

diffusion of innovation in classroom practice. As shown in the literature, diffusion is the process by which an innovation is communicated through certain channels over time by members of a particular social system with the intention of reaching mutual understanding (Rogers 1995, p.5). Similarly, as described by Cros (2000, p.70-74) in the social interactionism model of diffusion the interplay of individual decisions and their effects are key. Communication networks, and particularly personal networks, underlie this social influence.

In seeking mutuality and extensiveness, the question that the chapter addressed was:

*How do collegial and professional interactions influence teachers' ability to innovate and to sustain innovation in practice?*

Evidence of the communication channels and social interaction between teachers was found to exist in both the collegial and professional interactions of most teachers. Overall, there is supportive camaraderie between teachers and there is trust between the leadership and the teachers which is made explicit by Arthur (AS70a Ch.5 Section 5.6.3, p.229). In the case of Bronwyn and Ineke the collegial relations and their like-mindedness were palpable to the extent that they would complete each others sentences (BK44 & IG46 Ch.5 Section 5.5, p.205) and always used the first person plural 'we'. In Richard's case, collegiality and the professional relationship is evident from his descriptions of his conversations with Alena (RL28b Ch.5 Section 5.8, p.237). However, in other instances, while relationships are good, there is a small indication of mistrust (AS28/30 Ch.5 Section 5.6, p.214) or as in Henry's case, the lack of a like-minded colleague has plagued him over a considerable time period (Ch.5 Section 5.7.1, p.236). In this latter case it is conflicting paradigms that play a negative role and the evidence is in agreement with Cros' findings on this matter of conflict (Cros 2000, p.70-74).

Relationship balance emerges in the findings as an important factor. In the case of Bronwyn and Ineke, the empowering relationship balance in their

The effect of context on teachers' ability to innovate with information and communication technologies in secondary schools

department has changed with staff turnover but has not presented a significant problem. Although turnover has had some impact, cordial collegial and professional relations are maintained and a common sense of purpose (Fullan & Hargreaves 1992, p.4) predominates. In Francois' case, he has a good relationship with his colleague, but lack of time upsets the balance and they are unable to derive the mutual benefit that they would both enjoy (FP39 Ch.5 Section 5.10, p.247). Maria has virtually the whole staff as her department and has communication difficulties with them. The problem here is not the relationships, but the unwieldiness of this disparate department. Fundamental professional relationship problems exist in one department<sup>3</sup>, but there appears to be no mechanism for resolving this to mutual benefit.

The modular system of developing units of work provided an opportunity for collaboration in most of the larger subject departments. The system achieved its purpose in distributing the workload, but did not always result in collaborative practice. In Physical Science the workload was not lessened and the development of the modules was uneven as indicated by Arthur. Modular development was also not supported by systematic joint evaluation at either the design or implementation stage (AS28/30 Ch.5, Section 5.6, p.214) and therefore the onus for development remained with the individual with varying success. Also, the potential of the ICT infrastructure was not used to enable collaborative development. The single instance of inter-departmental collaboration on a module was discontinued after one year, attributed to staff turnover as well as relationship factors. While the intention of the module system was to lessen the workload, the mutual benefit was neutral as it did not exploit either collaborative opportunities or the ICT infrastructure. The effect was a distributed workload rather than a collaborative effort that epitomises professional learning in a community of practice.

Ideas are spread not only through spontaneous informal communication but also through more directed and managed communication channels (Rogers 1995, p.10) or networks (Steiner 2004, p.1). In the case of Wilding the more

---

<sup>3</sup> Not linked for ethical reasons.

The effect of context on teachers' ability to innovate with information and communication technologies in secondary schools

formalised communication that targets the spread of ideas is limited to generic professional development workshops at the start of term. There is no forum for professional learning in which ideas on pedagogical practice can be shared, debated or critiqued as recommended by Fogelman *et al.* (2006, p.186) and the OECD (2000, p.116). The lateral and vertical diffusion of innovative ideas is therefore limited and may explain why the leadership are unable to identify specific pedagogic innovations (LA21, Ch.7 Section 7.4.3, p.341). The lack of a forum is acknowledged by the leadership (LA43 Ch.7. Section 7.4.2, p.338).

The leadership is empathetic to the critical situation that the teachers find themselves in with the new curriculum and acknowledge the teachers' frustration (LA33 Ch.7 Section 7.4.2, p.337). At the same time, as LB admits, they do not know what happens inside the black box of the classroom (LB103 Ch.7 Section 7.4.1, p.335). While the Assessor's course (Ch.7 Section 7.4.2, p.343) addresses a specific gap in curriculum related knowledge it is not the only limitation to practice that needs to be addressed. Other areas in which the need for professional learning is indicated are pedagogic knowledge of ICT use and differentiation to address student need. These are both evident in the extracts from TL167/169 to MD178/180 (Ch. 6 Section 6.4.2, p.284).

