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Chapter Two

Framework for integration of Information and Communication Technology in teaching and learning

2.1 Introduction

Various factors influence teachers integrating ICT into their teaching and learning practices. These interrelated factors are however often viewed in isolation. This chapter aims to identify the different influential factors that principals have to keep in mind when planning effective and sustainable ICT integration. An alternative approach is provided. The pertinent question is: What is the influence that principals have on teachers' uptake and sustainable use of ICT in their teaching and learning? In order to answer this question intensive literature review took place to determine the influential factors and indicate the interrelatedness of the determined factors. ICT op School (2006, p. 14) maintains there is insufficient recent and systematically-collected data on ICT leadership in education. This question forms the basis of this study on the influence of principals on teachers' ICT integration through TPD. While Gibson (2002, p. 319) states: "It is becoming increasingly clear that the importance of administrative support in the integration of technology, curriculum, and instruction is understated and under supported", Ho (2006, p. 7) remarks that: "The literature on technology leadership is scarce, fragmented, limited in scope and more likely to be prescriptive rather than be descriptive in nature." Kalake (2007, p. 53) indicates: "Research on what enables principals to effectively lead the implementation process and principals' perception on the challenges and preferences of training was not found." It is therefore important to identify and clarify the specific factors that contribute to teachers using ICT effectively in their teaching and learning practices, as well as increase an understanding of how principals develop and unfold effective ICT practice in their teaching environments through TPD (Becta ICT Research, 2005, p. 5).

School leadership plays a vital role in schools in leading school reform, implementing innovations and making improvements. West-Burnham (1992, p. 117) states that: "No school improves without being led." The able principal has the capacity to influence, lead and motivate teachers to better performance and encourages innovative changes in teaching and learning (Han, 2002, p. 294). Although the concept of the principals' role in ICT implementation has been acknowledged for many years, the focus has only recently been placed on the principal's contribution to the successful and sustainable implementation of

ICT in education. School leadership is frequently cited as a critical component of education reform, revival of teachers and successful schools (Akbaba-Altun, 2006, p. 186; Bush & Glover, 2004, p. 3; Ho, 2006, p. 1; Leithwood, 2002, p. 105; Thomas, 2006, p. 31; Walsh, 2002, p. 3). Therefore principals' involvement will determine how ICT will be used in education by teachers and learners (Drago-Severson, 2004, p. xxi; Johnson, 2004, p. xvii; Soule, 2003, p. 8; Zepeda, 1999, p. 14). The single most important theme from many studies on the implementation of ICT is the necessity for strong, committed leadership where knowledge and commitment goes far beyond just the mere support of ICT integration. Without extended commitment it is not possible to integrate ICT effectively into the schools education system (Walsh, 2002, p. 5). At the centre of informed leadership is a person who has come to grips with the complexity of effective ICT integration and who exercises his or her influence to ensure that all the enabling factors are in place and addressed (DoE, 2004a, p. 4). The SITES 2006 international comparative study confirmed that the principal holds the critical position in the effective and sustainable development of ICT integration in schools (Pelgrum, 2007, pp. 1 - 2). While many emphasise the importance of the teacher, and professional development as important factors in ICT integration, the focus has recently been placed on the principal. Little research is available on the relationship of critical factors for the integration of ICT in schools in relationship with the specific role of the principal in TPD.

Stoner's (1999, p. 1) adapted life cycle model of learning technology integration and Toledo's (2005, pp. 183 - 185) five-stage model of computer technology integration illustrates that through the deployment of TPD teachers precede through five progressive stages necessary for the effective and sustainable integration of ICT within a teaching environment (Figure 2.1). I base this literature review on Stoner's and Toledo's adapted conceptual framework. Becoming experts in the integration of ICT empowers teachers to use ICT effectively, enhancing their teaching and learning practices. The role of the principal is seen as the main influential factor on teachers' effective integration of ICT. From this simplistic model, it is evident that there are also additional factors (Figure 2.1) to be considered to provide a comprehensive answer to the question that underpins this study: "How do principals influence teacher professional development for the integration of ICT in their schools?"

2.2 Principals influence

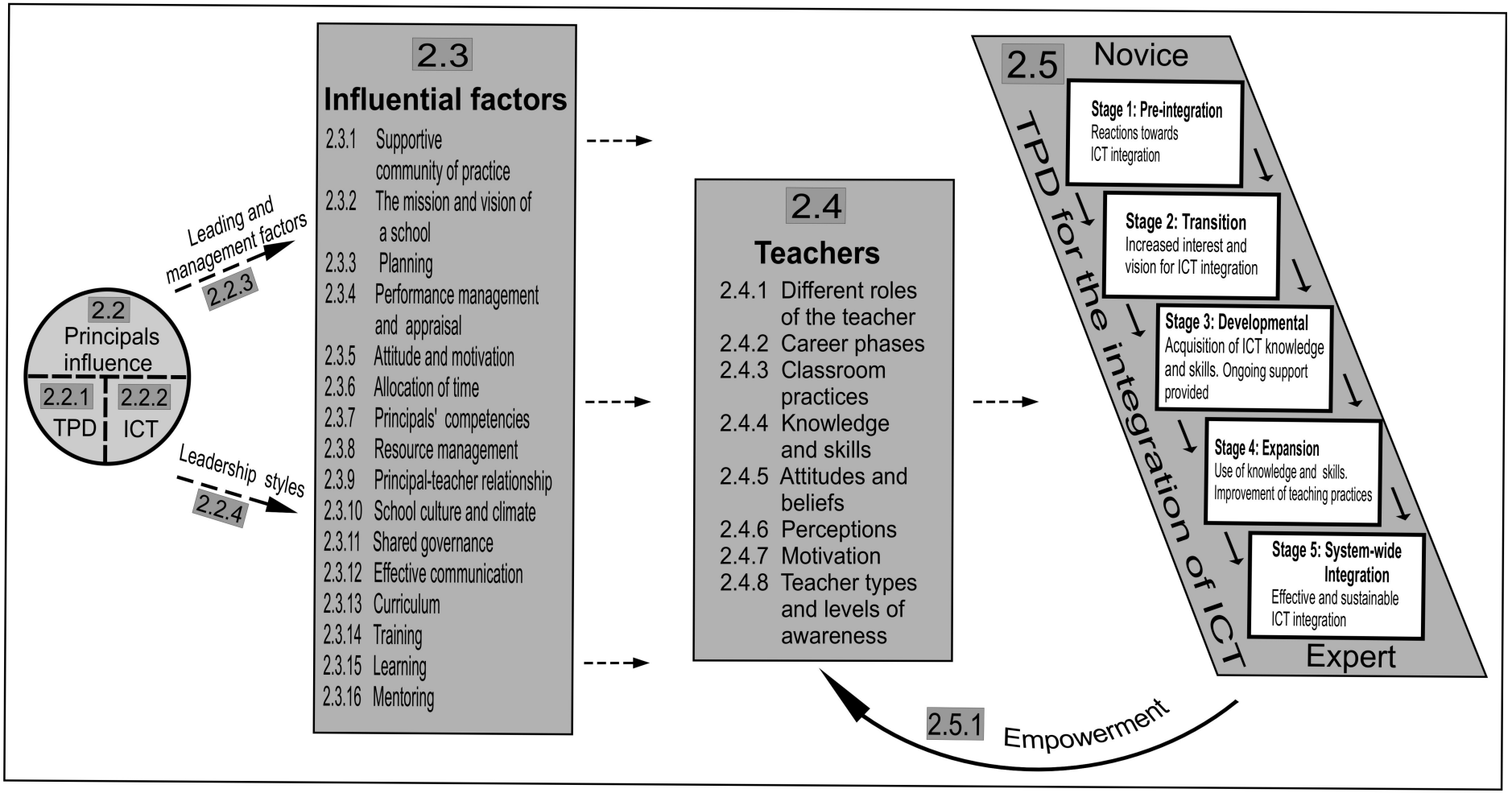
Changes in school environments are frequent and inevitable to keep abreast with the demands of the 21st century. All schools have a principal claiming the highest leadership position in the school. Just the mere fact of being in the position gives the principal authority to instigate and facilitate change. Principals are responsible for appropriate changes that

ensure an effective integrated education system. These accentuate the principals' influence on the effective and sustainable integration of ICT in their schools (Figure 2.1).

The important challenge for most principals is to know when to make significant strategic changes as well as choosing what strategic changes to make (Davies & Davies, 2005, p. 16). Principals should see the processes of teaching and learning as the prime function of the school (Davies, 2005, p. 5). They have enormous responsibilities regarding effective education and implementing appropriate change in their schools. The principal's leadership and management will influence the teaching and learning in the school (Becta ICT Research, 2005, p. 4; Butler, 1992, p. 11; Knapp & Glenn, 1996, p. 9; Vallance, 2008, p. 290; Young et al., 2005, p. 25). It is therefore important that principals have an understanding of what actions and strategies to take, and which leadership and management style to apply to have a positive influence on teachers' ICT integration into their teaching and learning practices (Walsh, 2002, p. 3). Gibson (2002, p. 330) states: "It is clear that school leadership in the 21st century will require new skills, new knowledge, new behaviours and dispositions as well as a new vision." Principals should also adapt their leadership and management styles for change to be effective.

Without an effective principal a school will stagnate. When the required change does not take place effectively, leading to practices that are unsustainable; allowing teachers to fall back to their previous teaching strategies and learning methods. An effective principal enables teachers to perform at their best and creates an environment were teachers are willing to bring about appropriate change in order to ensure that effective teaching and learning takes place. Schools with effective principals exhibit conditions and factors that create environments which have a positive influence on the teachers. As Young, Sheets and Knight (2005, p. 134) note: "Nothing effective happens in an elementary or middle level school without the endorsement and support of the principal." A principal demonstrating effective leadership and management abilities that provide continuous support enables teachers to succeed in even the most challenging environment, whereas an in-effective unsupportive principal can undermine the work of even the most able, eager and committed teachers (Johnson, 2004, p. xvii; Southworth, 2005, p. 76).

Figure 2.1 **Stoner's life cycle model of learning technology integration and Toledo's five-stage developmental model of computer technology integration***



* Adapted from Stoner (1999, p. 1) and Toledo (2005, pp. 183 - 185).

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2.2.1 Principals influence on teacher professional development

Diaz-Maggioli (2004, p. 3) defines TPD: "As a career-long process in which educators fine-tune their teaching to meet student needs." Becta (2004b, p. 1) view TPD: "As a process by which teachers acquire and develop skills and know-how to become effective in the classroom. It is ongoing and enduring, in response to an environment which is changing." Day and Sachs (2004, p. 3) describe TPD: "As all the activities in which teachers engage during the course of a career which are designed to enhance their work." These above definitions emphasise that TPD is the various activities and opportunities that teachers engage with to better themselves in their teaching profession by improving their skills, knowledge and expertise. TPD therefore in the above-mentioned definitions refers to the participation of teachers in developmental opportunities in order to be better equipped as teachers (Steyn & Van Niekerk, 2005, p. 250). TPD entails more than the above definitions and explanations. Although very compact I believe that they are not the ideal definitions, and that most TPD activities do not achieve the attended goals. The most acceptable definitions regarding TPD adopt all the facets and concepts outlined by Schlager and Fusco (2003, p. 4). They view TPD as: "A career-long, content-specific, continuous endeavor that is guided by standards, grounded in the teacher's own work, focused on student learning, and tailored to the teacher's stage of career development. The objective is to develop, implement, and share practices, knowledge and values."

Principals' perceptions of the importance and relevance of TPD will determine to what extent they will initialise and sustain TPD (Figure 2.1). The principals should focus on improving the effectiveness of teachers. The provision and promotion of appropriate TPD opportunities can lead to the improvement of teaching and learning practices, allowing teachers to grow professionally by extending and renewing their knowledge and skills (Arnold et al., 2006, pp. 3 - 4). A way that a principal can provide and sustain supportive contexts for teachers is through TPD as it influences teachers' confidence levels, their inclination toward trying out new innovative ideas, as well as their attitude towards the teaching profession and creative classroom practices (Blase & Blase, 1994, p. 67; Center for CSRI, 2007, p. 2; Drago-Severson, 2004, pp. xxi, 38; Tallerico, 2005, p. 123). Gibson (2002, p. 320) and Theroux (2004, p. 3) point out that TPD creates a supportive environment and principals should encourage and create TPD opportunities were teachers can continuously share their expertise, success, frustrations and knowledge with one another. Although teachers should assume responsibility for their own development, principals should assist teachers by providing the necessary time, resources, support and encouragement to enable them to work towards their professional development and achieving the schools' goals (Blase & Blase,

2001, p. 78; Blase & Blase, 1994, pp. 61 - 62). Hezel Associates (2005-2006, pp. 2 - 4) indicate that principals have significant responsibilities when it comes to initiating, organising, planning and implementing TPD in their schools, especially through creating in-house training opportunities. It is important that principals support and encourage TPD activities that will enable teachers to engage in innovative practices by making use of ICTs in their teaching and learning (Becta ICT Research, 2005, p. 5; Berube et al., 2004, pp. 1 - 3; Chung, 2005, p. 2; Demiraslan & Usluel, 2008, p. 468; Drago-Severson, 2004, p. xxi; Han, 2002, p. 294; Roberts & Associates, 1999, p. 10; Scrimshaw, 2004, p. 5; Zepeda, 1999, p. 6). Clarke (2007, p. 131) emphasises that an effective TPD programme is a critical factor in a school that has to become an integral part of teachers' professional lives. This will ensure continuous improved teaching and learning, contributing to the school's excellence. Internationally, Becta ICT Research (2006, p. 41) indicates that despite the high level of training, teachers indicated that ICT was the common area in which they required more professional development. Contradictory, most principals indicate that their teachers' skills in ICT meet or exceed current requirements (Becta ICT Research, 2006, p. 38). It therefore remains a challenge for principals to provide TPD opportunities for individual teachers, and to positively influence teachers' thinking and beliefs about the importance of ICT integration into their teaching and learning practices (Ho, 2006, p. 4). Most importantly, principals have to create opportunities for TPD (Blase & Blase, 2001, pp. 14, 16, 23, 64; Blase & Blase, 1994, p. 9; Demiraslan & Usluel, 2008, p. 470; Han, 2002, p. 295; Thorburn, 2004, p. 9).

2.2.2 Principals role in teachers' use of Information and Communication Technology in teaching and learning

There is no turning back – the use of ICT in education has become part of the way we teach and learn. Teachers' use of ICT varies widely from no use at all to the delivery of instruction to learners, planning of lessons, communicating via e-mail, as well as personal use and keeping of records (Francis & Ezeife, 2007, p. 2). Wang and Woo (2007, p. 149) indicate that ICT integration is a comprehensive process of applying ICT to the curriculum that enhances teaching and learning. The primary factor that has an influence on the effectiveness of learning is the pedagogy design that justifies the how, why and way ICT is being used (Wang & Woo, 2007, p. 149). Teaching and learning methods change as educators increasingly employ ICT for efficient and effective education (Walsh, 2002, p. 5).

Principals are the cornerstone to promote the innovative use of ICT in their schools (Figure 2.1). Principals should encourage teachers to use ICT in their instructional practices (Ho, 2006, p. 2). Gibson (2002, p. 319) suggests that principals as the leaders in their schools,

should not underestimate the impact of integrating ICT into teaching and learning. They should be actively involved in every aspect relating to ICT integration, and attain competencies on the use of ICT to increase the chances that teachers will be successful in integrating ICT in their teaching practices. Thomas (2006, p. 41) confirms this view: "Institutional leadership in the form of the school principal and the school management team are seen as having significant influence on the integration of computers in the classroom."

Principals should pay attention to a wide array of factors that influence teachers' effective use of ICT. Principals that understand the value of ICT in education, have a positive motivation on teachers' attitude towards the use of ICT. Principals who are committed to ICT integration implement effective strategies to ensure that their schools are equipped with appropriate ICT infrastructure for teaching and learning. Gibson (2002, pp. 320 - 321) indicates attributes required for principals leading successful ICT integration. Principals themselves should use ICT. They should also attend training opportunities and be competent about every aspect of ICT integration. They should respond to specific issues in their schools and to the constant change that ICT integration demands. Principals should display sincerity and confidence, and demonstrate excellent communication skills to motivate their teachers. It is important that they have a clear vision about the goals of ICT integration that teachers can relate to. The culture and teaching environments at their schools should strive for excellence, encourage teachers to learn more about ICT integration, as well as providing the necessary and ongoing support. ICTs form an important component that can inspire teachers, assist them with the challenges of the teaching profession and promote their lifelong professional development (Dirksen & Tharp, 1996, p. 2; Jackson, 2000, p. 1; Leask, 2001, p. 61; Loveless & Dore, 2002, p. 154). ICT integration is more than just putting computers in classroom. Teachers are more likely to make use of ICTs in their teaching and learning practices if they are convinced of ICTs' effectiveness and usefulness (Jimoyiannis & Komis, 2007, p. 167).

To successfully integrate ICT into a school's education system requires a paradigm shift — an entire new way of thinking about teaching and learning. Principals' actions determine the attitude of teachers towards ICT integration, as well as teachers' commitment. Integration of ICT in teaching and learning demands a positive attitude towards ICT integration, as well as actions to create appropriate TPD opportunities for effective and sustainable ICT integration. The integration of innovative practices and changes do not happen without continuous involvement from the principal (Busher, 2006, p. 151; Seyoum, 2004, p. 3; Spurr, Rosanowski & Williams, 2003, p. 3; Tallerico, 2005, p. 100). From the above, it becomes

evident that principals should exhibit effective leadership and managerial skills (Vallance, 2008, p. 290; Walsh, 2002, pp. 4, 24).