The IEB user groups and cluster groups go some way to providing an outlet for sharing and for gleaning resources i.e. networking. However, the interaction here is limited to sharing resources and there was no indication of collaborative practice across these groups. The flow of influence is perceived to be in a singular direction (HJ96 Ch.5 Section 5.6, p.227) and therefore no mutual benefit derives from this group. The validity of this mono-directional perception is subject to question (MD117 Ch.5 Section 5.6 p.228). In the two new subject areas the teachers turned to their cluster groups out of need and derived benefit from them. Although no mutual benefit resulted at the time, Francois certainly indicated the wish to reciprocate once he was in a position to do so (FP55 Section 5.10, p.253).

The effect of context on teachers' ability to innovate with information and communication technologies in secondary schools

Similarly, the partnership in which Wilding College is involved did not appear to provide any mutual benefit, except in Maria's case. Collegial relations with the partner school had, in fact, deteriorated as evidenced in HJ94 (Ch.5 Section 5.6, p.226) and no collaborative synergy ensuing from the partnership was evident.

Table 8.2: Interplay of relationship factors

Factor	Bronwyn & Ineke	Arthur & Hennie	Magriet & Thabo	Henry	Richard	Maria	Francois
Collegiality	Y Y	Y Y	Y Y		Y	Y	Y
Trust		Y					
Relationship balance	X X	X X		X	Y	X	X
Intra-department Collaboration	Y Y	X X	X X	X	Y	Y	Y
Inter-departmental collaboration	Y Y	X X	X X	X		Y	
Joint evaluation processes	X X	X X	X X	X			
Support from ICTs in collaboration	Y Y						
Staff turnover	XY XY	X X				Y	Y
Pedagogic workshops or forum							
Vertical communication of innovations							
Lateral communication of innovations							
Cluster groups (sharing)	X X	X X	X X		X	Y	Y
Cluster groups (collaboration)							
Other groups (sharing)	Y Y	Y		Y	Y		Y
Partnership	X X	X X		X		Y	
Evidence of PLC							

While communication is essential to diffusion and clusters or networks are key to the communication of creative ideas in learning organisations (Lewis & Romiszowski 1996), little advantage appears to be taken of these at Wilding

The effect of context on teachers' ability to innovate with information and communication technologies in secondary schools

College either internally or externally, limiting mutual benefits to individuals or to departments. Professional learning communities are essential to schools nowadays (Senge 1990, p.308) but are difficult to establish in secondary schools because of hierarchical structures and a subject-based culture. The evidence, as summarised in Table 8.2, indicates that these limitations apply in the case of Wilding College.

That there is a need for professional learning at Wilding College is evidenced in two instances. Firstly, there are pockets of innovative practice that respond to both the demands of the new curriculum and the affordances of ICTs, but they are invisible to teachers in other departments due simply to the lack of opportunity to share. Secondly, there is tension between subject departments due partly to the competition to attract students to optional subjects and the perceived risk in doing something different (Ch.4, Section 4.4.4, p.148). An appropriate professional learning process as described by Fullan and Hargreaves (1992, p.4-6) would allow teachers to act on their sense of purpose, provide them with the opportunity to voice their opinions, assumptions and beliefs and create a collaborative as opposed to only a collegial community together.

In answer to the sub-question on collegial and professional interactions and their effect on teachers' ability to innovate, this study has found the following:

1. Collegial relationships are positive and supportive to different degrees within departments. Sharing ideas and resources occurs within most subject-departments to mutual benefit. However, where the exception occurs the effects are negative and limiting and little mutual benefit is derived.
2. Generic professional development is provided but does not contribute to mutuality, the sustainability or institutionalisation of innovation or the sharing, evaluation and critiquing of practices.
3. There is no structure or mechanism to extend intra-departmental innovation in practice or its mutual benefits across the school.



The effect of context on teachers' ability to innovate with information and communication technologies in secondary schools

4. In the majority of cases, there is little perceived benefit derived from the association with formal networking groups although extensiveness occurs in the outward flow of influence.
5. The ICT infrastructure is not used for collaborative purposes other than the use of email or as a repository for resources.

Against the contextual background of the findings of the responses provided to the first two sub-questions, the findings of the effect of ICTs will now be discussed.

### **8.4.3 The effect of ICTs on teachers' ability to innovate**

Chapter 6 described the findings in relation to the third sub-question which was:

*How do ICTs influence teachers' ability to innovate and to sustain innovation in practice?*

The findings will be discussed in relation to the organisational, pedagogical and relationship perspectives.

#### **8.4.3.1 From the organisational perspective**

There is a complex connectedness of interactions between ICTs and innovation. To ensure pedagogic innovation with ICTs requires a focus on curricular goals, compatibility with assessment, teacher collaboration, and ongoing pedagogical and technical support. ICTs should not be confined to inaccessible laboratories (Cuban 2001 p.163; Means *et al.* 1993, Ch.VIa para.2; Peck, Cuban & Kirkpatrick 2002, p.59) and the focus needs to go beyond the provision of ICTs alone (Means *et al.* 1993, Ch.VIa para2; Cuban 2001, p.163; Peck, Cuban & Kirkpatrick 2002, p.51). Financial resources need to be balanced between the provision of ICTs and technical support on the one hand and pedagogical support on the other (Anderson & Becker 2001, p.3).