2.2.3 Leadership and management

The nature and quality of the principal's leadership and management has a huge influence in the school's effectiveness with regard to teaching and learning (Figure 2.1). Many regard it the determining factor for the success and sustainability of educational change (Akbulut, Kesim & Odabasi, 2007, p. 2; Bush, 2003, p. 10; Dimmock & Walker, 2005, p. 78; Southworth, 2005, p. 76; Steyn & Van Niekerk, 2005, p. 6; Wallace & Poulson, 2003, p. 229). Many authors indicate a relationship between ineffective schools and weak leadership. For a school to become effective, it is vital for the principal to apply strategies and changes that will guide the school towards a clear purpose and direction (Bush, 2003, p. 183; Dimmock & Walker, 2005, pp. 68 - 69; Ho, 2006, p. 1).

The term *leadership* is associated with *management* and *administration*. Although different, they are all interrelated and of equal importance (Clarke, 2007, p. 1; Everard et al., 2004, p. 22; Green, 2000, p. 8; Prinsloo & Van Schalkwyk, 2008, p. 48). Clarke (2007, p. 1) states: "Strong leadership and good management are both essential for the success of a school, and a good principal is skilled in both." Everard, Morris and Wilson (2004, p. 23) and Clarke (2007, p. 2) indicate the relationship between leadership and management (Table 2.1).

Table 2.1 Leading and management factors *

Leading is concerned with:	Managing is concerned with:
• vision • strategic issues • transformation • ends • people • doing the right things • create the culture	• implementation • operational issues • transaction • means • systems • doing things right • operate within the culture

* Adapted from Everard, Morris and Wilson (2004, p. 23); Clarke (2007, p. 2).

Clarke (2007, pp. 1 - 3) maintains that *leading* is concerned with establishing a vision, and directing teachers to reach their predetermined goals and objectives. *Management* focuses on ensuring efficient operating circumstances and systems to maintain direction in order to ensure the attainment of predetermined goals and objectives. Leading is therefore concerned with creating the culture while managing operates within the culture. Leadership and management are interrelated and should not be studied in isolation: "Leadership is frequently seen as an aspect of management" (Prinsloo & Van Schalkwyk, 2008, p. 48).

Management is essentially about ensuring that a school runs smoothly, while leadership is about ensuring the school runs somewhere (Southworth, 2005, p. 83). It is evident from the literature that effective leadership and management are two crucial components in a principal's repertoire, necessary for successful and sustained ICT integration. It is therefore essential to determine what effective leadership and management entails.

2.2.3.1 Leadership

Leadership is about direction-setting, developing, influencing, inspiring, supporting and leading teachers towards the future to attain objectives and implement changes to improve teaching and learning (Bush, 2003, pp. 7 - 9; Clarke, 2007, p. 1; Davies & Davies, 2005, p. 11; Dimmock & Walker, 2005, p. 12; Ho, 2006, p. 3). "Leaders look outward and to the future. To them success is derived from future-focused change" (Clarke, 2007, p. 1). Good leadership is based on developing a vision that inspires others, establishing shared goals and objectives, setting high expectations in the quality of education, encouraging TPD, developing a framework that encourages participation and shared decision making (Chung, 2005, pp. 1 - 3; ICT op School, 2006, p. 14).

Foskett and Lumby (2003, pp. 172 - 173, 187) advocate transformational leadership where principals empower teachers. Transformational leaders promote organisational learning through a shared vision and mission; foster a collaborative climate of accepted group goals; convey performance expectations; provide appropriate models and individual support and intellectual stimulation; enhance participation in school decisions; build a productive school culture, and also ensure opportunities for TPD. Davies and Davies (2005, pp. 10 - 13) point out that strategic leadership is the critical characteristic of effective school development. Strategic principals give direction and compile a framework of the future requirements of the organisation. The function of the strategy is to translate the school's vision into reality; provide direction through a proactive transformational mindset. Without the principal's interest, enthusiasm and understanding, the school would not be strategically focused (Davies & Davies, 2005, p. 23).

Leadership does not occur in isolation. The particular setting, structure and nature of the organisation, goals, teachers, community, and resources determine the type of leadership (Davies, 2005, p. 2; Southworth, 2005, p. 77). Dimmock and Walker (2005, p. 94) point out: "Schools are complex systems of interrelated parts; to change the parts is to change the system and vice versa." Han (2002, pp. 296 - 297) adds: "Strong leadership is demonstrated by being a lifelong learner, a supporter, a change agent, a facilitator, a good role model."

Prinsloo and Van Schalkwyk (2008, p. 162) summarise aptly: “People look to the leader for clarity and direction.” Principals do not only have to demonstrate strong and effective leadership they must also display various management skills.

2.2.3.2 Management

Management entails the managing of various activities, issues and changes that involves the effective and efficient operation of an educational organisation to achieve organisational goals (Bush, 2003, pp. 7 - 9; Clarke, 2007, p. 1; Davies, 2005, p. 2; Sapre, 2002, p. 102). Clarke (2007, p. 1) states that: “Managers look inward, and to the present. To them success is derived from improved systems of control, predictability and order.” Establishing relevant aims and objectives are attainable and essential as they provide direction and underpin the management of a particular school. Effective management of teachers is crucial as they are the essential elements in the delivery of education. Everard, Morris and Wilson (2004, p. 35) state: “The key to effective management is the ability to get results from other people, through other people and in conjunction with other people. If the underlying psychology is wrong, the most carefully constructed system and techniques will fail.” Institutional management and personal relationships form the key aspects of educational leadership (Everard et al., 2004, pp. 15 - 16). Organisational structures and systems create frameworks for action across the school. Structures and systems are management tools that principals use for establishing conducive conditions to ensure quality education (Southworth, 2005, pp. 83 - 84). Van Deventer and Kruger (2003, p. ii) indicate that management is the process by which educational leaders use teachers and other resources in the school efficiently to satisfy educational requirements and cultivate a culture of effective teaching and learning.

Bush (2003, pp. 37 - 175, 186 - 189) identifies management models that principals follow during leadership: formal, collegial, political, subjective, ambiguity or a cultural model (Addendum 2.1). The models present different ways of managing and leading educational institutions, offering valuable insight into the nature of management and leadership in education. Schools are complex organisations and no single framework represents the management of a school. The events, situations and problems differ considerably between schools. Although management models assist in understanding the complexity of the situations (Bush, 2003, p. 189), they all have limitations. It is up to principals to choose appropriate models to manage and lead the different situations, events and problems at a school. The use of a variety of models increases the effectiveness of school management (Bush, 2003, pp. 194 - 195). Literature indicates that principals should not only have

knowledge of the different management styles but also know the various leadership styles in order to be effective in planning and initiating TPD activities for sustained ICT integration.

2.2.4 Leadership styles

Principals have their own unique ways of interacting with teachers and implementing leadership styles for optimum effect (Figure 2.1). The dynamic and changing demographics of schools, development of ICT, and frequent changes in education require different leadership approaches compared to the past. Schools require leadership that brings about transformation (Bush & Glover, 2004, p. 6; Davies, 2005, p. 3; Walsh, 2002, p. 9). Although authors list a variety of leadership styles (Addendum 2.2) (Beatty, 2005, pp. 122 - 123; Davies & Davies, 2005, pp. 10 - 28; Deal, 2005, pp. 113 - 119; Everard et al., 2004, pp. 21 - 22; Harris, 2005, pp. 165 - 169; Hentsche & Galdwell, 2005, pp. 145 - 146, 149 - 152, 155 - 156; Lambert, 2005, pp. 95 - 96, 98; Leithwood & Jantzi, 2005, pp. 38 - 39; Novak, 2005, pp. 44 - 46; Southworth, 2005, pp. 75 - 77, 88 - 89; Starratt, 2005, pp. 61 - 72) three basic styles are described in management literature: autocratic, laissez-faire and democratic (Bradley et al., 1991, pp. 92 - 97; Prinsloo & Van Schalkwyk, 2008, pp. 165 - 166; Van Rooyen et al., 2005, pp. 72 - 73). Principals should choose the leadership style appropriate to their circumstances. The styles are:

- *Autocratic leadership style* is typically a top-down authority style. Leaders make all the decisions relying on power and delegates little authority and only responsibility. They are submissive towards superiors, while dominating their subordinates. Although this style demoralises teachers as they are not recognised during decision making, it is effective as decisions are made quickly.
- *Laissez-faire leadership style* is characterised by an invisible leader that avoids making decisions, and is a master at delegation. This style is successful where teachers are highly creative and work independently. It may lead to teachers having a sense of aimlessness, lack of focus and direction.
- *Democratic leadership style* fits in between the previous two. The leader treats all as equal and teachers have a say in decisions. Power and decision making flows both directions and responsibilities are respected. It leads to increased teacher morale, but may be time consuming in cases where quick decisions are required.

Prinsloo and Van Schalkwyk (2008, p. 167) point out that there is not one correct style, as each has advantages and disadvantages. *Situational leadership* refers to principals that switch between different leadership styles in different circumstances. Teachers' motivation increases when principals lead and manage according to the requirements of a specific

context (Spurr et al., 2003, p. 3). Gibson (2002, pp. 323 - 324) observes that for principals to lead effectively they have to be visionary, proactive, and informed in their leadership to create efficient learning environments and effective decision-making.

Teachers should be involved in decision-making processes. They are empowered with a sense of ownership and sharing of responsibility (Leithwood, 2002, p. 100; Means, 1994, p. 183; Steyn & Van Niekerk, 2005, p. 42). Everard, Morris and Wilson (2004, pp. 51 - 52), Prinsloo and Van Schalkwyk (2008, p. 127) indicate different styles of decision-making:

- *Autocratic*: without consultation, teachers are merely informed of what is expected of them. This style is often used for routine matters.
- *Persuasive*: decisions are taken before consultation and then sold to others. It is not open to discussion and the principal uses powers of advocacy to explain and justify his decisions.
- *Co-determinate*: decisions are made either by consensus or majority basis, and individual responsibility is usually avoided.
- *Consultative / democratic*: teachers are involved and take part in significant decision-making opportunities (Mullen, 2005, p. 4).

Knowledge of the different leadership and management styles would allow principals to utilise resources effectively. Principals being able to adapt their decision-making according to particular circumstances and individual teacher's needs will lead to successful and sustained ICT integration through TPD.

2.3 Influential factors

There are various influential factors that have an impact on teachers integrating ICT into their teaching and learning practices (Figure 2.1). It is the responsibility of the principal to support teachers in their endeavour. Principals must realise the importance of establishing a school setting that assists teachers through TPD. Van der Westhuizen (1997, pp. 191 - 192) indicates that many aspects influence the relationship between a principal and teachers necessary for work satisfaction and overall contentment. Kalake (2007, pp. 143 - 145), having researched multiple case studies on enabling and constraining factors for ICT implementation, indicated that minimal prior planning, unclear organisational vision, inadequate policies, insufficient budgeting, and inappropriate teacher training all impacted on teachers' integration of ICT into the curriculum. Additional hindering factors for ICT implementation were principals' insufficient knowledge about ICT integration, as well as inappropriate decisions regarding ICT infrastructure. Principals that used computers daily

demonstrated enhanced knowledge and skills about using computers in education. This also enabled them to voice an opinion on the relevance of ICT in education. Therefore, for fundamental change to take place, it is essential that principals have a clear purpose linked to a sustainable vision for the school; make informed decisions, allocate resources appropriately according to the school's vision; create inclusive decision making structures; and provide continuous training to support teachers in their daily teaching and learning practices (Blase & Blase, 1994, pp. 9 - 10; Cowie & Jones, 2005, p. 3).

2.3.1 Supportive community of practice

Principals, in conjunction with the senior management team (SMT) are responsible for establishing and maintaining a community of practice (COP) to enhance excellent teaching and learning at schools (Figure 2.1). The way that principals lead and manage the school will influence the COP at their schools. Principals and teachers should work together towards continuous improvement by implementing a set of structures that support school improvements. School structures include organisational arrangements, and policies that explicitly create working conditions to support and inspire work towards whole school improvement (Butler, 1992, p. 11). It is essential that the COP and structures support the professional development effort as the effectiveness of professional development is context-specific and take into account teachers' life stage and career development, along with school-identified requirements (Day & Sachs, 2004, p. 297). COP is crucial where TPD is promoted, and where teachers are willing and enthusiastic to integrate ICT into their teaching and learning practices. The COP is an important enabling support agent for the integration of innovations and change. COP enables teachers to collaborate with professionals becoming an important support element for integrating ICT in teaching and learning (Day & Sachs, 2004, p. 221; Dean, 1991, p. 10; Drago-Severson, 2004, p. 24; Nolan et al., 2005, p. 4). The COP should support teachers to take risks, be innovative and develop professionally in a positive climate of motivated and high performance teachers (Tomlinson, 2004, pp. 130, 136).

When enthusiastic teachers return from TPD sessions, ready to change their practices, the principal must ensure that the COP assist them in their integration process. If they do not receive the required support, they will fall back into their old practices (Kovalchick & Dawson, 2004, p. 32; Rodrigues, 2005b, p. 60). Such an supportive environment allows for collaborative planning and shared decision making, provides essential training, as well as policy and curriculum expertise (Blase & Blase, 1994, p. 23). Lieberman (2000, p. 77) indicates that teachers require supportive conditions to sustain change. Principals should

create a collaborative working community where teachers are encouraged to share perspectives, beliefs and work together as a team to sustain and improve successful teaching and learning (Busher, 2006, p. 137). A collaborative working community helps to move away from an autocratic leadership style to a more democratic management style. If conducted correctly it becomes a successful means of school improvement and teacher empowerment (Steyn & Van Niekerk, 2005, p. 135). Collaborative approaches provide teachers access to relevant information and alternative perspectives, promote reflective practice, give support and constructive feedback, help develop a culture that supports TPD, facilitate change through encouragement and validate change (Blase & Blase, 1994, p. 59; Busher, 2006, p. 122; Drago-Severson, 2004, p. 70). Gibson and Oberg (1999, p. 6) state: "In a collaborative environment, professional development support can be given that is accessible, time saving and context-specific." Isolation from the support of colleagues can have a negative effect on teacher satisfaction, learning and effectiveness (Center for CSRI, 2007, p. 2). Support and guidance from colleagues can influence teachers' perspectives and behaviour (Demiraslan & Usluel, 2008, p. 470; McKenzie, 1999, p. 112; Rallis & Goldring, 2000, p. 46). There are numerous benefits when teachers take part in collaboration. Collaboration allows teachers to support and motivate each other, share expertise, plan together, reflect on teaching and learning practices which in turn leads to cooperation, reduced workload, effective communication and increased teachers' efficiency and confidence (Arnold et al., 2006, p. 3; Blase & Blase, 1994, p. 19; Drago-Severson, 2004, pp. 17 - 18; Glatthorn et al., 2006, p. 19; Inger, 1993, p. 1; Leask, 2001, p. 137; Rallis & Goldring, 2000, p. 46; Rodrigues, 2005b, p. 9).

Teachers in effective schools are reported to work collegially and to collaborate and achieve shared goals (Cowie & Jones, 2005, p. 9; Day & Sachs, 2004, p. 36). Teachers working together in teams become more effective, professional and efficient. This leads to improving the quality of education and creating better learning and teaching environments (Steyn & Van Niekerk, 2005, p. 113). Collegiality cannot be forced onto teachers as it takes time to develop and establish. Collegiality is essential for effective and sustainable implementation of educational change, activities and interactions (Day & Sachs, 2004, p. 222; Selwyn, 2002, p. 135; Thorburn, 2004, p. 5).

Teachers also require financial, personal and technical support when it is expected of them to learn and integrate ICT effectively into their teaching and learning practices (Becta ICT Research, 2003, p. 1; Buckenmeyer, 2005, p. 15; Han, 2002, p. 296; Scrimshaw, 2004, p. 10; Seyoum, 2004, p. 3). Teacher collaboration is one of the strategies that educational institutions can implement to assist teachers in the process of integrating ICTs. By

continuously creating opportunities for collaboration allow teachers to be in an environment where learning and development can take place on a regular basis (Darling-Hammond, 2005, p. 12). A collaborative learning environment between teachers is of utmost importance for sustaining effective integration of ICT in education (Brand, 1997, p. 4; Moonen & Voogt, 1998, p. 103; Zheng, 2003, p. 8). Collaboration creates the opportunity for teachers to discuss issues relating to ICT integration in teaching and learning. Teachers can share their achievements with colleagues and demonstrate the benefits that ICT integration can bring to education, problems with regard to ICT can also be discussed so that future mistakes can be avoided and all teachers can experience success (Becta ICT Research, 2005, p. 40; Ehman et al., 2005, p. 261).

2.3.2 The mission and vision of a school

An important component for effective and successful leadership is that principals should institutionalise and communicate a clear attainable vision because it creates direction and purpose for future success (Clarke, 2007, p. 2). The process of determining the school's vision involves the compilation of a mission statement that indicates the strategies that will be implemented to achieve pre-established goals. Development of a mission statement is important as it creates opportunity to determine the principles and values that will guide progress, purpose and key features of the school. The process of mission development promotes and aids various actions necessary to enhance and sustain effective teaching and learning (Arnold et al., 2006, pp. 2 - 3; Foskett & Lumby, 2003, p. 122; Tomlinson, 2004, pp. 133, 145). The vision can inspire and motivate teachers to work towards the attainment of aims and objectives, pave the way for TPD to take place, establish a standard of excellence, allow change to take place by making use of available skills, talents and resources, and ensure that management activities and actions are purposeful and functional (Arnold et al., 2006, p. 2; Berube et al., 2004, p. 2; Bush, 2003, pp. 6 - 7; Spurr et al., 2003, p. 3; Tomlinson, 2004, pp. 143 - 144; Wallace & Poulson, 2003, pp. 220 - 222; Young et al., 2005, p. 25).

Principals involving the teachers in the vision-making process will help to develop a shared vision, allowing teachers to make decisions and to contribute their knowledge, skills and positive attitudes resulting in ownership and the active use of such a vision (Arnold et al., 2006, p. 2; Becta ICT Research, 2005, p. 28; Becta ICT Research, 2006, p. 38; Bush, 2003, p. 3; Clarke, 2007, p. 3; Davies & Davies, 2005, p. 14; DoE, 2004a, p. 3; Drago-Severson, 2004, pp. 39, 105; Leithwood, 2002, p. 98; Prinsloo & Van Schalkwyk, 2008, p. 161). It is therefore necessary that principals, in conjunction with the teachers, develop and articulate a

clear vision of how TPD should be incorporated to bring about instructional changes in teachers teaching and learning for ICT integration to be sustainable (Ho, 2006, p. 3). Bush (2003, pp. 4 - 5) states the following: "Although governments have the constitutional power to impose their will no innovation will be implemented successfully without the commitment of those who have to implement the changes."

2.3.3 Planning

When the mission and vision has been determined, it is necessary for planning to take place. Prinsloo and Van Schalkwyk (2008, p. 74) describe planning as: "A systematic and continuous process during which needs must be determined, realistic and obtainable objectives set, and tasks defined in accordance with predetermined standards in order to achieve the set objectives." Planning is necessary to ensure an effective and efficient school (Clarke, 2007, p. 3). Effective principals assess current situations and resources, monitor the impact of TPD programmes so that they can make informed decisions and plan ahead for improved teaching and learning (Arnold et al., 2006, p. 3; Scrimshaw, 2004, p. 5). Although teachers should be involved in such planning, in many schools they are not involved (Foskett & Lumby, 2003, pp. 124 - 125).

In planning whole-school provision there must be a clear attainable vision and understanding of how ICT can enhance teaching and learning to provide a context in which ICT can become appropriate. The ICT integration plan must be customised to the school's culture, available resources and environment; entail a detailed description of the steps and methods required; as well as proposed completion dates to translate the school's ICT vision into reality (DoE, 2004a, p. 3). Leadership and planning factors influence the access and quality of ICT infrastructure. For example, it is necessary to plan ahead as computer infrastructure is usually replaced after every few years (Becta ICT Research, 2005, pp. 14, 24; Becta ICT Research, 2006, pp. 11, 15).

2.3.4 Performance management and appraisal

Tomlinson (2004, p. 10) maintains: "Performance management is about planning for performance, developing to improve performance, measuring performance and rewarding performance." Performance management entails the continuous communication of expectations, and creating the opportunity to share in enhancing the organisation's mission, values and objectives (Tomlinson, 2004, pp. 130, 132). Steyn and Van Niekerk (2005, p. 277) define appraisal as: "A continuous and systematic process to help individual teachers with their professional development and career planning and to help ensure that the in-

service training and deployment of teachers matches the complementary needs of individual teachers and schools." The purpose of performance appraisal is to improve the performance of teachers through the use of positive reinforcements for teachers who perform well, and to support, coach and warn teachers whose performance does not meet expectations (Clarke, 2007, p. 158). Appraisal is a process that assesses teacher's performance and it should be approached delicately as it involves a teacher's personal qualities and beliefs. Teachers must understand that appraisal is a mechanism through which TPD can take place and has the potential to improve the quality of teaching and learning (Steyn & Van Niekerk, 2005, pp. 280, 297).

In South Africa performance management is demanded by the DoE. In South African schools the DoE uses the *Integrated Quality Management System* model for school improvement. The results of the development appraisal consequently form the basis for the development of the school improvement plan. The responsibility for developing the school improvement plan rests with the school development team of which the principal is a member (Clarke, 2007, p. 132). This offers an opportunity for the principal to aid in, develop and refine the teachers' personal growth plan. Through the inclusion of the integration of ICT into teachers' personal growth plan, teachers get the opportunity to indicate their competency relating to the effective integration of ICT into classroom practices. An entire school's results can then be analysed and used as basis for compiling a relevant TPD plan focused for the integration of ICT into the curriculum.

Individual schools can also develop internal plans and measures of rewarding performance. Principals should have the initiative and resources to reward teachers. One way of influencing and modifying teacher behaviour is through positive reinforcement (Rallis & Goldring, 2000, pp. 48 - 49; Steyn & Van Niekerk, 2005, pp. 155 - 156; Tomlinson, 2004, pp. 132 - 134). Rewards can be extrinsic or intrinsic. Extrinsic rewards include tangible rewards such as monetary compensation, less working hours, time off for TPD, allowing teachers to have a say in choosing the grades and learning areas they would like to teach; or by relieving teachers of duties, more status and power. Intrinsic rewards are subjective and focus on feelings of competence, achievement and prestige that contribute to motivated and encouraged teachers. Both types of rewards are intended to maintain energised and positive behaviour. Successful principals determine the appropriate type of reward for the particular situation and the individual teacher. Praise, recognition, encouragement and gratification also have a positive impact when it is sincere, appropriate and deserved. The simple but sincere act of praising and encouraging teachers appears to be a primary, effective and

valued form of reward for teaching (Blase & Blase, 2001, p. 123; Steyn & Van Niekerk, 2005, p. 169).

Offering of incentives and a school environment conducive to teacher learning can improve teaching and learning that results in a lasting and positive change (Akbulut et al., 2007, p. 2; Carlson & Gadio, 2002, p. 123; Drago-Severson, 2004, p. 55; Thorburn, 2004, pp. 5 - 6). Incentives should however be considered carefully. While group rewards motivate some teachers, individual rewards can increase competition among some teachers (NCREL, 2000, p. 5).

The provision of personal laptops can instigate a variety of changes. In some schools teachers are recognised with ICT hardware such as laptops. Cowie and Jones (2005, pp. 3 - 6) indicate that laptops have a positive impact on teachers' personal and professional development. However, evidence of the success of this strategy is limited as not many schools can afford this initiative (Jamieson-Proctor et al., 2006, p. 512; Scrimshaw, 2004, pp. 19 - 20).

2.3.5 Attitude and motivation

Principals' actions and attitudes affect teachers' empowerment and general morale. Principals should have a positive influence on teachers. Negativity is demoting and hampers the functioning of a school, attainment of objectives and opportunities for development (Blase & Blase, 1994, p. 79; Demiraslan & Usluel, 2008, p. 470; Foskett & Lumby, 2003, p. 192; Steyn & Van Niekerk, 2005, p. 23).

It is essential to keep teachers motivated towards the teaching profession. Frequently changes in the system have an influence on the school environment. Thorburn (2004, p. 5) points out: "Imposed change can lead to low morale, dissatisfaction and reduced commitment as it usually requires teachers to acknowledge their inadequacies." For principals to motivate individual teachers it is important that they should understand what motivates each individual teacher. Principals should recognise the importance of and promoting teachers motivation as it is conducive to teachers performing optimally (Everard et al., 2004, p. 25; Foskett & Lumby, 2003, pp. 79 - 80; Steyn & Van Niekerk, 2005, p. 143).

Principals are in a position to positively motivate and influence teachers' attitude towards the integration of ICT in their teaching and learning practices. By creating and ensuring that teachers take part in TPD opportunities will assist in boosting teachers' confidence levels and

attain ICT knowledge and skills. The encouragement of ICT integration and ongoing appropriate motivation will ensure that teachers are committed to achieve the established goals (Blase & Blase, 1994, p. 75; Foskett & Lumby, 2003, p. 76).

2.3.6 Allocation of time

The implementation of innovative change takes time. Time is one element that teachers never have enough of (Everard et al., 2004, p. 5). The principal can influence the working patterns of teachers through ensuring optimal and effective utilisation of available time by eliminating time wasters that prevent teachers from improving their skills and practices (Edgerson & Kritsonis, 2006, p. 3; Steyn & Van Niekerk, 2005, p. 15; Tallerico, 2005, p. 106; Zepeda, 1999, p. 49). It is necessary to create time for TPD (Cope & Ward, 2002, p. 10; Glatthorn et al., 2006, p. 58; Rallis & Goldring, 2000, p. 49; Tallerico, 2005, p. 119). Insufficient time not only prohibits attendance of TPD activities, but it also leads to a stressful working environment which diminishes the quality of instruction, morale, effectiveness and commitment (Center for CSRI, 2007, p. 1). Teachers require time to learn new technologies and integrate their newly learned skills into their teaching and learning practices (Bradley et al., 1991, p. 14; Buckenmeyer, 2005, p. 14; Carlson & Gadio, 2002, p. 124; Day & Sachs, 2004, p. 28; Knapp & Glenn, 1996, p. 222; Means, 1994, pp. 215 - 216; Theroux, 2004, p. 3; Woodbridge, 2004, p. 2; Zepeda, 1999, p. 85). When teachers do not have sufficient time to incorporate new innovations, skills or strategies, they usually revert back to their previous teaching and learning practices. Allocation of sufficient time is therefore a key element for teachers to successfully integrate ICT into their daily teaching and learning practices (Scrimshaw, 2004, p. 11).

2.3.7 Principals' competencies

Prinsloo and Van Schalkwyk (2008, p. 115) describe knowledge as: "Information, data, facts, theories and concepts that have been contextualised. Knowledge is used to clarify and understand logic, sequences and relationships." Principals constitute the role model in a school. It is therefore necessary for them to practice what they preach. Gibson (2002, pp. 321 - 322) and Han (2002, p. 295) point out that due to continuous education change, it is essential for principals to regularly update their own ICT knowledge and skills to ensure that appropriate changes are implemented. Southworth (2005, p. 88) states: "Leadership learning is necessary because creating learning schools rest, in large measure, on the quality of leadership." Principals should be knowledgeable about organisational strategies, planning and development processes, curriculum, instruction, assessment and TPD to be able to guide teachers to bring about real change (Arnold et al., 2006, p. 3; Berube et al.,

2004, p. 2; Busher, 2006, p. 155; Drago-Severson, 2004, p. xxi; Kalake, 2007, pp. 56 - 57). For principals to influence teachers' sustainable and effective ICT integration it is necessary that they themselves realise the impact of ICT on education (Seyoum, 2004, p. 3; Theroux, 2004, p. 3; Walsh, 2002, p. 23).

2.3.8 Resource management

Schools require resources to function optimally. Foskett and Lumby (2003, p. 129) describe resources as: "The means by which the processes of education can be operationalised." They categorise resources into three groups: financial, physical and human resources (Foskett & Lumby, 2003, p. 129). Principals should know what resources are available in order to optimally employ what is available. They should have the necessary skills to plan, organise, control and develop the resources in order to fully meet their schools' challenges and requirements (Everard et al., 2004, pp. 6 - 7; Tomlinson, 2004, p. 165). For teachers to be successful, principals should take the necessary steps to ensure that appropriate, flexible and instructional resources are available when teachers require them (Center for CSRI, 2007, pp. 2 - 3; Gordon, 2003, p. 3; Scrimshaw, 2004, p. 5). Drago-Severson (2004, p. 44) points out: "If resources are scarce it will be necessary to build upon teachers' intrinsic motivation for professional development." The retention of qualified and recruitment of expertise teachers in specific learning areas are difficult. It has become a challenging issue for most principals to manage their teachers effectively (Foskett & Lumby, 2003, p. 63). Many principals find themselves in an environment where financial resources are not readily available. This hampers the successful integration of ICT. Principals then have to implement creative strategies to generate funding. Insufficient resources negatively impact on teachers learning and teaching as it determines the frequency, quality and the number of teachers that can undergo TPD (Drago-Severson, 2004, pp. 53 - 54).

Functional technological infrastructure and facilities must be available before teachers can integrate ICT on a regular basis in teaching and learning activities (Becta ICT Research, 2004b, p. 3; Cowie & Jones, 2005, p. 10; Han, 2002, p. 296; Means, 1994, p. 177; Seyoum, 2004, p. 2). However, the availability and access to an infrastructure for ICT does not guarantee that teachers integrate ICT effectively (Buckenmeyer, 2005, pp. 3, 9; Rodrigues, 2005b, p. 19; Seyoum, 2004, p. 3; Zhao & Bryant, 2006, p. 58). Although many schools have been provided with sufficient computers and adequate facilities, teachers' use of these facilities and computers are limited. This is often due to insufficient funding for TPD in the use of ICT (Carlson & Gadio, 2002, p. 125; Day & Sachs, 2004, p. 75; Guru & Percy, 2005, pp. xiii, xiv; Selwyn, 2002, p. 23; Seyoum, 2004, p. 3). It is therefore necessary to allocate

sufficient resources to TPD. With continuous technological advancements and limited financial resources, principals have to be creative in generating sufficient funds for effective and sustainable ICT integration and ICT infrastructure (Seyoum, 2004, p. 1; Walsh, 2002, p. 19).

2.3.9 Principal-teacher relationship

Leadership entails understanding and acknowledging the requirements and contributions of individual teachers to maximise their strengths and minimise their limitations for the benefit of the school (Prinsloo & Van Schalkwyk, 2008, pp. 162 - 163). Teachers have different personalities, requirements and find themselves in different personal surroundings. Principal-teacher relationships vary considerably, even within the same school environment. Principals should know their teachers well enough to make appropriate decisions and demonstrate the correct relationship behaviour to address the individual requirements of teachers. It is therefore necessary to not only focus on work-related issues, but also on personal issues. This will lead to stronger approval and support for the principal's leadership style (Busher, 2006, p. 139; Steyn & Van Niekerk, 2005, p. 154). Principals should have the ability to influence teachers positively about themselves, but also toward their teaching profession by focussing on the fundamental components inherent of quality relationships. As a result of meaningful interactions with their principals, teachers feel appreciated and willing to perform optimally and more effective teaching and learning practices consequently result (Edgerson & Kritsonis, 2006, p. 2). Acknowledging teachers' individuality and knowing their particular personal circumstances will guide the principal to apply appropriate relationship strategies and to develop each teacher optimally (Busher, 2006, pp. 82 - 83; Johnson, 2004, p. xviii).

2.3.10 School culture and climate

According to Sergiovanni and Starratt (1988, p. 106) and Kruger and Steinman (2003, p. 14) the school culture is part of the school climate and they influence one another. The culture of the school can be reflected in its climate. The school culture refers to a set of norms, values, beliefs, rituals and ceremonies, symbols, assumptions and stories that make up the *persona* of the school (Diaz-Maggioli, 2004, p. 5; Leithwood, 2002, p. 99). It also refers to the *ethos* or *atmosphere* at a school (Busher, 2006, p. 84) and guides teachers and learners to behaviour that is appropriate to the school (Bradley et al., 1991, p. 41; Busher, 2006, p. 84). Every school therefore has its own particular characteristics that constitute the school's unique climate. These characteristics are interrelated the way they function in a particular school and create a climate that will either hinder or support the teaching and learning. This

climate also has an effect on the teachers' behaviour and the way they see themselves, their attitude towards the school and to what extent they will achieve the goals and objectives of the school. It also informs relationships with colleagues.

Prinsloo and Van Schalkwyk (2008, p. 70) observe that: "A culture of teaching and learning in a school will influence a productive and positive classroom environment which is conducive to effective teaching and learning." Principals are primarily responsible for determining and maintaining the climate and the culture of schools. Therefore they also influence the teaching and learning that occur at the school (Arnold et al., 2006, p. 3; Blase & Blase, 2001, p. 97; Gordon, 2003, p. 4; Spurr et al., 2003, p. 4). Principals shape school cultures according to particular schools' situational factors, resources and challenges (Drago-Severson, 2004, p. 41). It is important that the principal creates and sustains an environment where teacher learning can flourish and continuous development can take place through the provision of necessary resources (Blase & Blase, 2001, pp. 16, 80; Day & Sachs, 2004, p. 36; Drago-Severson, 2004, p. 39; Sallis & Jones, 2002, p. 96; Young et al., 2005, p. 26). It is not only the principal that has an impact on the school culture, the teachers' perception of the principal as a leader is also important (Berube et al., 2004, p. 2).