The effect of context on teachers' ability to innovate with information and communication technologies in secondary schools

In terms of these criteria from the literature Wilding College has an extensive ICT infrastructure that functions efficiently as confirmed by the leadership (LB41 Ch.7 Section 7.4.5, p.345). However, the focus has been on this efficient functioning of the ICTs and IT Department needs rather than the effective use of ICT and classroom needs. The lab model has been the accepted model of ICT provision which creates accessibility problems, particularly for optional subjects. A bottle-neck is created in the labs by the simultaneous scheduling of Computer Science and other optional subjects, limiting access for the latter. This is being addressed in part by the intended provision of a multi-media PC and digital projector for each classroom, but a single computer does not support student centred or generative learning (Hokanson & Hooper 2000, p.533); rather it favours teacher-centred learning. The roll-out of this plan also creates equity problems with teachers having to teach identical modules concurrently even though some lack the necessary access to tools essential to the delivery of the module. Therefore, whilst on the surface Wilding College is well-equipped; in practice disconvergent factors limit access at the time it is needed, countering an array of convergent factors that would otherwise enable innovative use of ICTs. Generally, teacher thinking is ahead of what they are able to achieve in practice and their frustrations need to be addressed.

Personal competency and comfort with ICTs influences teachers' ability to innovate in practice and even where competency is limited, as in the case of Maria it is not a deterrent to practice (Ch.6 Section 6.4.5, p. 322). Magriet emphasises the improvement in her productive efficiency through the use of the administrative package (MD156/158: Ch.6 Section 6.4.2, p.290). In this case she perceives the product itself to be the innovation. There is no indication therefore that teachers require further support in the form of training courses in the use of current applications.

The prohibitive cost to students was a factor in the decision to end the laptop programme in the late 1990s. While the financial support for ICTs in the school is relatively generous, given the higher relative costs of ICTs in South

Africa, funding remains a constraining factor in maintaining and upgrading the network and ICT infrastructure and in providing specialised technologies such as digital projectors. However, consideration does not appear to have been given to the idea of less costly alternatives<sup>4</sup>. The cost of ever more powerful mobile technology is decreasing and it is becoming more common to find students with this type of technology in their pockets. Suggestions for integrating mobile use were made by both Henry and Arthur (HN17c & AS131 Ch 6 Section 6.4.2 p.274).

#### **8.4.3.2 From a pedagogical perspective**

ICTs need to become an element of the curriculum (Huffman & Rickman 2004, p.282) and innovation needs to take place in the pedagogical practice. Innovative pedagogical practices promote active and independent learning; encourage collaborative and project-based learning in real-world contexts; heighten sensitivity to individual needs and diversity; redefine traditional space and time learning configurations; and increase parent and community connections with the school (Mioduser et al 2003, p.26).

ICTs are fundamental to innovation at Wilding College. This is evident in both the descriptions of innovations and in the teachers' direct statements. The use of ICTs by teachers at Wilding College to a great extent focuses on curricular goals as opposed to the teaching of skills, but the effect of contextual factors on this process is both complex and varied. Regarding skills, the expectation is that students will arrive at the school with both technical competency and information literacy, which the evidence shows does not always occur, with ensuing problems. Where student application skills are limited, peer-teaching is used to resolve the problem in some instances. There is disparity between the expectations of the teachers and student information literacy levels and this problem is unresolved. However, the problem has been addressed at policy level by the recent development of an anti-plagiarism policy which has yet to be implemented consistently in

---

<sup>4</sup> As of August 2009 a class-size complement of small laptops has been introduced experimentally but, at the time this study concludes, this project is only two weeks old.

<sup>5</sup>Thesis submitted by Mary Elizabeth Reynolds in partial fulfilment of the requirements for the degree of Philosophiae Doctor (Computer Integrated Education) in the Department of Curriculum Studies, Faculty of Education, University of Pretoria, August 2009. 402

practice. Unlike application skills which can be easily transferred through peer-teaching, information literacy skills are embedded in thinking and writing processes and need to be scaffolded in the design of a learning unit (Beetham & Sharpe 2007, p.2-3). Access to the Internet enables the alignment of learning with real-world contexts (Mioduser *et al.* 2003 p.26), particularly in the content areas such as in the examples provided by Ineke (IG17-19 Ch.4 Section 4.5.1.1, p.153) and Henry (HN81 Ch.6 Section 6.4.3.1, p.304).