There is widespread agreement that the kind of culture required in schools is characterised by collaborative and collegial relationships, support, teacher reflection, participative decision making, shared purpose and values, continuous professional development and sustained interest in improved teaching and learning (Blase & Blase, 1994, p. 11; Diaz-Maggioli, 2004, pp. 5 - 6; Leithwood, 2002, p. 99; Southworth, 2005, p. 85). Teachers require more than just knowledge about incorporating ICT in education. They also require an ongoing supportive climate and culture for sustainable, effective and institutionalised change (Akbulut et al., 2007; Chen & Chang, 2005; Cowie & Jones, 2005; Dirksen & Tharp, 1996; Gibson & Oberg, 1999; Girod & Cavanaugh, 2001; Ho, 2006; Knapp & Glenn, 1996; Leask, 2001; Loveless & Dore, 2002; Means, 1994; Moonen & Voogt, 1998; NCREL, 2000; Rodrigues, 2005b; Shelly et al., 2004; Simonson & Thompson, 1997; Spurr et al., 2003; Thorburn, 2004; Webber & Robertson, 1998). To sustain such a collaborative culture, it is necessary that the principal facilitate and support a conducive work environment (Butler, 1992, p. 12). Principals should strive to improve teachers' working conditions and morale, develop a culture in which teachers work together for the common good and develop the capacity and commitment of teachers (Glatthorn et al., 2006, p. 56; Spurr et al., 2003, p. 3). Although principals can determine, modify and maintain the schools culture, they can also be a product of it and in some instances also be constrained by it (Busher, 2006, p. 87).

Cultures where teachers' growth is associated with learning and development, incorporate continuous professional development activities in the workplace. This enables teachers to translate theory into practice by meeting the requirements of teachers (Day & Sachs, 2004, p. 154; Drago-Severson, 2004, p. 32; Rallis & Goldring, 2000, p. 51). It is necessary that principals should build a culture of innovation and encourage ICT use in teaching and learning practices. Principals can ensure that there is a detailed blueprint of the steps and methods needed to translate the school ICT vision into reality helping to build a culture where ICT becomes an integrated part of teaching and learning, enabling teachers to become familiar with the integration of ICT in education (DoE, 2004a, pp. 3 - 4).

2.3.11 Shared governance

The concept of *shared governance* may be defined in many ways: *shared leadership*, *collaborative decision making* or *distributed leadership* (Busher, 2006, p. 16; Mullen, 2005, p. 4). Principals should delegate power, authority and responsibility as they alone cannot achieve the set aims and objectives (Schumaker & Sommers, 2001, pp. 28 - 29; Tomlinson, 2004, p. 99). Although principals through delegation entrust teachers with authority and responsibility, the principal remains accountable (Prinsloo & Van Schalkwyk, 2008, p. 57). Successful shared governance principals realise by incorporating teachers in the decision-making process, it is essential to empower teachers, and that co-operative decision-making is the foundation of shared governance (Blase & Blase, 2001, p. 41). Inviting teachers to assume responsibilities creates the opportunity for teachers to learn, grow professionally, make decisions and become involved. This provides teachers with a sense of ownership in the overall operation of the school and will contribute to a positive and enthusiastic teacher corps (Blase & Blase, 2001, p. 65; Drago-Severson, 2004, p. 100). Steyn and Van Niekerk (2005, pp. 19 - 20) point out that delegation should be supplemented with the necessary resources, expectations and rewarding of performance. The authors also warn that principals should not use delegation strategies as a means to avoid responsibility. Care should be taken not to over-delegate, and also not to interfere after a task has been delegated.

2.3.12 Effective communication

Effective change demands effective communication. Through communication, principals can convey the required change, as well as how the change should take place. Effective communication is not reliant on the receiving or sending of information, but depends on a two-way communication which entails effective listening and feedback (Arnold et al., 2006, p. 2; Schumaker & Sommers, 2001, p. 1; Steyn & Van Niekerk, 2005, p. 42). Steyn and Van

Niekerk (2005, p. 40) indicate: “Effective communication occurs when the sender’s intended meaning and the receiver’s perceived meaning are virtually the same.” In order to determine if the sender’s and the receiver’s meaning are in agreement, it is necessary for the recipient to give feedback in the form of a reaction or response to the message. Principals require constant communication with a wide array of people in a number of ways about various issues. Principals require good communication skills as change in education have become complex and demanding. Various communication media are to the avail of the principal. ICT facilitate many of these today. The principal should choose the appropriate medium while keeping in mind the content, importance and objective of the message as well as the intended audience (Steyn & Van Niekerk, 2005, pp. 31, 33, 36, 37). Prinsloo and Van Schalkwyk (2008, p. 83) conclude that effective communication affects the efficient running of the school.

2.3.13 Curriculum

Shelly, Cashman, Gunter and Gunter (2004, p. 6.08) state that: “The key to successful ICT integration is identifying what you are trying to accomplish within your curriculum.” Curriculum can be described as an interrelated set of plans and experiences that a learner accomplishes under the guidance of a learning institution (Marsh, 1997, p. 5), that results in learning (Diaz-Maggioli, 2004, p. 5). It is the responsibility of the teachers that the curriculum reaches the learners and that the outcomes of all the different learning areas are met and to promote the intellectual, personal, social and physical development of learners (Busher, 2006, p. 106; Jacobs et al., 2004, p. 26).

Shelly, Cashman, Gunter and Gunter (2004, p. 6.05) point out that the curriculum should drive ICTs. Teachers should use appropriate ICTs for the particular learning content to enhance learning. ICTs should not be seen as a separate discipline. It must enhance the existing curriculum areas through integration as a resourceful tool to teach, rather than as a separate subject to teach about (Guru & Percy, 2005, pp. 5 - 6; Wang & Woo, 2007, p. 149). ICT is not transformative on its own. ICTs require teachers to integrate it successfully into the curriculum and instructional framework, align it with teaching and learning outcomes and use it for engaged learning projects (Kovalchick & Dawson, 2004, p. 33; NCREL, 2000, p. 1). Shelly, Cashman, Gunter and Gunter (2004, p. 6.05) state that ICT: “... cannot enhance learning unless teachers know how to use and integrate ICT into curriculum-specific or discipline-specific areas.” The computer is a tool for generating and modifying curricula, enabling teachers to incorporate the latest approaches into their teaching and learning (Albion, 1999, p. 1; Di Benedetto, 2005, p. 2; Leask, 2001, p. 181; Somekh & Davis, 1997, p.

100; Wikipedia, 2006, p. 3). Plomp, Anderson, Law and Quale (2003, p. 16) point out that learning with ICT indicates the use of various computer applications that enhances teaching and learning practices. Learning through ICT means that ICT is integrated so completely as an essential tool in the curriculum that the teaching and learning of that curriculum is no longer possible without it. Curriculum support involves providing continuous assistance and guidance to teachers in their use of ICT in the curriculum as well as the provision of TPD activities that focus on ICT training and integration (Becta ICT Research, 2003, p. 1).

South African teachers experience difficulty in effectively integrating ICT into the curriculum (Brand, 1997, p. 1; Jamieson-Proctor et al., 2006, p. 523; Kalake, 2007, p. 147; Paul, 1999, pp. 6 - 7; Zhao & Bryant, 2006, p. 53). There is also little evidence of teachers integrating ICT into the curriculum on a regular basis (Di Benedetto, 2005, p. 2). The curriculum often lacks explicit indication of how to integrate ICT into the curriculum (Di Benedetto, 2005, p. 2; Guru & Percy, 2005, pp. 4 - 5; Loveless & Dore, 2002, p. 99; Zheng, 2003, p. 5). TPD on the integration of ICT in the curriculum is required (NCREL, 2000, p. 1; Seyoum, 2004, p. 7). Learners do better when teachers have received training on ICT integration, than those learners whose teachers did not have the training on ICT integration (Thorburn, 2004, p. 7). Teachers should participate in professional development activities where the emphasis falls on intensive curriculum-based ICT training (Zhao & Bryant, 2006, p. 53). Day and Sachs (2004, p. 242) maintain: ”There is no curriculum development without teacher development.”

2.3.14 Training

Inadequate training and experience is one of the main reasons why teachers have negative attitudes toward ICT and therefore do not use ICT in their teaching and learning practices (Asan, 2003; Gillani, 2003; Jimoyiannis & Komis, 2007; Seyoum, 2004; Stephens & Crawley, 1994; Tenbusch, 1998; Thorburn, 2004; Woodbridge, 2004; Zhao & Bryant, 2006). A training strategy for ICT integration should become part of the school culture. Every school should have its own particular training strategy to support teachers to achieve pre-determined goals and objectives (Tomlinson, 2004, p. 47). Teachers then realise the importance of training to guide them in achieving educational objectives and to make use of every possible training opportunity (Stephens & Crawley, 1994, pp. 81 - 82; Tomlinson, 2004, p. 47). Infrastructure and teacher support is not enough to ensure effective ICT integration. When teachers believe they do not have the necessary skills or knowledge to use ICT effectively, they tend to feel uncomfortable in an ICT-enabled environment (Thorburn, 2004, p. 6; Zhao & Bryant, 2006, p. 57). Teachers should be provided with training that will boost their confidence and their abilities (Brand, 1997, p. 7; Scrimshaw, 2004, p. 10; Thorburn, 2004, p. 2). Although

novice teachers often have the knowledge and skills in using computers when they enter the teaching profession, they are rarely equipped with skills to integrate ICT into their teaching and learning practices (Guru & Percy, 2005, pp. 3 - 4; Roberts & Associates, 1999, p. 8; Woodbridge, 2004, p. 2). Teacher training should be a continuous process that provide regular updates on ICT development and integration in education (Seyoum, 2004, p. 5).

Most ICT-related TPD comprises passive sessions with no opportunity to practice the presented material (Rodrigues, 2005b, p. 6; Schlager & Fusco, 2003, p. 1). TPD in ICT requires more than what the traditional training approaches can offer (Phelps et al., 2004, p. 2). It must be ongoing and an integral part of TPD (NCREL, 2000, p. 2). Long-term involvement starts from the teachers' perspectives and provide ongoing support to enable them to take ownership of the process (Berube et al., 2004, p. 4; Rodrigues, 2005b, p. 87; Zhao & Bryant, 2006, p. 54). Teachers feel frustrated and overwhelmed when too much information and too many programs are introduced within a limited time frame, and when no attention is given to their previous ICT abilities (Drago-Severson, 2004, p. 34; McKenzie, 1999, p. 79; Zhao & Bryant, 2006, p. 57). Means (1994, p. 18) states: "There is a tremendous need for teacher training that will demonstrate to teachers the potential of various technologies; and of technical assistance that would help them to identify particular technologies and applications to serve their purpose; and show teachers how to use these technologies in instruction." The reappraisal of training activities require establishing the training requirements of the teachers, the design and delivery method of the training activities, as well as post-training assessment and support (Tomlinson, 2004, p. 97).

Kante (2003, p. 1) indicates the number of teachers who require training usually exceeded financial, human and technical capabilities. The complexity and content of training, as well as the expectations of what teachers should know and be able to do are constantly increasing. Most national decision-makers presume that as soon as teachers have been trained to use ICT, success will follow. Cox, Preston and Cox (1999, p. 4) indicate training alone is not effective to sustain the use of ICT in their teaching and learning practices. They indicate that more attention should be given to factors that motivate teachers to adopt new behaviour. Training can be one way of motivating teachers to use ICT in their teaching practices, but training does not guarantee that teachers will integrate ICT more effectively. Other factors such as teachers' perception and attitude also contribute to the success of ICT integration (Albion, 1999, p. 2; Zhao & Bryant, 2006, p. 58).

2.3.15 Learning

Over the years teachers have become reluctant to attend any activity that has to do with training due to the fact that they are forced to attend TDP that they deem unnecessary. They often regard training sessions as time wasted, or that the training ultimately entails more work. Learning in education usually involves teachers discovering that they do not know something, or that they have been doing something wrong. These factors tend to make teachers negative towards development and they resist any indication of change that will follow (Schumaker & Sommers, 2001, pp. 47 - 52). Change and learning are like the opposite sides of a coin: whenever there is change, learning must follow; and when learning takes place, it leads to change (Tomlinson, 2004, p. 48). Change is a process that takes time and it can not be expected of teachers to immediately incorporate the change into their current teaching and learning practices. Change entails individual growth and development in terms of the change itself, as well as the acquisition of new skills and knowledge. Effective training takes into account the nature of learning and the fact that learning requires change (Butler, 1992, p. 2). TPD involves learning. When TPD takes place, teachers engage in meaningful interaction with the content and through the interaction, learning takes place. This eventually leads to visible changes in the teachers' attitudes towards their professional teaching and learning practices (Day & Sachs, 2004, p. 220).

Day and Sachs (2004, p. 13) point out that teachers have to engage in direct learning (workshops and conferences), learning in schools (mentoring, colleagues, research, teamwork and appraisal), as well as learning out of school (reform networks and professional development centres) if they want to keep up with change in education. Learning is a complex process as it encompasses a person's knowledge, skills, insight, beliefs, values, attitudes and habits and requires inner learning (intrapersonal sense-making), as well as outer learning (relating to and collaborating with others) (Day & Sachs, 2004, p. 36; Tomlinson, 2004, p. 48). The collaborative approach is advocated for teacher learning, because it helps to develop a culture that supports learning and development (Drago-Severson, 2004, p. 39). Teacher learning is most likely to occur when teachers focus on relevant issues in the specific learning areas which they teach; have sustained opportunities to study; when they can experiment with innovations and receive appropriate feedback; when they have opportunities to collaborate with colleagues; and have access to expertise knowledge (Day & Sachs, 2004, p. 47). Young, Sheets and Knight (2005, pp. 4 - 5) indicate that adults learn best when they are goal orientated, internally motivated, self-directed, involved in their own learning and seek out learning experiences when faced with change.

2.3.16 Mentoring

Mentoring is a way of supporting teachers to ensure that they acquire the necessary knowledge and skills (Cowie & Jones, 2005, p. 9; Steyn & Van Niekerk, 2005, p. 266). A mentoring programme focuses on learning. The mentor usually has more knowledge and experience in a specific area, and also has the ability to transfer the acquired knowledge and skills to another person. Through this process a relationship is formed that often involves a long-term goal (Drago-Severson, 2004, pp. 123 - 124; Mullen, 2005, p. 2; Tomlinson, 2004, p. 104; Young et al., 2005, p. 2). Mentoring is commonly used interchangeable with coaching, assisting, guiding, advising, leading, teaching, learning, readiness, support, compensation, counselling and socialisation (Mullen, 2005, p. 2; Tomlinson, 2004, p. 104). A mentor should be able to communicate effectively, build relationships, encourage and motivate, solve problems, handle conflict, guide and set goals (Young et al., 2005, p. 12). Mentoring creates a supportive learning environment where teachers can modify their current practices and get the opportunity to enhance their self-development (Busher, 2006, pp. 142 - 143; Drago-Severson, 2004, pp. 18, 138; Zepeda, 1999, p. 111). Principals usually employ mentors for new teachers to help them to become familiar with the environment and culture of the school (Glatthorn et al., 2006, p. 86). For mentorship to have a positive and lasting effect, it should be part of the school culture (Mullen, 2005, p. 6; Zepeda, 1999, p. 78). A mentoring programme assists in the development of committed and competent teachers, establishing a school environment that strives for excellence in teaching and learning (Clarke, 2007, p. 128).

Mentoring can aid teachers who are reluctant ICT users. Mentors should support teachers on different ICT levels, skills, preferences and abilities; helping them as individuals to integrate ICT effectively into their teaching and learning practices (McKenzie, 1999, p. 111; Shelly et al., 2004, p. 6.16; Zhao & Bryant, 2006, p. 60). A mentor can also help teachers locate applicable ICT resources or tools for a specific learning area (Massachusetts Department of Education, 2002, p. 17). Effective mentors share the responsibility of integrating ICT effectively as they assist and support teachers with planning and attainment of the necessary confidence, knowledge and skills. Teachers are empowered to apply newly acquired strategies, knowledge and skills into their teaching and learning practices. Mentors should through continuous assessment keep track of the teachers development (McKenzie, 1999, pp. 112 - 115).

The identification and knowledge of the influential factors for teachers' effective ICT integration is important for principals as it will enable principals to identify and pay attention

to the factors that restrain effective ICT integration. Principals should apply their leadership and management skills to ensure that the influencing factors are in place to ensure optimum utilisation of TPD opportunities that could lead to sustained ICT integration. It is not only the various influential factors (§ 2.3) that principals have to consider but also various teacher factors.

2.4 Teacher factors in professional Information and Communication Technology development

Teachers tend to react to ICT according to the factors indicated in Figure 2.1. These factors will determine the effective and sustainable use of ICT. Effective teachers are the determining factor in quality education and change in education ultimately rely on teachers (Borko, 2004, p. 3; Chen & Chang, 2005, p. 1; Jacobs et al., 2004, p. 24). Teachers have different important roles to fulfil in education. Principals should therefore focus on influencing teachers positively to integrate ICT effectively. Some change has lasting effect while others having no impact at all. Change as such is very difficult for most teachers, especially when they are in a situation where everything is going well, or they have been teaching for quite a long time, and when they do not see the necessity for change (Rodrigues, 2005b, p. 56; Schumaker & Sommers, 2001, p. 41). The effect that change has on teachers' will differ according to individual teachers and their particular circumstances. Change because of its very nature, is a difficult concept for teachers to accept as change includes the acceptance of new beliefs or altering existing beliefs. Change is a process not an event (Walsh, 2002, p. 5) and teachers must adapt to change personally and developmentally. Teachers' personal concerns are pivotal to their ability and willingness to adapt and change (Lieberman, 2000, p. 77). Constant changes in education make teachers reluctant to take part in any action that involves change and therefore makes the integration of ICT a complicated innovation (Guru & Percy, 2005, pp. 2 - 3; Moonen & Voogt, 1998, p. 99). Butler (1992, p. 11) indicates that effective innovative change goes through three stages: change often starts through TPD (initiation); used in classrooms (implementation), and then becomes part of the school (institutionalisation).