With regard to curricular goals, the effect of ICTs on teachers' ability to innovate is different in every case. Bronwyn and Ineke have high expectations of the students' ability to apply thinking skills in using ICTs (Dede 2000, p.282). They scaffold the student learning process with ICTs (Beetham & Sharpe 2007, p.2-3) to attain curricular goals and formative assessment is integrated into their learning design (Dede 2000, p.282; Looi 2004, p.92; Means 1993, p.3; Roschelle *et al.* 2000, p.76). The use of ICTs relies less on their own ICT competencies and more on their pedagogic competency while at the same time they build student competency. In contrast, the Physical Science teachers appear to use ICTs in a more traditional manner as a demonstration medium rather than in an innovative way although their description of using Excel implies generative use (AS131 Ch.6 Section 6.4.2, p.280). Their reliance on traditional methods can be attributed in part to access problems as well as to the nature of the subject. Continuation of traditional methods is consistent with the findings of Peck *et al.*'s study (2002, p.134). In Henry's case ICTs are used in innovative ways for real-time learning (Mioduser *et al.* 2003 p.26) appropriate to the nature of the subject. In Richard's case his focus is on achieving creative ends with a highly technical application, yet he meets resistance because of student factors. Maria achieves curricular goals through collaboration while Francois' ability to achieve them is impeded by systemic factors and ICT policy.

Student resistance to the use of ICTs as determined by Richard and Henry is unexpected and not accounted for in the literature encountered for this study. Richard struggles to encourage students to follow the Computer Art option

and to retain the students in the course. Henry tries to make use of social networking tools to encourage student collaboration, but meets with disinterest until countered by extrinsic motivation. In both these instances, the teachers' technology vision is ahead of that of their students, although a rethink of their learning design processes might be indicated.

#### **8.4.3.3 From a relationship perspective**

A school as a professional learning community (Wenger 2008, p.2) emphasises collaborative opportunities amongst professional teachers. ICTs are the combination of network infrastructure as well as the means of communication, collaboration and engagement that enable the processing, management and exchange of data, information and knowledge (DoE 2003, p.16). According to this definition the communication of data, information and knowledge are therefore inherent in the technology itself. However, the extent to which the infrastructure at Wilding College is used in this way for curricular purposes is limited. From an administrative perspective, data is shared via the *Pencil Box* system, although its added-value features have not been exploited. From a communication perspective information is shared to the extent of overload using email as well as e.g. the calendar facility of the email package. However, the use of ICTs for sharing or social construction of knowledge is limited to either email or the Intranet as a distribution repository.

The ICT factors affecting teachers' ability to innovate are summarised in Table 8.5.

In answer to the sub-question of the influence of ICTs interactions and their effect on teachers' ability to innovate, this study has found the following:

1. The ICT infrastructure supports curricular use of ICTs but limits teachers' ability to innovate to the extent that they desire.
2. Where innovations in teaching practice occur they are not diffused to the benefit of other teachers through the use of ICTs and therefore extensiveness and sustainability are limited.

The effect of context on teachers' ability to innovate with information and communication technologies in secondary schools

3. As the basis for collaborative interaction between teachers the ICT infrastructure is significantly under-exploited.
4. The school relies on traditional structures which are sometimes in conflict with curricular goals. Possible benefits of asynchronous time and space configurations through ICT use have not been considered<sup>5</sup>.
5. Financial constraints common to all schools occur, but no consideration has been given to less costly forms of ICT provision.

Table 8.3: Interplay of ICT factors

Factor	Bronwyn & Ineke	Arthur & Hennie	Magriet & Thabo	Henry	Richard	Maria	Francois
Accessibility	X X	X X	X X	Y	X	X	X
Equitable provision		X X	X X				X
Financial limitations		X X	X X				
ICT support			X				
Student – centred use	Y Y	X X	X X	Y	(XY)	Y	(Y)
Teacher Competency	Y Y	Y Y	Y Y	Y	Y	(Y)	Y
Improved Productivity			Y				
Curricular focus	Y Y	Y Y	Y Y	Y	Y	Y	Y
Student-centred use	Y Y	XY XY	X X	Y	Y	Y	Y
Student factors	Y Y		X X	X	X		X
Collaborative use of ICTs	Y Y						
Exploitation of Admin. system							

#### 8.4.4 The effect of leadership interactions

The final sub-question provided an alternative perspective from the leadership point of view:

*How do leadership interactions influence teachers' ability to innovate and to sustain innovation in practice?*

<sup>5</sup> That is, until the advent of the Moodle learning management system which is, at the time of concluding this study, just starting to take off.

The effect of context on teachers' ability to innovate with information and communication technologies in secondary schools

For innovations to succeed in schools certain conditions are required to be present (Sharma 2005, p.54-56). These conditions include supportive leadership, networks rather than hierarchies, effective group decision-making processes, clearly outlined organisational goals, mutual concern for quality and positive support.

The positive support in an atmosphere of trust provided by the leadership at Wilding is acknowledged by every teacher. The leadership support includes affirmation, provision of resources including ICT resources, empathetic understanding of the difficulties that teachers face and personal development opportunities. However, as pointed out by Arthur, the resources are still insufficient in terms of the expectation on curriculum delivery and the one resource that the leadership is unable to provide is time. The pressures on teachers resulting from a lack of time to achieve to expectations are critical and as LA states '*something's got to give*'. It is this problem that only the leadership can find a solution to. Suggestions made by the leadership for improving this situation are that teachers complete the Assessor's course to enable their understanding and that a curriculum map is compiled. However, these measures are easier said than done as teachers do not appear to have the time to make the breakthrough in the first place. A strategic rethink of teacher expectations is thus indicated.

Wilding College is characterised by formal hierarchies (Ch. 7 Section 7.3, p.338). Although collegial relationships and communication are very good the sharing of knowledge and innovative ideas is limited by both the lack of a collaborative culture and the failure to exploit the potential of the ICT infrastructure. Decision making processes are encumbered by the hierarchical structure and the complexity of the partnership and are counter-productive in the case of ICTs (e.g. FP68-76; Ch. 6 Section 6.4.6, p. 325). The goals of the organisation are expressed in terms of excellence and achievement of the individual within the six pillars on which the school culture is founded. Teachers are overtly encouraged to strive for "*greatness*" rather than rely on the "*hubris born of success*" (Collins 2009: see Ch.7 footnote 2,

p.345) as advocated in a series of teacher workshops. However, such excellence is still largely perceived by the students and the parent body in terms of marks and results and, as a consequence, there is conflict between teacher and student views (HN11 Ch.4 Section 4.4.8, p.151).

According to the literature, the involvement of school leadership in the integration of ICTs is critical (Breuleux 2002 p.10; Otto & Albion 2002, p.3; Staples *et al.* 2005, p.305; Sharma 2005 p.53). While the Wilding leadership is involved, their focus has been on product innovation and the efficient operation of the network, rather than on process innovation or support for pedagogic effectiveness. The school leadership needs rather to identify and determine how technology growth and development goals will best serve curricular goals, with each intertwined in reciprocal supportive roles (Staples, Pugach & Himes 2005 p.306-307). To achieve this end the technology leadership, supported by school leadership, must have a strong curriculum focus aligned with technical expertise. In cases where both the technology leader and the principal are focused on acquisition, teacher leadership of the curriculum aspect is essential (Staples et al 2005, p.307).

Beliefs that the leadership hold have a significant impact on the culture that supports the creative integration of ICTs for teaching and learning and determine the interpretation of the vision for learning through either action or inaction (Otto & Albion 2002, p.3-4). The Wilding leadership appears to believe in the potential of ICTs, but LB admits to being unsure of any improvement in student learning that could be associated with ICTs (LB55 Ch.7 Section 7.4.2, p.342). One significant effect of beliefs is expressed by LB (LB121/123 Ch.7 Section 7.4.6, p.353) in describing the difference in approach between the IT directorate and the academic staff: while one party wants the machines to work, the other wants the learning to work. It is this fundamental difference in belief that underlies the tensions in the innovative use of ICTs. LA also concedes (LA172/174) that the structure of the school and the needs of the learners and the curriculum are in conflict. He confirms



The effect of context on teachers' ability to innovate with information and communication technologies in secondary schools

the obstacles that were raised as “*grammar of schooling*” factors (Ch.2 Section 2.4.6, p.74) and acknowledges the necessity to address these issues.

**Table 8.6: Interplay of leadership factors**

<b>Factor</b>	<b>LA</b>	<b>LB</b>	<b>LC</b>
<b>Positive support</b>	Y	Y	Y
<b>Provision of resources</b>	Y	Y	Y
<b>PD opportunities</b>	Y	Y	Y
<b>Pedagogic support</b>			
<b>Meet expectations</b>	X	?	Y
<b>Communal decision-making</b>			
<b>Product innovation</b>	Y	Y	Y
<b>Process innovation</b>	X	X	X
<b>Potential of ICTs</b>	Y	Y	Y
<b>Learner needs c.f. school structure</b>	X		
<b>Lateral communication</b>			
<b>Vertical communication</b>			

The interplay of factors from a leadership perspective are summarised in Table 8.6.

In answer to the sub-question of the influence of leadership interactions and their effect on teachers' ability to innovate, this study has found the following:

1. The leadership views converge in most instances with those of the teachers, particularly regarding affirmation, trust and support and the leadership is empathetic to the critical pressures of curriculum change.
2. While the leadership express support for ICT integration, their support has been limited to the provision of resources (product innovation) rather than pedagogic support (process innovation).

The effect of context on teachers' ability to innovate with information and communication technologies in secondary schools

3. Structures that cut across hierarchies and support collaborative professional learning are largely absent and this is acknowledged by the leadership.
4. Lateral and vertical communication of innovative ideas is limited.

In view of the findings and conclusions with regard to the sub-questions of this study, the literature and findings will now be drawn together.

**8.5 The effect of context on teachers' ability to innovate with ICTs**

This study has investigated the effect of context on teachers' ability to innovate, using Wilding College as its case. The case has been investigated in terms of three principles: convergence, mutuality and extensiveness and posed the following question:

*How do teachers innovate in the face of complex, simultaneous and ongoing changes and, in particular, how do they innovate with ICTs amidst such changes?*

The findings in answer to this question are summarised in Table 8.7. While identifying patterns in organisational and human experiences can be helpful, in complex contexts the inclination to identify patterns even where they do not exist should be resisted (Webb & Lettice 204, p.92). In this study, recurring factors have been found, but it is the interplay of the different factors and the effect of that interplay which has been identified as unique for each individual and therefore cannot be generalised. The reduction of this interplay to a series of statements loses the nuance of this interplay and should be taken into account.