The way teachers see themselves as professionals and identify with other professionals, will have an influence on their teaching practices and their behaviour. Diaz-Maggioli (2004, p. 6) indicates: "That a true teaching professional is a teacher who is engaged with a career path that encourages, fosters, and rewards constant professional growth that reflects directly and positively back on classroom practice." Teacher development is also a process of personal

development and factors concerning personal development may hinder the achievement of professional development goals.

Teachers should perceive ICT integration as practical and beneficial before real integration will take place (Moonen & Voogt, 1998, p. 100). Educational ICT is not, and will never be transformative on its own. Teachers are required to integrate ICT appropriately and effectively into education (Carlson & Gadio, 2002, p. 1). To integrate ICT effectively teachers should make two radical changes: they must learn how to use ICT, and fundamentally change how they teach (Scrimshaw, 2004, p. 13).

2.4.1 Different roles of the teacher

Prinsloo and Van Schalkwyk (2008, pp. 110 - 111) indicate seven significant roles of teachers in the education environment. Teachers' have various roles that they have to fulfil in their teaching professions. Teachers can integrate ICT in all the roles to enhance the roles:

- *Learning mediator:* Teachers are learning mediators and have to be sensitive to the diverse requirements of learners. They construct learning environments; are knowledgeable of subject content and they apply various principles, strategies and resources.
- *Interpreter and designer of learning programmes and materials:* Teachers interpret, plan and design learning programmes and decide on the most suitable learning materials.
- *Leader, administrator and manager:* Teachers are the leaders, administrators and managers in their particular classrooms and are responsible for their learners.
- *Scholar, researcher and lifelong learner:* Due to numerous changes in the education system, teachers remain scholars, researchers and life long learners.
- *Community, citizenship and pastoral role:* Working with learners from different communities and social environments signifies that the teacher also has a community, citizenship and pastoral role to fulfil for the learners placed in their care.
- *Assessor:* Teachers are responsible for the continuous assessment of learners' progress, as well as the assessment of current teaching and learning practices in their specific learning areas.
- *Learning area / subject / discipline / phase specialist:* Teachers should be specialists in their particular learning areas, and to make optimal use of the teaching and learning time allocated for that particular learning area while implementing the most suitable approaches to particular situations.

Teachers can use ICT in all the seven roles to empower them and lead to whole school improvement. TPD can assist teachers in attaining the required skills and knowledge to make optimal use of ICT in all seven roles.

2.4.2 Career phases

It is necessary for the principal to have knowledge of the different phases teachers find themselves in over time in their teaching profession. By identifying the phase that the individual teacher is in, will assist the principal to apply the most appropriate strategy to support the teacher in integrating ICT effectively. Steyn and Van Niekerk (2005, p. 255) distinguish between the following phases:

- *Survival phase* (first year in teaching): Most teachers are hesitant to try out new approaches and welcome guidance and support from experienced teachers.
- *Adjustment phase* (two to four years experience): Teachers are now more confident and ready to experiment with new approaches.
- *Adult phase* (more than four years experience): During this phase teachers are more receptive to change and ready to take on new responsibilities. They also become more aware of TPD.

Teachers in different phases have different requirements with respect to their personal growth and development. Their orientation to change and development also differ. Teachers seek different sources of knowledge and learn in different ways at different times in their careers (Day & Sachs, 2004, p. 155). These aspects make it difficult for the principal to cater for individual teachers and to ensure that individual teachers benefit from TPD activities (Johnson, 2004, p. xviii). The teachers' individual histories and life experiences shape their interactions with the environment they find themselves in. Their personal development, as well as their professional life cycle affects their choices. Teachers at different phases of career and personal lives want different goals and they are able to achieve different qualities of performance (Busher, 2006, p. 30). The career phase that the teachers find themselves in will determine to what extent they will integrate ICT into their teaching and learning practices. Teachers' current classroom practices will also affect their attitude towards ICT integration and to what extend they will go to integrate ICT effectively.

2.4.3 Classroom practices

Classroom practices are an indication of how teachers go about in their daily teaching and learning activities. Classroom practices also refer to teachers' behaviour or the way teachers perform in the classroom (Diaz-Maggioli, 2004, p. 3). Teachers apply and exhibit particular

individual learning and teaching styles in their classrooms. These individual classroom practices have an influence on the manner in which teachers attend to their daily classroom activities.

TPD must be applicable and relevant to teachers' current classroom practices and experiences (Rodrigues, 2005b, p. 75). One of the goals of TPD is the integration of ICT effectively into classroom practices. ICT can assist teachers in their classroom practices, allowing for individual creativeness. Through implementing new practices, teachers can adapt and apply their skills and knowledge to fit their particular classroom environment (Chen & Chang, 2005, p. 4). Teachers should use ICT as an effective tool for curricular instruction. Integrating ICT implies that the teacher should create a ICT rich environment where ICT gets used to infuse the teaching and learning practices. This implies that measurement of success will not be determined on how well the learners use the computers, but how well they learned the subject matter (Nichols, 2006, p. 1). Teachers use ICT mainly for administrative tasks such as lesson planning, communicating with parents and doing assessment, but rarely is ICT used to enhance teaching and learning practices (Soule, 2003, p. 8).

2.4.4 Knowledge and skills

Teachers should have the necessary strategies, knowledge and skills to be able to teach effectively in a particular learning area. As teachers sometimes have to teach various learning areas and different grades in their teaching careers for which they did not receive the appropriate training, they have to regularly take part in professional development activities to increase and update their knowledge and skills. Teachers should keep track of the latest curriculum developments and use the best teaching and learning strategies to maintain a high standard in education. Changes in teacher knowledge and skills can be addressed through professional development (Albion, 1999, p. 1).

The vital skills to use ICTs with confidence and efficiency are of utmost importance for education in the 21st century (Akbulut et al., 2007, p. 1). Effective ICT integration in education requires that teachers have the relevant ICT knowledge and skills (Albion, 1999, p. 1; Asan, 2003, p. 154; Chen & Chang, 2005, p. 4). Teachers have to learn ICT skills in context. Skills learned in isolation do not lead to the motivated use of the skills (Thorburn, 2004, p. 2). Many teachers do not have the knowledge or skills to recognize the potential for ICT in teaching and learning. Just knowing how to use ICT is not enough (NCREL, 2000, p. 1). Enthusiasm increases as a teacher gains more computer skills and knowledge, which in

turn fosters a positive attitude towards computer use (Zheng, 2003, pp. 4 - 7). The integration of ICT in teaching and learning depends on knowledgeable, confident and enthusiastic teachers who are motivated and are prepared to integrate ICT effectively (NCREL, 2000, p. 1; Rodrigues, 2005b, p. 58).

Teachers are at different levels when it comes to skills and knowledge about ICT integration into the education system. Kovalchick and Dawson (2004, pp. 27 - 30) describe the different changes that teachers go through in the use of ICT in five progressive levels: entry, adoption, adaptation, appropriation and invention. The *entry stage* is characterised by teachers having little or no experience in ICT use and show little inclination to change instruction. During the *adoption stage*, teachers are more interested to integrate ICT, but insufficient experience leads them to replicate their traditional instructional strategies. ICT is thoroughly integrated into traditional classroom practice in the *adaptation stage*. The *appropriation stage* is the turning point where there is a change in attitude and the value of ICT is understood, and integration becomes effective. During the final *invention stage,* teachers start experimenting with new teaching approaches and ICT integration becomes effective and sustainable.

2.4.5 Attitude and beliefs

There are various factors that determine teachers' attitude towards TPD. The culture, ethos and environment of the school, resources available, quality of leadership and management will have an influence on teachers' attitude towards TPD. There are various significant factors that influence teachers' use of ICT in education and it will be a challenge for any TPD programme to ensure sustained effective ICT integration. TPD should be more than the mere training of teachers to acquire the necessary skills in the use of ICT. Effective TPD takes into consideration various factors that are crucial for teachers to have confidence for ongoing learning. ICT integration varies according to individual teaching beliefs, perceptions and attitudes towards ICT uptake, prior experience and how the teachers incorporate ICT into their practices (Ajzen, 1988; Asan, 2003; Basinger, 2003; Bradley et al., 1991; Buckenmeyer, 2005; Busch, 1995; Day, 1999; Ehman et al., 2005; Francis & Ezeife, 2007; Jimoyiannis & Komis, 2007; Kovalchick & Dawson, 2004; Lieberman, 2000; Moonen & Voogt, 1998; Nolan et al., 2005; Phelps et al., 2004; Woodbridge, 2004). When teachers implement ICT in their teaching practices, they are not only required to make use of ICT but also exhibit positive attitudes and beliefs towards ICT in education (Seyoum, 2004, p. 5). Webber and Robertson (1998, p. 3) confirm this: "Successful learning manifests itself in alterations to beliefs and practices." Studies on the uptake of ICT by teachers have revealed that teachers exhibit a wide range of obstructive behaviours that lead to resistance to the use

of ICT (Jimoyiannis & Komis, 2007, p. 150; Leask, 2001; Selwyn, 2002; Somekh & Davis, 1997; Zheng, 2003). Leask (2001, p. 226) states: "Teachers do not adopt computer ICT in emotionally neutral ways." Teachers' attitudes towards ICT have an influence on their uptake, integration and sustainability of ICT into their learning and teaching practices. The attitude and beliefs of teachers towards ICT has an influence on the sustained use of ICT in classrooms (Asan, 2003, p. 154; Buckenmeyer, 2005, pp. 11, 14; Busch, 1995, p. 148; Chen & Chang, 2005, p. 7; Gibson & Oberg, 1999, p. 2; Thorburn, 2004, p. 2; Zhao & Bryant, 2006, pp. 53 - 54). Some teachers may not want to use computers for teaching even when they are available (Nawawi et al., 2005, p. 88). Teachers should have a positive attitude towards ICT for effective implementation and integration of ICT in education (Asan, 2003, pp. 153 - 154; Seyoum, 2004, p. 6; Zepeda, 1999, p. 80). Teachers' prior knowledge or experience with computers will have an influence on their attitude towards ICT use. Teachers who have confidence in their ICT abilities will exhibit a positive attitude towards the use of computers (Busch, 1995, p. 152; Zheng, 2003, pp. 6 - 7). Teachers should be comfortable when using ICT and have confidence in their ICT ability are two important components for the successful integrating of ICT in education (Chen & Chang, 2005, p. 3). Ajzen (1988, p. 120) maintains: "People's attitudes influence their adoption of certain behaviours and that their attitudes are determined by salient beliefs about that behaviour." Applying Azjen's theory to teachers' uptake and integration of ICT in their daily teaching and learning practices will depend upon their positive intention to use ICT. Cox, Preston and Cox (1999, p. 6) indicate that particular attitudes and beliefs perceived by the teacher can be categorised into three components to determine the uptake of ICT in education (Table 2.2).

Table 2.2 Beliefs and attitudes*

Attitude towards the behaviour	Subjective norm	Perceived behavioural control
• The effects on their role as a teacher • The impact on pupils' motivation • The impact on the teachers' influence • How the behaviour might affect other teachers • Information they have about the value of ICT • Previous experiences in using ICT • Expertise in using ICT • Expectation that it will contribute to the learning process	• Perceived social pressure • Pressure from colleagues • Pressure from requirements of the national curriculum • Pressure from educational reforms, parents, pupils and the media	• Extent to which teachers believe themselves to be capable of using ICT in their teaching • Influenced by past experience as well as anticipated impediments and obstacles

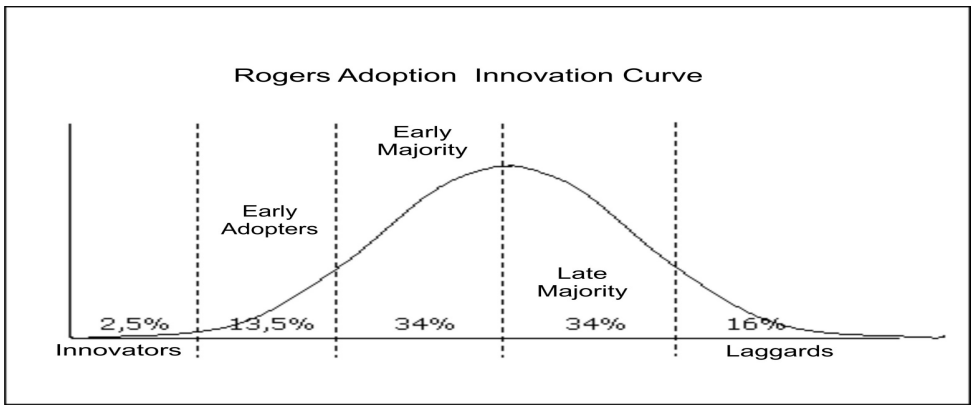
* Adapted from Cox, Preston and Cox (1999, p. 6).

According to Cox, Preston and Cox (1999, p. 6) (Table 2.2), teachers' prior believes and attitudes will have an influence on their integration of ICT into their teaching and learning practices. Attitude towards the behaviour are determined by teachers' previous experience,

attained knowledge and skills, expectations and value of ICT, the impact that ICT will have on the school, learners, colleagues and themselves. Subjective norms are an indication of pressure perceived by the teacher from people or organisations to use ICT. Perceived behavioural control refers to teachers' past experiences, anticipated obstacles and beliefs in their capabilities of using ICT.

Teachers also do not have the same attitude towards and experience of integrating ICT into their teaching and learning practices. Some will grasp at every opportunity to make use of ICT, while others have little interest in ICT and will even avoid every opportunity. Roger's Adoption Innovation Curve model (Figure 2.2) classifies adopters of innovations into various categories.

Figure 2.2 Roger's Adoption Innovation Curve*



* Adapted from Waters (2008, p. 1).

Knowledge about the adoption stages provides background for the principal on how to choose appropriate strategies for effective ICT integration (Sallis & Jones, 2002, p. 109; Scrimshaw, 2004, p. 15; Theroux, 2004, p. 3; Thorburn, 2004, p. 2): These different levels and categories should be considered when implementing teacher training.

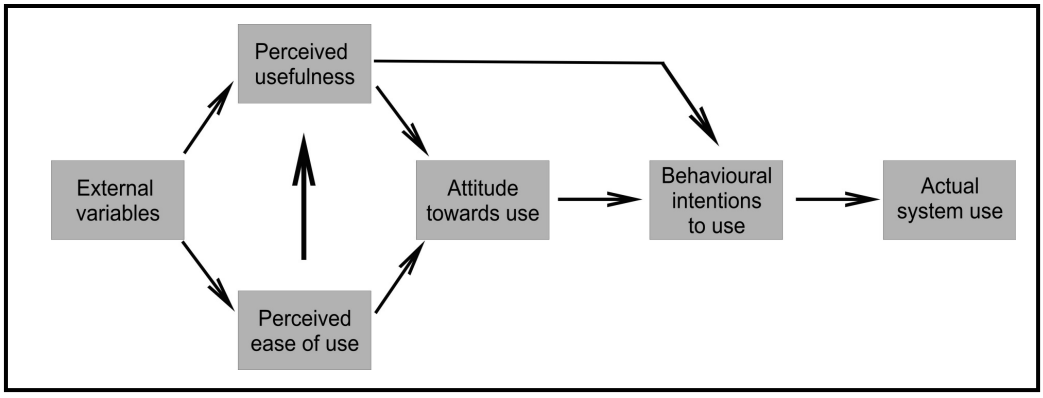
- *Innovators* (first 2.5%): the risk-taker willing to take the initiative and time to try something new
- *Early adopters* (next 13.5%): tend to be respected group leaders, the individuals essential to adoption by whole group
- *Early majority* (next 34%): the careful, safe, deliberate individuals unwilling to risk time or other resources
- *Late majority* (next 34%): those suspect of or resistant to change. Hard to move without significant change

- *Laggards* (last 16%): those who are consistent or even adamant in resisting change, pressure required to force change (Berglund Center Summer Institute, 2002, pp. 1 - 2; Latina, 2000, p. 1; Waters, 2008, pp. 1 - 2).

Teachers near retirement often do not see the necessity to become knowledgeable in the use of ICT. They are often sceptical, unenthusiastic and show little commitment, while beginner teachers are often computer literate and eager to use ICT in their classes (Day & Sachs, 2004, pp. 11 - 12; Roberts & Associates, 1999, p. 10). Training should be flexible to suit all the teachers and also be comprehensive enough to provide skills and knowledge for all levels and categories (Tenbusch, 1998, p. 4).

Davis, Bagozzi and Warshaw (1989) investigated the reasons why people use computers and their attitudes towards them. In their technology acceptance model (Figure 2.3) they linked the perceived usefulness and ease of use with attitudes towards using ICT and actual use.

Figure 2.3 Technology acceptance model*



* Adapted from Davis, Bagozzi and Warshaw (1989).