The effect of context on teachers' ability to innovate with information and communication technologies in secondary schools

Table 8.5: Summary of findings

Organisational interactions	Collegial & professional interactions	ICT interactions	Leadership interactions
Curriculum change and the change to an inclusive philosophy stimulate innovation in teacher practice. At the same time disconvergent factors generated by the same changes combine with systemic factors resulting in a neutralising or retrogressive effect on teachers' ability to innovate.	Collegial relationships are positive and supportive to different degrees within departments. Sharing ideas and resources occurs within most subject-departments to mutual benefit. However, where the exception occurs the effects are negative and limiting and little mutual benefit is derived.	The ICT infrastructure supports curricular use of ICTs but limits teachers' ability to innovate to the extent that they desire.	The leadership views converge in most instances with those of the teachers, particularly regarding affirmation, trust and support and the leadership is empathetic to the critical pressures of curriculum change.
The response of teachers to organisational level changes is unique to each individual set of circumstances and cannot be generalised.	Generic professional development is provided but does not contribute to mutuality, the sustainability or institutionalisation of innovation or the sharing, evaluation and critiquing of practices	Where innovations in teaching practice occur they are not widely diffused to the benefit of other teachers and therefore extensiveness and sustainability are limited.	While the leadership express support for ICT integration, their support has been limited to the provision of resources (product innovation) rather than pedagogic support (process innovation).
Limited time or its corollary, overload, is a significant inhibitor to teacher innovation.	There is no structure or mechanism to extend intra-departmental innovation in practice or its mutual benefits across the school.	As the basis for collaborative interaction between teachers the ICT infrastructure is significantly underexploited.	Structures that cut across hierarchies and support collaborative professional learning are largely absent and this is acknowledged by the leadership.
	In the majority of cases, there is little perceived benefit derived from the association with formal networking groups although extensiveness occurs in the outward flow of influence.	The school relies on traditional structures which are sometimes in conflict with curricular goals. Possible benefits of asynchronous time and space configurations through ICT use have not been considered.	Lateral and vertical communication of innovative ideas is limited.
	The ICT infrastructure is not used for collaborative purposes other than the use of email or as a repository for resources.	Financial constraints common to all schools occur, but no consideration has been given to less costly forms of ICT provision.	

## 8.6 Conclusions

Taken together with the literature, the conclusions drawn from the findings of the study are therefore:

**Conclusion 1:** *Secondary schools are characterised by complex interactions and each teacher's ability to innovate is affected in different ways dependent on the interplay of convergent and disconvergent factors in their individual context. Identifying and addressing disconvergent factors will enhance the institutionalisation or sustainability of innovations in teacher practice.*

**Conclusion 2:** *The effect of context is different for each individual teacher and professional learning should therefore be differentiated and scaffolded in the same way as student learning is scaffolded and differentiated to student need.*

**Conclusion 3:** *Time and overload are significant factors in inhibiting teacher innovation and in some cases can cause retrogression or the opposite effect to what is intended by mandated change.*

**Conclusion 4:** *Positive collegial and professional relationships are fundamental in order for mutual benefit to derive to teachers and students alike.*

**Conclusion 5:** *Institutionalisation or extension of teacher innovation over time and space within secondary schools requires an open and supportive collaborative structure and accompanying strategy of pedagogic support.*

**Conclusion 6:** *Schools require both social and ICT infrastructures to scaffold professional learning and the lateral and vertical extension of innovative ideas in a professional learning community both within and beyond the school.*

**Conclusion 7:** *Alignment between the ICT infrastructure and curriculum needs is essential to support process innovation in teacher practice.*

**Conclusion 8:** *To realise mutuality, extensiveness and thereby institutionalisation of innovations transparent strategies, channels or mechanisms for the lateral and vertical sharing of innovative ideas need to be in place.*

**Conclusion 9:** *A fundamental rethink of traditional structures, including the ICT infrastructure, is indicated in order to achieve the combined benefits intended by mandated change, teacher innovation and ICTs.*

**Conclusion 10:** *The active support of school leadership in developing pedagogic practice is essential to teacher innovation irrespective of the use of ICTs.*

**Conclusion 11:** *ICTs are fundamental to teacher innovation.*

## **8.7 Reflection**

Methodological, scientific, substantive and personal reflections will be addressed in sections 8.7.1 to 8.7.4.

### **8.7.1 Methodological reflection**

In Chapter 1 I provided the background to the school and to the evolution of this study. Essentially, the study evolved out of personal experience at the school and was a story seeking a framework in which to be told. The school provided a research opportunity because of the richness of the interactions resulting from the complexity of its transformation process and the depth of the data that could be drawn on. From a purely practical point of view, familiarity with the school over a long period of time as well as the demands that the school makes, limiting time for contact with less accessible organisations, were also significant factors in the case selection.

However, the intention of the study was not only to provide a description but also to try and understand the impact of contextual factors on teachers' ability

to innovate. As a participant in the context I was fully aware of the stresses and overload that my colleagues commonly expressed and to date remain the subject of discussion in HOD meetings, without resolution. I was similarly aware of the high aspirations of each teacher. A research problem is a "difficulty which can often be expressed as a contradiction between what is happening and what someone would like to happen" (Bassegy 1999, p.6). It was the contradictions between these aspirations and the stress levels that teachers endured to try and meet their aspirations that underlay the focus of the study. In order to contribute to a solution this study was framed as a study of context.

Methodological issues that arose included ongoing interaction with the literature, ongoing interaction with the environment and the dynamics of the question development process. The ongoing interaction with the case environment was consistent with my role of participant-researcher. The ongoing interaction with the literature resulted from my role at the school, the disparate nature of context and the vastness of the field. The question development process, beyond semantic implications, was part of the challenge of distilling the essence of the complex context. While the sub-questions were relatively fixed at the outset, they shifted in and out of focus and occasionally morphed into differing entities, eventually settling during the latter part of the analysis phase.

In collecting the data, I needed to be aware of the change of balance in the relationship between myself as a supportive colleague and myself as the researcher. I became the research instrument from my own perspective, but the transcripts indicate that my colleagues still saw me in my usual role. This was not only evident in the way that they addressed me, often using my name, but also in the searing honesty with which, I believe, they shared their views. In their responses they provided "*thick description*" (Geertz 1973, p.6) which caught the diversity, variability, creativity, individuality, uniqueness and spontaneity of the interactions in their human experiences (Cohen *et al.* 2000, p.139). It is for the honesty and detail of their responses that I retained as

much of their narrative as I could. I trust that I have been able to do justice to their stories through my interpretations.

### 8.7.2 Scientific reflection

The path through the literature resulted in the conceptual framework using the terminology of the sustainability of innovations: convergence, mutuality and extensiveness. This terminology provided a framework with which to describe the interplay or effect of the identified factors rather than the themes themselves. The conceptual framework was ratified in use.

The place of this study is in the description of a particular context from a participant researcher point of view. Based on the literature this case is specifically one that does not emphasise exemplary projects. Many of the studies on ICTs had identified schools that were exemplary in their ICT use or specific projects that were exemplary in the way in which they employed ICTs. From these exemplary projects, taxonomic factors were extracted and described as important to the innovative use of ICTs. However, the limitations of these studies were that they were unable to identify *how* such factors interacted. In seeking convergence, mutuality and extensiveness it has been possible to describe the *effect* of such factors, albeit there was little evidence of extensiveness within the context.

The literature differentiated between sustainability and institutionalisation of innovations. Institutionalisation occurs when an innovation is assimilated into the culture of an organisation and becomes a part of it, losing its own identity (Miles 1983 cited in Billig, Sherry & Havelock *et al.* 2005, p.987). A sustainable innovation is one that retains its own identity and endures over time as part of the organisational culture (Billig *et al.* 2005, p.987). Teaching and learning innovations are sustainable when they become part of and are integrated within the individual and institutionalisation and integration of innovation on a personal level cannot be separated. Interactions with colleagues are crucial to continuous learning about different innovations and helping teachers avoid pitfalls in sustaining the innovations (Lane 2001, p.89-

90). Although the terminology originated in Sherry & Gibson's *Systemic Sustainability Model* (2002, p.9) I believe that they apply equally to institutionalisation of innovation, particularly in the light of Lane's contention on institutionalisation and personal innovation (Ch. 2 Section 2.4.4, p.70). Whether an innovation is sustained or institutionalised is immaterial in this case. What is important is that innovation is stimulated and diffused through interaction with colleagues to enable professional and organisational learning.

### 8.7.3 Substantive reflection

This study set out to describe the effect of context on teachers' ability to innovate, and to innovate in particular with ICTs. At the outset, the relation between innovation and ICTs was not specified; rather it was left to emerge through the findings.

Innovation in the educational context is defined as pedagogical practices that promote active and independent learning; encourage collaborative and project-based learning in real-world contexts; heighten sensitivity to individual needs and diversity; redefine traditional space and time learning configurations; and increase parent and community connections with the school (Mioduser *et al.* 2003, p.26). Factors identified as critical to the innovation process included, *inter alia*, ICT infrastructure and ICT policy. While this relationship is specified in the literature, the findings also show a direct relationship between ICTs and innovation. For some teachers (e.g. Henry, Francois, Bronwyn and Ineke) ICTs and innovation were inextricably bound together with curriculum innovation. For Richard, ICTs formed a separate curricular component, but the use was generative. For the Physical Science teachers the innovation is largely in the improvement of traditional methods of delivering curriculum. ICTs help solve Maria's problem of distributed delivery across a diverse staff. No matter the nature of the innovation, without ICTs none of these innovations could have occurred.