Davis, Bagozzi and Warshaw (1989) found that people's computer use was predicted by their intentions to use it and that perceived usefulness was also strongly linked to these intentions. Glatthorn, Jones and Bullock (2006, p. 22) indicate: "The key to success lies in how technology is experienced and applied." Teachers' beliefs are a significant factor when integrating ICT successfully as beliefs determine how teachers handle tasks and problems and is a strong predictor of behaviour (Albion, 1999, p. 2; Asan, 2003, p. 154; Bajares, 1992, p. 311). It is also important to take teachers beliefs into consideration when implementing TPD. Teachers are more willing to change when their beliefs are aligned with new teaching and learning practices (Ehman et al., 2005, p. 257). Teachers with appropriate experiences of ICT view the relevance of integrating ICT in teaching and learning (McCain & Jukes, 2001, p. 113; Zheng, 2003, p. 8). Teachers should personally experience the advantages of ICT

and become committed users before they can effectively integrate ICT into their classrooms (Knapp & Glenn, 1996, p. 31).

Perceived self-efficacy and attitudes go hand in hand and are important predictors when it comes to the uptake of a task, the effort put into the task and the persistence to accomplish the desired outcomes of that task (Busch, 1995, pp. 147, 151; Chen & Chang, 2005, p. 7; Eastin & LaRose, 2000, p. 5; Francis & Ezeife, 2007, p. 5; Webber & Robertson, 1998, p. 10). Self-efficacy is essential to overcome the fear many novice users experience (Eastin & LaRose, 2000, p. 3). Self-efficacy represents a person's beliefs about being able to organise and execute the courses of actions required to manage prospective situations (Albion, 1999, p. 3; Busch, 1995, p. 147; Eastin & LaRose, 2000, p. 2; Tomlinson, 2004, p. 3; Wikipedia, 2006a, p. 1). Albion (1999, p. 2) maintains: "Self-efficacy beliefs are important, and measurable, component of the beliefs that influence technology integration." According to Albion (1999, pp. 3 - 4) self-efficacy beliefs can develop in response to four sources of information or experiences. The first type and most powerful influence, is when self-efficacy increases when behaviour is successfully performed. The second influence is when similar people are seen to perform particular behaviour successfully and the saying *if they can do it, I can do it as well* applies. Another source of influence if it is realistic and positive is verbal persuasion that can encourage efforts that lead to increased efficacy through success. Self-efficacy beliefs can also be effected by a person's physiological and affective state such as stress. It is therefore necessary through TPD to increase teachers' self-efficacy beliefs in their ability to use computers in order for teachers to effectively incorporate ICT in their teaching strategies, as a lack of confidence for teaching with ICT will have an influence on the levels of ICT usage (Albion, 1999, p. 3).

The provision of TPD activities is an important way of improving teachers' competence and confidence in using ICT in their teaching. The SITES 2006 study indicate that teachers' willingness to participate in ICT professional development is influenced by the perceived relevance to their current teaching and learning practices. Attendance was influenced by teachers' willingness to participate, but a determining factor was availability. Attendance at pedagogically oriented ICT-related professional development activities contributed positively to the likelihood that the teachers would use ICT in their teaching. It was also found that teachers are generally much more willing to attend pedagogically oriented rather than technically oriented ICT-related professional development activities (Law & Chow, 2007b).

2.4.6 Perceptions

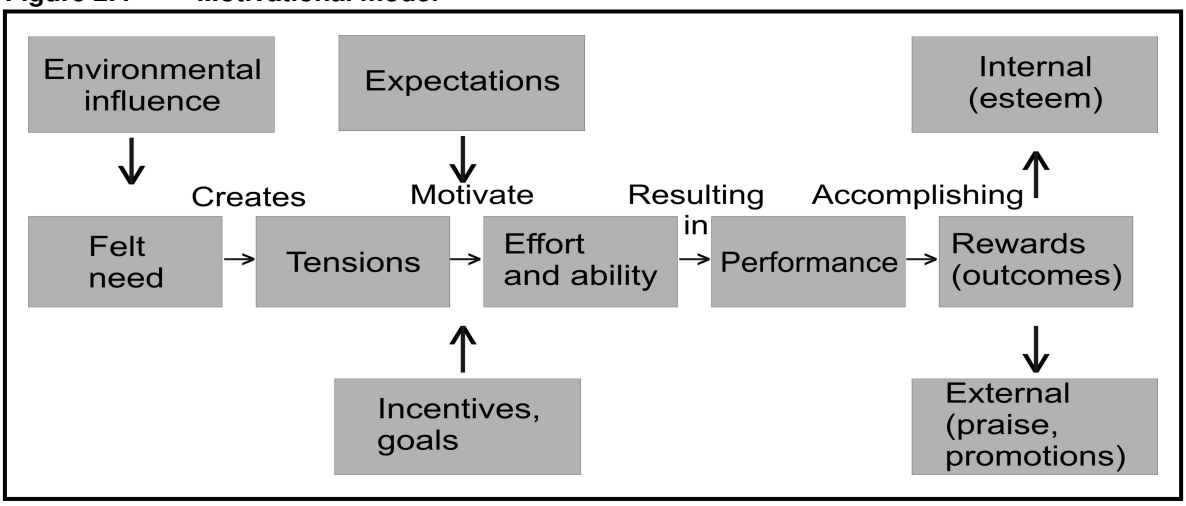
To integrate ICT successfully in education it is important that teachers have the appropriate perceptions of ICT usefulness as it has an impact on their instructional practice (Cope & Ward, 2002, pp. 1, 10; Zhao & Bryant, 2006, p. 55). Teachers' perceptions and practices change as they become more comfortable with using ICT (Asan, 2003, p. 154; Francis & Ezeife, 2007, p. 4; Lal, 2002, p. 2; Webber & Robertson, 1998, pp. 9 - 10; Zheng, 2003, p. 8). Jimoyiannis and Komis (2007, p. 152) indicate five interrelated factors which influence teachers' perceptions about ICT and TPD aimed at integrating ICT in their teaching and learning practices. Interrelated factors are: continuous ICT support and coordination, ICT pedagogical development that enables teachers to use ICT in their everyday classroom practice, collaboration with colleagues and specialist teachers, availability of educational software and ICT infrastructure development.

Incorporating ICT in education can be perceived as just another burden and therefore teachers can resist the opportunity for the uptake of ICT (McCain & Jukes, 2001, p. 5). Although there is an increase in teachers willing to incorporate ICT in their teaching practises, there is still room for improvement (Loveless & Dore, 2002; OFSTED, 2001; Thorburn, 2004). Examining and identifying teachers' perceptions of using ICT in education, can help to determine specific factors in order to develop an effective TPD programme with the appropriate conditions and requirements (Zheng, 2003, p. 3).

2.4.7 Motivation

It is important to investigate the motivation of teachers towards ICT integration in teaching and learning as it has an impact on the successful integration of ICT (Woodbridge, 2004, p. 1). Motivation refers to a person's desire to pursue a goal or perform a task and has an effect on learning and performance outcomes. Motivation is influenced by internal factors: perceptions and personal goals as well as external factors: opportunities and rewards (Kovalchick & Dawson, 2004, p. 34). Teachers' motivation forms an important part of TPD activities. Strategies on how teachers can be motivated and what can be done to keep them motivated have to be considered as it increases the effectiveness of TPD activities (Butler, 1992, p. 4; Carlson & Gadio, 2002, p. 122; Dean, 1991, p. 16). Steyn and Van Niekerk's (2005, p. 141) motivation model (Figure 2.4) indicates how teachers' motivation to engage in a activity can be influenced by various factors.

Figure 2.4 Motivational model*



* Steyn and Van Niekerk (2005, p. 141).

The motivation process can be regarded as an incentive for action. Figure 2.4 indicates that the process usually starts with a real need that creates tension. Tension is created by insufficiency in teaching experience. Personal or environmental tensions motivate a teacher to attempt to reduce or eliminate this tension. A teacher's past and present environmental experience influence the direction these efforts will take. Expectations also influence the effort the teacher will make. If a teacher believes that the desired outcomes are unlikely or impossible to attain, he or she may not make any further attempts to accomplish the goals. Performance alone does not enable individual teachers to satisfy their needs, especially if they have insufficient or inappropriate skills. Rewards or outcomes result from the motivated activity. Outcomes may come from the external environment in the form of praise, promotions and/or financial rewards. Outcomes can also come from the internal environment in the form of a positive feeling, gained self-esteem and/or a sense of achievement as a result of accomplishing the desired goal.

Cox, Preston and Cox (1999, p. 1) point out that attention should be paid to factors that motivate teachers to use ICT that will focus on the sustainable use of ICT, and not the burdening aspects. There are several ways in which ICT can be used to motivate teachers in their professional lives. Collaboration, support, easy access to policies, procedures and resources, curriculum planning and professional development can all act as examples of applications that motivate (Jackson, 2000, p. 1). Teachers are often reluctant to change their teaching strategies that they are familiar with and are consequently cautious of new time consuming activities. Some require additional motivation and incentives to actively participate in professional development activities and embrace technological driven innovations (Carlson & Gadio, 2002, p. 122). Self-efficacy is an aspect of motivation that

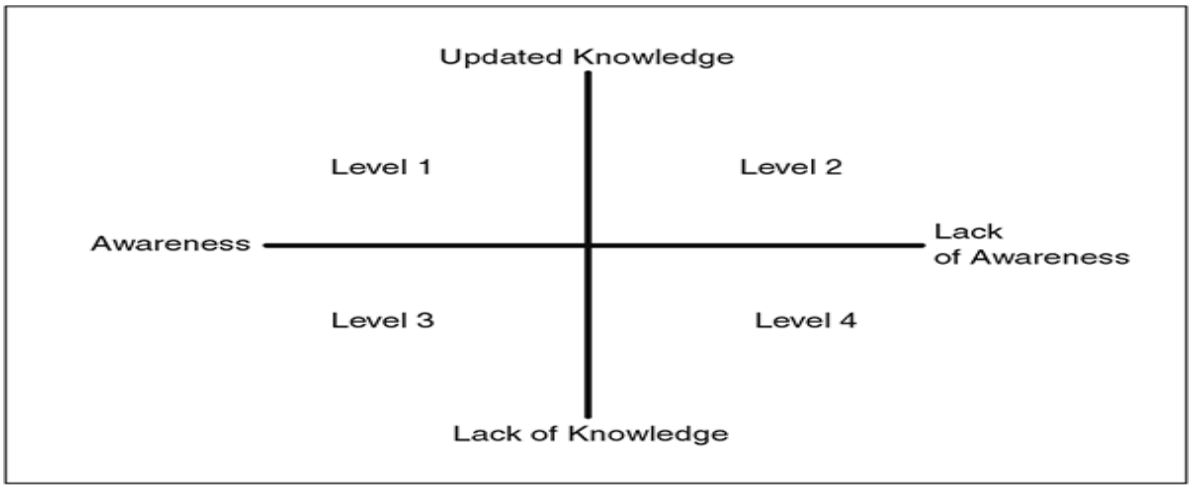
helps to determine whether a teacher continues with or avoids computer use (Zheng, 2003, p. 3).

As effective TPD is influenced by motivators, it is important to pay attention to the different intrinsic and extrinsic factors that motivate teachers to engage in learning activities (Day & Sachs, 2004, p. 226; Rodrigues, 2005b, p. 74). Recognition from colleagues and leaders in the teachers' working environment may provide the necessary extrinsic motivation for teachers to take part in professional development. As TPD activities provide opportunities for collaboration, it will act as an intrinsic motivation for teachers to take part. Teachers who realise the potential of using ICT to enhance their teaching and learning practices will also be intrinsically motivated to learn new skills and knowledge in the effective use of ICT(Francis & Ezeife, 2007, p. 11). Additional financial and professional opportunities may also motivate teachers to participate in professional development activities (Carlson & Gadio, 2002, p. 123).

2.4.8 Teacher types and levels of awareness

If principals are knowledgeable about the individual teachers' level of awareness they will be able to determine the most suitable TPD activities that will fulfil teachers' individual requirements. The principals will also be able to determine which teachers are experts in particular fields and getting them involved in TPD by assigning them as mentors or giving teachers opportunities to give training workshops to their colleagues. By using expert teachers to help novice teachers will strengthen the learning community at a school. Daiz-Maggioli (2004, p. 8) distinguishes between four awareness-levels (Figure 2.5). Most teachers fall into one of the awareness-level categories.

Figure 2.5 The quadrants of teacher's choice framework*



* Adapted from Diaz-Maggioli (2004, p. 8).

Figure 2.5 provides the four levels or quadrants of the differences in awareness. Level 1 teachers are aware of the fact that they possess up-to-date knowledge and that it would be to the benefit of their school if they partake in the professional development of teachers. By sharing their knowledge they are in a position to help their colleagues that are in other levels by providing training, expert coaching and/or being mentors. Level 2 teachers are not aware that they possess updated knowledge. Colleagues can observe their classroom practices and identify the areas of strength that the teachers in level 2 have. Teachers in level 3 are aware that they require development in specific knowledge areas. Teachers in level 4 are unaware of the necessity to expand their knowledge in specific areas. Appropriate professional development for teachers in levels 3 and 4 can include using teachers in level 1 to facilitate their development. Teachers enter a cycle of continuous professional development as there are always changes to be made in education. Teachers can have different awareness levels for different types of knowledge which means that in some areas they are experts, while in others they are still novices. This type of climate could assist in fostering collaboration as teachers will not be scared to admit that they have particular weaknesses or lack specific knowledge as they can be both an expert and a novice depending on their knowledge in particular fields (Diaz-Maggioli, 2004, pp. 7 - 9). TPD is always going to be a challenge no matter what the context, purpose, process or outcomes are as each individual teacher has various development requirements which are influenced by personal, school and environmental factors. What is learnt from a learning activity or experience may be different from that which is intended to be learnt (Day & Sachs, 2004, p. 293). For that reason it is advisable to monitor a teacher's subsequent performance to determine the success of the training.

In TPD is it necessary that teachers are willing and positive towards the process. By engaging on an authentic level teachers can see the relevance of that which they are being learned and correlate it to their current experiences and practices. TPD has to have intrinsic value for the individual teacher' otherwise it will not have any influence on their teaching and they will not be prepared to change their current teaching practices (Rodrigues, 2005b, pp. 5, 60, 74).

2.5 Teacher professional development

It usually rests on the shoulders of principals to initiate and implement appropriate TPD activities that will ensure that teachers effectively integrate ICT into their teaching and learning practices (Figure 2.1). TPD is instigated through the impact of innovation, politics and research (Rodrigues, 2005b, p. 55). The primary way in which principals can ensure

that teachers are supported in their personal and professional growth is through sustained effective TPD activities (Drago-Severson, 2004, p. xxi). TPD deals with changes that teachers experience throughout their teaching careers in their skills, teaching methods, disciplines and techniques, curricula, lesson plans, rules and procedures, attitudes, beliefs, expectations and concerns about the teaching profession (Day & Sachs, 2004, p. 48). TPD creates opportunity for teachers to reflect on current practices enabling them to improve their performance, knowledge, skills, and use continuous assessment methods to determine the success thereof (Borko, 2004, p. 5; Carlson & Gadio, 2002, p. 120; Clarke, 2007, p. 132; Day & Sachs, 2004, pp. 7, 10; Drago-Severson, 2004, p. 105; Francis & Ezeife, 2007, p. 2; Nolan et al., 2005, pp. 3 - 4; Rodrigues, 2005b, p. 1). TPD should not be intended for remedial purposes or to fix errors, but should be aimed at building a climate of professional teachers in the school system (Zepeda, 1999, pp. 3, 4) where ideas, challenges, successes and practices can be shared (Center for CSRI, 2007, p. 2; Darling-Hammond, 2005, p. 8; Nolan et al., 2005, pp. 2 - 4). High quality TPD forms the key to sustained teacher effectiveness and continuous growth (Chen & Chang, 2005, p. 1).

In using ICTs effectively teachers will be able to access high quality and diverse content, create content of their own, communicate, collaborate and integrate ICTs into teaching and learning (Dirksen & Tharp, 1996; DoE, 2004b, p. 14). Most teachers want to learn to use ICT but due to insufficient conceptual frameworks, time, computer access, and support, they often do not acquire the necessary skills (Carlson & Gadio, 2002, p. 120). TPD is the forming of collaborative and constructive approaches to ICT integration, accompanied by consistent support that incorporates ICT with curriculum projects and teachers' choice (Ehman et al., 2005, p. 251; Nolan et al., 2005, pp. 2 - 3). A well-resourced model of TPD helps teachers to take risks and allows them to see the relevance thereof and provide them the opportunity for recognition and reward. Teachers will then take responsibility for their professional development and use it to achieve and maintain best teaching and learning practice (Rodrigues, 2005b, p. 92).

There is a common requirement among teachers that ICT should form part of their TPD (Becta ICT Research, 2006, p. 38; Francis & Ezeife, 2007, p. 3). A well-planned, ongoing TPD programme, grounded in a theoretical model, linked to curricular objectives, incorporating formative evaluation activities, and sustained by sufficient financial and staff support is essential if teachers are to use ICT effectively to improve teaching and learning (Carlson & Gadio, 2002, p. 120). TPD can create the opportunity for teachers to collaborate, explore and evaluate the integration of ICT in their pedagogical practices and strategies (Massachusetts Department of Education, 2002, p. 18; Seyoum, 2004, p. 4).

Day and Sachs (2004, pp. 22, 148) refer to three interconnected purposes of TPD: extension, growth and renewal. Extension takes place through the introduction of new knowledge or skills of ICT, growth takes shape through the development of greater levels of expertise in the integration of ICT, and renewal is achieved through transformation and change of knowledge and practice through the effective integration of ICT. TPD is influenced by constantly changing contexts and consists of many facets that indicate the complexity of TPD (Day & Sachs, 2004, pp. 33 - 34). TPD differs from school to school and situation to situation because of the huge diversity of culture and different settings in which teachers work. TPD is no longer an option but an expectation for all professionals (Day & Sachs, 2004, p. 4). Despite recognition of its importance, the professional development currently available to teachers is inadequate. Each year schools, districts and the government spend millions financing in-service training and other forms of TPD that are fragmented, intellectually superficial, do not take into account adult learning and provide insufficient follow-up support (Borko, 2004, p. 3).

2.5.1 Teacher empowerment

Principals can empower teachers by creating TPD opportunities according to the specific requirements of the teachers regarding the effective and sustainable integration of ICT (Figure 2.1). Principals can ensure that TPD activities at school are aimed on empowering teachers to develop positive attitudes and beliefs towards ICT integration, become more effective and competent teachers and support teachers in the process of adapting successfully to a changing environment. Teacher empowerment is an essential component to be considered in the developmental process of teachers. Through empowerment teachers get a renewed feeling that they are part of the education system and can still make important contributions to the education process. In most traditional schools the only teachers who take part in any decision-making processes are those in leadership positions. Empowerment means that teachers are given the authority to partake in decisions affecting their professional development and through this process deepen their knowledge and improve their teaching and learning practices. According to Steyn and Van Niekerk (2005, p. 160) empowerment is: “The process by which teachers are entrusted with the power (authority) to make decisions and take actions regarding assigned tasks, and are involved in devising ways to maintain a productive and satisfying work environment and in daily problem-solving and decision-making.” Teachers become empowered when they are involved in decisions concerning school governance, working conditions, content of the curricula, salaries and professionalism (Blase & Blase, 1994, pp. 2 - 5). Empowerment also includes expanding teachers’ knowledge and skills through training and development, enabling them to reflect on

best practices through collaboration and giving them confidence to make a difference in the school's education system (Blase & Blase, 1994, p. 7). It is important that teachers are empowered to be involved in bringing about change in their schools. In allowing teachers to gain a share in the ownership of change, encourages teachers and makes them more positive to implement change because it allows them to implement some of their values in the process of constructing successful learning and teaching situations (Busher, 2006, p. 151). Empowerment has been associated with positive teacher morale and job satisfaction (Blase & Blase, 1994, p. 9). Teachers taking part in a study of Blase and Blase (2001) overwhelmingly indicated that principal leadership is the most important factor contributing to teachers' empowerment.

2.5.2 Constrictions for teacher professional development

Informed and knowledgeable principals are in a better position to make informed and effective decisions (Table 2.3). Principals who are informed on the constrictions of TPD can assist in the process by avoiding the identified stumbling blocks. It is rare to find a TPD environment where teachers are recognised as being both learners and experts. Recognising teachers' skills, strengths, experiences, expertise and limitations place them in the position of novice and expert where an opportunity is created to view each other as peers, tutors and learners (Rodrigues, 2005b, p. 78). In most TPD courses on ICT integration, the potential is usually explored but its strategic implementation is assumed (Rodrigues, 2005b, p. 6). If principals can eliminate the factors that prevent TPD from being effective it will lead to an increased number of teachers making appropriate changes to their current teaching practices. There are various factors that will have an influence on the effectiveness of TPD. Table 2.3 indicates the stumbling blocks and corrective actions that can be taken for effective TPD.

Table 2.3 Constrictions for TPD*

Stumbling blocks	Description	Corrective actions that can be taken
Top-down decision making	• Planning of strategies are made by administrators and consultants • Teachers are not involved and programmes become a burden instead of a solution	• Collaborative decision-making • Teachers are involved in the design of the training • Knowledge shared and developed by teachers
The idea that teachers require to be "fixed"	• Too often professional development is guided by the fact that the problem lies with teachers who don't know how to teach • Numerous teaching approaches have surfaced claiming to be the ultimate solution for teaching problems	• A growth-driven approach driven by strategic plan • Perceived as an essential component • Teachers are aided in the ICT integration process and not seen as a problem
Lack of ownership of	• Teachers have little or no say during the process of professional development	• Teachers give their opinions of different practices

Table 2.3 Constrictions for TPD*

Stumbling blocks	Description	Corrective actions that can be taken
the professional development process and its results	• Teachers question programmes that were built without them, yet are aimed at changing the way they do things	• Inquiry-based ideas • School based programmes • Include collaboration
The technocratic nature of professional development content	• Teachers are taught techniques that they are expected to replicate in the classroom • Most of these methods serve the requirements of teachers and learners in specific contexts • In attempting to transfer these practices into their classrooms, teachers require more time and effort than what was originally anticipated	• Context-specific programmes • Integrate ICT into the curriculum • Integrate ICT into specific learning area • Allocate sufficient time
Universal application of classroom practices	• Same professional development programmes are applied to all teachers regardless of subject, student age, or level of cognitive development • Although a one-size-fits-all approach is economical it is not very effective	• Tailor-made techniques • Varied and timely delivery methods • Individual ICT abilities are considered
Lack of variety in the delivery modes of professional development	• Usually the cheapest format of professional development is chosen • Differentiated instruction in the classroom is important but when it comes to instruction for teachers, undifferentiated approaches usually prevail	• Combination of generic and subject specific skills • Appropriate format is chosen
Inaccessibility of professional development opportunities	• Professional development seldom reach teachers when they are really required • Teachers requirements are unmet if they do not help plan and deliver professional development • Only a small percentage of teachers seem able to transfer the content to the classrooms	• Collective construction of programmes • Provide training differentiated by teacher expertise • Teachers are aided throughout the process
No ongoing support in transferring ideas to the classroom	• Transferring new ideas to the classroom is an obstacle for most teachers • There is little or no ongoing support for in-service teachers in helping to bridge the gap between theory and practice	• Adequate support systems • On-going support after course is finished • Collegial opportunities are created to aid each other
Disregard for the teachers' varied requirements and experiences	• Teachers go through specific developmental stages as they progress in their careers, each having particular requirements and crises • TPD is standardised assuming that all teachers should perform at the same level, regardless of their individuality	• Individual development promoted in the context of organisational development • Teachers who are in the same career stage, have the same requirements are grouped together
Lack of systematic evaluation of professional development	• No evaluation of the impact that the programme has on current practices • A learning organisation should determine the effectiveness of established programme and use results for improvement	• Proactive assessment • Assess current levels of ICT use • Determine effectiveness of professional development
Little or no recognition of the learning characteristics of teachers	• Teachers have their own unique learning characteristics that have to be taken into account if the professional development is to be successful	• Andra-gogical (adult-centred) instruction • Adapt and correct TPD to cater for individual learning characteristics of teachers

* Adapted from Diaz-Maggioli (2004); Scrimshaw (2004); Glatthorn, Jones and Bullock (2006); Valli and Hawley (2002).

TPD decisions are usually made top-down and prescriptive ideas leave teachers with no say. Planning and TPD strategies should be developed in conjunction with the teachers. They are often viewed as novices and it is rarely recognised that teachers have vast amounts of

applicable experience that can be used (Rodrigues, 2005a, pp. 5 - 6). TPD is often aimed at fixing problems and the average perspective is that the fault lies with the teacher. Numerous teaching approaches have come about, claiming to be the ultimate solution. Teachers are taught methods, contents and skills without keeping in mind that teaching and learning takes place in different contexts. Most TPD are standardised and the one-size-fits-all approach is taken without considering teachers' individual requirements (Becta ICT Research, 2004b, p. 3; NCREL, 2000, p. 3; Roberts & Associates, 1999, p. 10; Zhao & Bryant, 2006, p. 60). Little ownership develops among teachers as the individual requirements of the teachers are not taken into consideration. It is difficult for teachers to implement as it takes extra effort and time to make that which they learned applicable to their specific situation as they have to adapt the learning content.

Training takes place once every few years and minimum or no support or follow-up is provided to implement the suggested training (Darling-Hammond, 2005, p. 4; Glatthorn et al., 2006, p. 41; Loveless & Dore, 2002, p. 22). The universal application of classroom practices that are prescribed and the undifferentiated approaches in TPD leads to little or no change in teachers' current teaching and learning practices. The programmes are de-contextualised and when the teachers return to their schools, they do not know where to start due to insufficient and non-existent follow-ups. Most TPD approaches do not keep up with new and ever-changing developments in education (Carlson & Gadio, 2002, p. 128; Chen & Chang, 2005, p. 1; Jimoyiannis & Komis, 2007, pp. 151 - 153; McCain & Jukes, 2001, p. 114; Schlager & Fusco, 2003, p. 4). Once-off training sessions about ICT do not provide ongoing learning experiences and support that is essential for teacher change to take place effectively (Berube et al., 2004, p. 4; Carlson & Gadio, 2002, p. 119; Chen & Chang, 2005, p. 1; Cope & Ward, 2002, p. 4; Jackson, 2000, p. 7; Jimoyiannis & Komis, 2007, pp. 152 - 153; Kovalchick & Dawson, 2004, p. 536; Thorburn, 2004, p. 4; Viadero, 2005, pp. 1 - 2; Woodbridge, 2004, p. 2). They should be replaced by ongoing programmes that are related to the school's curriculum goals, designed with built-in evaluation, and sustained by adequate ongoing support (Thorburn, 2004, p. 8; Viadero, 2005, pp. 2 - 3).

There are various corrective actions that can be taken to avoid apparent stumbling blocks for effective ICT (Table 2.3). Teachers should be involved in determining appropriate strategies, as well as in the design of their own TPD. TPD should make use of teachers that are experts in their fields. TPD must cater for teachers' individual requirements by making use of tailor-made techniques, adult-centred instruction and a variation of delivery methods (Basinger, 2003, p. 3; Carlson & Gadio, 2002, p. 120; Center for CSRI, 2007, p. 2; Ehman et al., 2005, p. 260; Kotyk, 2006, p. 26; Lieberman, 2000, p. 78). This includes that opportunities are

created for collaboration, teachers can share experiences, discuss possibilities, reflect on their learning, apply new strategies, and evaluate their learning (Carlson & Gadio, 2002, p. 121; Schlager & Fusco, 2003, p. 4). Assessment should take place beforehand to determine the teachers' current knowledge and skills, as well as at the end to determine the impact of the TPD. A teacher's professional development is a process that is inseparable from the construction and expression of the teacher's personal identity (Day & Sachs, 2004, p. 157). There should be adequate and on-going support so that the new knowledge and skills can be effectively incorporated into teacher's teaching and learning practices (Foskett & Lumby, 2003, p. 84). Teachers should have the opportunity to repeatedly practice their newly attained skills and knowledge to enable and achieve teachers' full integration of the new strategies into their teaching repertoire (Darling-Hammond, 2005, p. 6; Francis & Ezeife, 2007, p. 6; Schlager & Fusco, 2003, p. 4). Follow-up is critical to the integration of new knowledge and skills (Butler, 1992, p. 10).

2.5.3 Information and Communication Technology integration through teacher professional development

TPD is necessary for effective and sustainable ICT integration (Figure 2.1). Introduction of any innovatory practice has to be accompanied by significant TPD (Rodrigues, 2005b, p. 19). The dilemma that most educational institutions have with ICTs is the transformation of new applications into current practices (Akbulut et al., 2007, p. 1). Teachers require the opportunity to develop skills and gain experience of incorporating ICT into their teaching and learning (Basinger, 2003, p. 2; Rodrigues, 2005a, p. 1). TPD programmes can help teachers to address the impact of ICT and make appropriate decisions about the role that ICT will play in their teaching practices (Roberts & Associates, 1999, p. iv), and by learning how to integrate ICT built-up communities of practice (Sallis & Jones, 2002, p. 108). TPD becomes the key element in the implementation plan for any educational change involving ICT being implemented as a tool for teaching and learning across the curriculum (Carlson & Gadio, 2002, p. 1; NCREL, 2000, p. 1; Plomp et al., 2003, p. 23).

TPD in the 21st century should have clear goals and purposes that focuses on the individual requirements of the teachers and makes use of different delivery methods to aid the process of ICT integration in teacher's teaching and learning practices (Day & Sachs, 2004, p. 27; Francis & Ezeife, 2007, p. 6; Glatthorn et al., 2006, p. 42; Soule, 2003, p. 8; Steyn & Van Niekerk, 2005, p. 251). TPD for the successful integration of ICT should focus on how ICT can support the teaching and learning of specific learning areas paying special attention to

the curriculum and strategic thinking (Massachusetts Department of Education, 2002, p. 18; McKenzie, 1999, p. 81).

Teachers are required to stay abreast with the latest curriculum and ICT developments. Teachers should integrate ICT effectively in their teaching methods and they will be able to do so if they attain the necessary knowledge and skills. This indicates that TPD should take place continuously due to changes in the education system and the rapid developing pace of ICT (Day & Sachs, 2004, p. 55; Glatthorn et al., 2006, pp. 41 - 43; Rodrigues, 2005a, p. 1). Teachers are therefore expected to become lifelong learners through TPD (Akbulut et al., 2007, p. 1; Bradley et al., 1991, p. 14; Day & Sachs, 2004, pp. 48, 49, 150; Dean, 1991, p. 7; Drago-Severson, 2004, p. 105; Jacobs et al., 2004; Leask, 2001, p. 45; McCain & Jukes, 2001, p. 89; Rodrigues, 2005a, p. 3; Thorburn, 2004, p. 4; Zepeda, 1999, pp. 4, 19, 76).

Innovative practices depend on the provision of effective TPD fostering learning communities for ICT integration (Plomp et al., 2003, pp. 11 - 12). Before implementing a TPD programme for effective ICT use the school's current level of ICT use should be determined and each individual teacher's level of ICT competency should be assessed (NCREL, 2000, pp. 2, 3). Teachers' knowledge, skill, confidence, motivation and beliefs regarding ICT integration must be heightened (Ehman et al., 2005, p. 256).

2.5.4 Strategies for Information and Communication Technology integration through teacher professional development

Implementing appropriate strategies and activities brings the action necessary for appropriate changes into motion. The principal can implement many TPD strategies to assist teachers to increase their skills and knowledge with regard to the effective integration of ICT. Ensuring that specific factors, opportunities and conditions are present in the school environment will foster teachers' ICT integration and ensure sustainability. In order to apply the appropriate strategies effectively it is necessary that the principal is knowledgeable about influential factors to ensure sustainability of changes. A principal should act as a facilitator and support TPD for the process of change. Providing appropriate support and ensuring conducive working conditions will positively affect teachers' attitude for the implementation of change into their teaching and learning practices (Gordon, 2003, p. 2; Tomlinson, 2004, pp. 101 - 102).

Insufficient TPD for ICT use has become an obstacle to successfully integrate ICT into the curriculum. Strategies have to be implemented in order to sustain the effective use of ICT to

enhance teaching and learning. To effectively change the whole school environment, TPD programmes should coincide with institutional development. All teachers should be involved in in-house TPD opportunities as it can lead to improvement of the whole school (Francis & Ezeife, 2007, pp. 1, 6, 7; Glatthorn et al., 2006, pp. 35, 40; Spurr et al., 2003, p. 4). The most important prerequisite for success is that the whole school's committed to a policy of efficient ICT use. Using ICT should be part of a comprehensive plan for instructional improvement. This calls for cautious planning and extensive and continuous teacher training (Paul, 1999, p. 7). TPD ought to include actions or activities that will lead to the improvement of teaching and learning practices having an effect on the development of the whole school (Zepeda, 1999, pp. 5 - 7). Whole school alignment enables teacher collaboration, reflection and other synergies for improved teaching and learning (Spurr et al., 2003, p. 4). Whole school strategies which focus on how ICT can enhance teaching and learning and required resource allocation can help to support and sustain schools' use of ICT effectively in learning (Becta ICT Research, 2006, p. 38). The principal is central to implementing whole school strategies that will support effective and sustained ICT integration into teachers' learning and teaching. TPD should therefore be an integral part of the school ICT plan or whole-school improvement plan and contain all the vital components that research has found to be important, such as time, flexibility, accessibility, convenience, and considering the varying requirements of the teachers (Brand, 1997, pp. 1 - 3; Day & Sachs, 2004, pp. 226 -227; Joiner, 2002, p. 1).

Scimshaw (2004, pp. 5 - 6) suggests that there are various strategies to support TPD in the use of ICT. These strategies can be divided into three categories: teacher-based strategies, school-based strategies and external-based strategies (Table 2.4). Integrating ICT through professional development will lead to change in individual teachers, as well as the school as an organisation. Teacher-based strategies and school-based strategies are therefore interrelated. The commitment of individual teachers to integrating ICT should correlate to the commitment of the school as any discrepancies may have an impact on the degree to which the teachers integrate ICT in their teaching and learning. It is therefore vital that both teacher-level and school-level factors be addressed in order to increase ICT use (Scrimshaw, 2004, pp. 5 - 6).