Research on successful innovative educational pedagogies (Nachmias *et al.* 2004, p.296; Tearle 2004, p.345) highlights the inter-relatedness of contextual



factors. In the case of the Israeli study, the authors acknowledged that their research produced shallow results and suggest that further research investigates the relative importance of the factors that affect innovation, their relation to the innovation life-cycle and the correlation between the factors and the nature and properties of innovation (Nachmias *et al.* p.306-307). While this study did not build directly on their recommendations, it has been able to shed some light on the relationships between similar factors which emerged from this specific context.

#### **8.7.4 Personal reflection**

Constructivist learning is not limited to students *per se*, but is equally applicable to teachers' professional learning and to the process of research as a learning activity (Rossman & Rallis 2003, p.5) in which the report becomes the construction of the researcher's reality as an interpretation of the reality of the researched. This study has synthesised multiple perspectives drawn together from the literature and through my interpretation of my colleagues' realities. In researching their context I have been afforded privileged insight into their realities. The unique case that is Wilding College has been amalgamated through a process of social construction of knowledge. The report is mine and the learning on my part has been immense, but the stories are those of my colleagues and this study has served its purpose if benefit accrues to but one of them.

In working with my colleagues on a daily basis, I have a privileged vantage point. Mine is not the hierarchical advantage which implies rank, judgement or evaluation; rather it is the advantage of encountering and understanding day-to-day realities and pedagogic needs of teachers and it is to these ends that this study has been directed.

#### **8.8 Recommendations**

Recommendations for policy and practice and for further research are provided in sections 8.8.1 and 8.8.2

### **8.8.1 Recommendations for policy and practice**

The conceptual framework for this study, as illustrated in Figure 2.5 (Ch.2 Section 2.8.1, p.98), shows potential diffusion of innovations across boundaries between individual teachers within and beyond the boundaries of their subject discipline. Collegial relations, collaborative practice and socially constructed professional learning are processes that bridge the divide between individuals, subject disciplines and different levels of the hierarchy in secondary schools. These processes allow the diffusion of innovations and support their institutionalisation. For benefit to diffuse from an individual teacher's practice to the organisation as a whole therefore requires these processes to be present in a school. For benefit to diffuse beyond the organisation requires networks or wider communities of practice.

The policy and practice recommendations of this study are therefore:

- Secondary schools need to understand the interplay of convergent and disconvergent factors and how they affect each teacher's ability to innovate.
- Secondary schools should establish strategies and processes for bridging the individual and discipline-related boundaries that inhibit the diffusion and institutionalisation of innovation in teaching practices.
- The potential of the school ICT infrastructure should be harnessed to scaffold professional learning and the lateral and vertical extension of innovative ideas in a professional learning community.
- Teachers' professional learning processes should be scaffolded in the same way as student learning processes and be customised to individual need.
- The potential of alternative ICT models should be investigated to address the problems of access that inhibit innovation as well as for their cost-effectiveness.
- Transparent processes for the design, support, benchmarking, evaluation and implementation of teacher-generated innovations

The effect of context on teachers' ability to innovate with information and communication technologies in secondary schools

should be established in order to ensure consistent and equitable delivery of curriculum.

### **8.8.2 Recommendations for further research**

Further research into context-specific factors was called for by Breuleux (2001, p.7). On the other hand, Zhao *et al.* (2002, p.484) contended that innumerable studies existed on contextual factors, but that they were limited as they did not identify the characteristics of such factors, their applied contexts and the relationship amongst the factors. This study has responded to these calls. However, a single case is not exhaustive and further research along similar lines is indicated in order to establish whether similar ranges of patterns of effects exist.

This study has also provided an unusual perspective in that my role in the school as teacher-librarian is different to that of a school leader or a classroom teacher. The interpretations of similar incumbents in different contexts may shed light on the expectations of the role in 21<sup>st</sup> Century school libraries.

Wilding College is a monastic independent school. A similar study in a variety of different schools may further illuminate the effects of context.

Follow-up action research within the school itself is also indicated.

### **8.9 Limitations of the study**

Common limitations of case studies are that results may not be generalisable, it is difficult to cross check for data selectivity or bias and that, as it involves the researcher as a participant in the process, the interpretations will always be subjective (Nisbet & Watt 1984, p.76).

This study does not centralise ICTs but focuses on the context in which they are integrated. It is not a longitudinal study, but looks instead at a transverse

The effect of context on teachers' ability to innovate with information and communication technologies in secondary schools

period in time, recognising that dynamic change is continuous. This study does not claim generalisation to the full context or from one context to the next, rather it shows how the combination of factors affects each individual in a unique way.

The study may have benefited from action research as opposed to individual research, but given the time limitations on Wilding teachers it is unlikely that progress could have been made as a joint endeavour, at least not during the period in which the new curriculum was implemented.

### **8.10 Conclusion**

This case study has described and documented the interaction between secondary school teachers and their context as they respond to multiple simultaneous changes in the school environment by innovating in their classroom practice, including innovating with information and communication technologies (ICTs). The study has responded to calls for research into context-specific factors and the findings have shown that each teacher is subject to a unique pattern of interaction of factors affecting their ability to innovate. Taken together with the literature the findings have been able to demonstrate the effect of context on teacher's ability to innovate.