Table 2.4 Strategies for supporting TPD in the use of ICT*

Teacher-based strategies	
Connection to student learning	• Improve teaching and learning • Use ICT effectively in instruction and help learners develop higher-order thinking and problem-solving skills • Implement new teaching techniques to encourage and assist learners

Table 2.4 Strategies for supporting TPD in the use of ICT*

	• Expose learners to information and experts
Hands-on ICT use	• Receive continuous ICT training • Initially acquire core ICT competencies and skills • Use ICT to enhance teaching and learning in different learning areas • Regular use of ICT leads to confidence and boost own productivity
Involved in the planning	• For teachers to develop ownership of professional development they must participate actively in its construction shaping the programme accordingly to their requirements and motivations
Variety of learning approaches	• Professional development must be in a variety of forms such as mentoring, ongoing workshops, special courses, structured observations and practical demonstrations • Relevant to individual teachers as teachers differ from one another in terms of their theoretical and professional knowledge and the stages in their careers • Concrete experience with adequate support, appropriate feedback and long-term follow-up
Curriculum-specific application	• Link ICT with curriculum • Integrate ICT into content • Provide activities in the context of practice • Be able to select digital content based on requirements and learning styles of learners and infuse in curriculum
New roles for teachers	• Coach or facilitator in class • ICT supports collaboration outside class • Must be able to adapt to different roles
Sufficient time	• Teachers must prioritise and organise according to the time required to integrate ICT successfully
School-based strategies	
Principal and decision making	• Central in enabling teachers to engage in innovative practice • Create incentives for ICT use
Whole school planning	• Create a vision statement and development plan for school • Requirement assessment to establish current levels of ICT use and staff preferences for the future
Built-in evaluation	• Determine requirements of teachers, goals and strategies • Evaluation during and after professional development activity • Determine if professional development promotes effective ICT integration
Ongoing process	• Continued practice throughout teachers' careers be seen as a career-long endeavour • Takes time conducted over several years for significant change in educational practices
Collegial learning	• Require time to discuss ICT with other teachers and support each other • Follow-up discussions, teacher networks and collegial activities are necessary • Teachers possess a wealth of knowledge that must be explored and shared
Sufficient time	• Time to plan, practise skills, try out new ideas, collaborate, and reflect on ideas • Requires additional time in teachers' daily schedule; they should not be expected to devote more of their own free time
Technical support	• On-site technical support personnel giving assistance to teachers • ICT must be easy to access and implement
Administrative support	• Administrators and leaders must have clear vision of ICT integration and have knowledge of how ICT is used in schools • Networked computers used for daily tasks
Adequate resources	• ICT in class should be the same used for professional development • Funds available for technical equipment, professional development, and networks

Table 2.4 Strategies for supporting TPD in the use of ICT*

Continuous funding	• School budgets • Make use of funding strategies, community organizations and projects • Costs for ICT is an ongoing expense
External-based strategies	
Working together	• Work closely with local community and interacting with one another • Knowledge about teaching and learning only makes sense when considered in the context of a teacher's own school culture and climate • Working with local schools leads to sustained teachers' motivation and identification of successful practices
Participation	• Participate in national ICT developments, projects and initiatives and local-based training
Support	• Linking with peers both within the local and the external community through electronic networks and forums may lead to necessary support

* Adapted from NCREL (2000, pp. 3 - 8); Scrimshaw (2004, pp. 5 - 6); Diaz-Maggioli (2004, p. 7); Becta (2005, pp. 3, 8).

Teacher-based strategies are intended to aid teachers in the integration process. Indicated in Table 2.4 TPD should use a variety of learning approaches and activities where teachers can integrate ICT into student learning and infuse it into the curriculum. Teachers must be able to develop ICT integrated lessons or units that can be implemented in their own learning areas and they must be provided with ongoing support until they are able to integrate ICT effectively into the curricula of their specific learning areas. For effective ICT integration in everyday teaching and learning is it essential to consider ICT, content and pedagogy not in isolation, but rather in the complex relationships. There has to be knowledge about the applicable pedagogy of that specific content, knowledge of how a subject can be transformed by the application of ICT and knowledge of how ICT can support pedagogical goals. Knowledge on these different aspects are important in order to make TPD ready and appropriate for ICT integration (Becta ICT Research, 2005, p. 40; Ehman et al., 2005, pp. 252 - 264; Jamieson-Proctor et al., 2006, p. 512; Jimoyiannis & Komis, 2007, p. 153; NCREL, 2000, p. 1). For teachers to take ownership of professional development they have to be involved in the planning or involved as facilitators. For any ICT innovation to be implemented successfully in schools, sufficient time must be allocated to teachers to come to terms with implementing ICT in their instruction. Effective professional development provides authentic tasks in collaborative settings and the time to do the tasks well (Means, 1994, p. 185).

Principals apply school-based strategies (Table 2.4) in the planning and decision-making process to deploy the required resources to ensure sustainable and effective ICT integration. As the costs of ICT integration is an ongoing expense there should be strategies in place to ensure that there are sufficient funds for professional development, appropriate hardware and software, and sustained technical support. Teachers experience the use of incentives

positively and this can motivate them to sustained ICT integration. The incentives do not only have to be the provision of laptops, it can be by merely giving the appropriate recognition in a form that the principal decides on such as certificates or even trophies.

Schools can incorporate external strategies to support or improve their use of ICT (Table 2.4). It is important that schools involve the community in their activities as the schools are situated in specific communities with regard to equity, language, culture and in most cases are dependent of community support. Teachers from local schools can work together in developing lessons that integrate ICT in the different learning areas to alleviate the workload of the teachers. Teachers can get together face-to-face or use networks to collaborate about best practices and give each other the necessary support. Teachers should participate in national ICT projects and initiatives and local-based training where they can share their knowledge and expertise.

2.5.5 Stages of Information and Communication Technology integration in teacher professional development

Toledo (2005, pp. 177 - 191) indicates a five-stage developmental model for the integration of ICT (Figure 2.1). Each stage in the model has distinctive characteristics, tasks and actions that occur as teachers move toward the system-wide integration of ICT.

- *Pre-integration*: teachers show limited professional and personal ICT use
- *Transition:* increased interest and vision for the use and integration of ICT
- *Developmental:* acquisition of ICT knowledge through experts. Planning and implementation of new ICT programmes
- *Expansion*: creation of an environment in which teachers are encouraged to risk trying new technologies. Strengthening of the relationships between support personnel and teachers
- *System-wide integration:* ICT being embedded into curriculum. Enthusiasm for integration increases. Evidence of the integration of standards and proficiencies for teachers indicated.

This five-stage model provides a template for principals to assist them to meet the demands of teaching and learning in a technology-rich world. TPD can use the five-stage model to describe teachers' ICT integration.

2.5.6 Barriers to Information and Communication Technology integration

Research on the barriers to ICT integration have been conducted over a number of years and suggests that there are various interrelated and complex factors that have an influence

on the successful implementation and integration of ICT in education (Albion, 1999; Becta ICT Research, 2004a; Han, 2002; Jamieson-Proctor et al., 2006; Seyoum, 2004; Thorburn, 2004). Key factors are: staff development, attitude, infrastructure, consensus and support, knowledge and skills, lack of commitment, inadequate feedback, lack of time and money, sustainability and transferability, resistance to change, vested interest in the status quo, fear of new situations and inadequate expertise for solving problems arising during initiation and implementation have an determining influence on the effective and sustainable use of ICT (Blase & Blase, 1994; Fabry & Higgs, 1997; Scrimshaw, 2004; Seyoum, 2004). Zepeda (1999, pp. 121 - 123) indicates other barriers such as insufficient resources, competing requirements and visions, traditions, under-representation in the decision-making process, poor preparation, interrupted sequence of leadership and the view that change is unmanageable. Most commonly cited barriers for teachers to integrate ICT effectively are that teachers do not have time to effectively incorporate ICT outside their normal working hours, insufficient access, confidence, support and effective training (Asan, 2003, pp. 153 - 160; Becta ICT Research, 2004a, p. 28; Gibson & Oberg, 1999, pp. 5 - 7; Nawawi et al., 2005, p. 88; NCREL, 2000, pp. 1 - 2; Roberts & Associates, 1999, pp. 8 - 14; Thorburn, 2004, p. 2; Zhao & Bryant, 2006, p. 58; Zheng, 2003, pp. 2, 5). Most of these barriers have existed for a long time and have not yet been successfully overcome. As Shelly, Cashman, Gunter and Gunter (2004, p. 6.10) state: “For more that two decades, several barriers have hindered technology integration in many schools.” This may be an indication why ICT integration has not progressed as quickly as expected (Thorburn, 2004, p. 1). Jamieson-Proctor, Burnett, Finger and Watson (2006, p. 512) maintain: ”The fact that there are so many factors that have an influence on the uptake of ICT in education, requires close scrutiny, analysis and responses to capitalise upon the affordances of ICT for improving teaching and learning.” The different schools do not experience the same barriers, and the impact of the various barriers on ICT integration will also differ (Becta ICT Research, 2004a, p. 23). Cowie and Jones (2005) add: “It is not sufficient to consider the various factors that contribute to effective ICT integration in isolation it is however the convergence of various factors.” The factors manifest in different ways as both enablers and barriers act in different circumstances and at different times as the use of ICT evolves and develops in that particular school environment.

Although there are different classifications for the different barriers such as external or first-order barriers and internal or second-order barriers, I selected to categorise the barriers in two categories namely institution barriers, an indication of barriers at school level and individual barriers, referring to teacher-level barriers. Even though they are differentiated as two main categories they remain interrelated, any factors influencing one barrier are likely to

have an influence on other barriers (Becta ICT Research, 2004a, pp. 19,20). Gender differences is not regarded as a barrier or as an enabler as most of the teachers in today's schools, especially in a South African context, are female and it would give an unrealistic view of gender as an influence on teachers' use of ICT in education. According to the SITES 2006 data, age and gender has no significant influence on teachers' pedagogical adoption of ICT (Law & Chow, 2007a). The SITES 2006 study indicates the barriers that teachers experienced when using ICT in their teaching. The barriers that relate to school-level and teacher-level barriers are indicated in Table 2.5. The school-related barriers are mostly related to insufficient access and infrastructure, while teacher barriers relate to competence, confidence and time available.

Table 2.5 The barriers experienced by teachers in their use of ICT *

Category of barrier	Specific obstacle included within each category
School-related barriers	• ICT is not considered to be useful in my school • My school does not have the required ICT infrastructure • My school lacks digital learning resources • I do not have the flexibility to make my own decisions when planning lessons with ICT • I do not have access to ICT outside school
Teacher-related barriers	• Insufficient ICT-related skills • Insufficient ICT-related pedagogical skills • Insufficient confidence to try new approaches alone • Insufficient time to develop and implement ICT-using activities • Unable to identify which ICT tools will be useful

* Adapted from Law and Chow (2007b, p. 17).

The highest percentages of reported barriers in South Africa were teacher-related. There was an indication of the large diversity across systems in terms of the contextual factors influencing ICT adoption in South Africa due to the large percentage of schools that do not have effective access to ICT usage. School-related barriers as experienced by teachers had a negative connotation with teachers' possibility to use ICT in their teaching. The results indicated that school-related barriers are also important factors influencing ICT use. Teacher-related barriers had a significant negative connotation with teachers' use of ICT (Law & Chow, 2007b).

2.5.6.1 School-level barriers

Teachers require access to good quality computers at times when it suits them best. Many schools only have one computer centre used for learners to improve their ICT skills. The computers should be connected to the Internet so that teachers can search for additional resources and also be networked so that teachers have opportunities to collaborate (Becta ICT Research, 2004a, pp. 11-14). The benefits of ICT integration are not realised unless

there is adequate access to a technological infrastructure (Day & Sachs, 2004, p. 75; Kovalchick & Dawson, 2004, p. 33). Funding for schools to provide the necessary infrastructure for ICT integration is slow to realise, particularly in disadvantaged, inner-city schools, and rural areas (Asan, 2003, p. 160; Gibson & Oberg, 1999, p. 5; Roberts & Associates, 1999, p. 9; Thorburn, 2004, pp. 3 - 4).

Schools require technical support. It is frustrating for teachers when there is no immediate support available. Technical support represents an ongoing problem in schools. Schools that do not have technical support won't be able to do preventive technical maintenance and this, in turn, will lead to more frequent breakdowns and teachers that avoid the use of computers (Becta ICT Research, 2004a, p. 16; Becta ICT Research, 2006, pp. 14 - 15; Kovalchick & Dawson, 2004, p. 32). Reliability can also be seen as a barrier. Hardware failures, poor or slow internet access, incompatible software or out-of-date software can be frustrating for all users (Thorburn, 2004, p. 2). Environmental stability is also a key factor in the school when it comes to integrating innovations or making appropriate changes. Frequent or unexpected changes in leadership, policies, curricula, planning, government demographics make implementation difficult and teachers negative (Thorburn, 2004, p. 7). Pressure to prepare learners for examinations and tests can discourage teachers from integrating ICT in the different learning areas as some principals and teachers view the integration of ICT as a distraction from their usual teaching activities (Soule, 2003, p. 7). It is necessary to eliminate the school-level barriers and this will help to minimize the barriers that teacher's experience.

2.5.6.2 Teacher-level barriers

ICT integration does not occur naturally. There will always be some critical barriers to overcome. Identification of barriers is one of the first steps towards removing them. Once the barriers to change have been removed, teachers' beliefs and practices are more readily open to change. Teachers require ongoing support and time to develop their own technological knowledge and skills, support is required that goes far beyond the once-off workshop or training session (Brand, 1997, pp. 1 - 5; Buckenmeyer, 2005, p. 3; Gibson & Oberg, 1999, pp. 5 - 6; Knapp & Glenn, 1996, p. 21; Roberts & Associates, 1999, p. 12; Woodbridge, 2004, p. 2; Zhao & Bryant, 2006, p. 58). Teachers require time to learn new skills. Availability of time in education has become a major barrier for effective teacher development. In the teaching profession, it is difficult for teachers to allocate time to practice ICT in their busy schedules. It takes time to allocate suitable resources and to integrate ICT use effectively into teaching and learning practices. By expecting teachers to practice during

their own time makes them reluctant to make the effort and the uptake of ICT becomes slow (Becta ICT Research, 2004a, pp. 9, 15; Becta ICT Research, 2006, p. 19; Massachusetts Department of Education, 2002, p. 15; Schumaker & Sommers, 2001, p. 106).

Teachers who consider themselves low-skilled often feel anxious about using ICT in front of the class for fear that the learners will actually know more than they do. Teachers fear that they will show learners that they lack some skills and knowledge in the use of ICT when they find themselves in a situation not knowing the solution. These teachers do not have the confidence of using ICT in their teaching and learning practice. Some teachers even fear they might damage the computer with their inappropriate actions (Becta ICT Research, 2004a, pp. 7 - 8, 15; Roberts & Associates, 1999, p. 7; Thorburn, 2004, p. 6). Teachers' competency levels are related to their confidence and is a major factor in determining whether they will make use of ICT (Jamieson-Proctor et al., 2006, p. 523). Some teachers are using the same teaching strategies day after day. Resistance leads to barriers to proposed change. Some teachers are comfortable with their current teaching methods and are reluctant to change and adopt new teaching methods (Jamieson-Proctor et al., 2006, p. 512; Means, 1994, p. 57). Teachers who are reluctant to make use of ICT usually have negative attitudes towards ICT. Care should be taken to influence them positively to make use of ICT (Becta ICT Research, 2004a, p. 17). For teachers to become positive towards the use of ICT, they should understand the benefits of integrating ICT in education (Becta ICT Research, 2004a, p. 17; Jamieson-Proctor et al., 2006, p. 512).

2.5.7 Enablers for the uptake of Information and Communication Technology

Han (2002, p. 294) points out that there are various factors that may have an influence on the effective and sustainable integration of ICT. Enablers for the effective and sustainable uptake of ICT are a supportive environment characterised by the following: availability of quality TPD, supportive and visionary leadership, collaboration, a climate of using ICT which is both encouraged and rewarded, the ease with which teachers integrate ICT, availability of resources and having on-site ICT support. Seyoum (2004, p. 7) and Nawawi, Ayub, Ali, Yunus and Tarmizi (2005, pp. 89 - 90), indicate two types of conditions that have to present for any innovation to be transferred and sustained in a school: essential conditions and contributing or supporting conditions. Essential conditions are the availability of teachers' professional development and ICT resources, and perceived value of innovation. Essential conditions are necessary but contributing or supporting conditions help to ensure the sustainability of the innovation. Contributing conditions are: support within and outside the schools, funding, supportive plans, access to ICT resources, the desire to change, strategies

and policies that facilitate the sustainability of an innovation. Principals should assess the presence of specific conditions in schools and then take appropriate steps to strengthen the conditions that are already present while taking steps to rectify or improve those that are not present in order to facilitate and enhance the integration of ICT in teaching and learning (Nawawi et al., 2005, p. 96).

DoE designed various strategies to encourage the use of ICT. Planning contact time for collaboration with colleagues, initiating just-in-time ICT training, develop instructional ICT-based materials for teaching and learning and peer-teaching of ICT related skills. Collaboration with other schools to share expertise and experiences on ICT integration, equipping teachers with personal laptops so they would be able to make ICT use a part of their lives and not be constrained by the unavailability of ICT facilities, and by employing more ICT assistants to support teachers in ICT use. There are elements that affect the acceptance of new ideas and have an influence on the speed by which ICT will be successfully integrated into schools. Teachers' perceptions of the advantages of using ICT should be increased and the effective use of ICT must be visible. Teachers' ICT use will be determined by the compatibility of such ICT with their existing educational beliefs and values. The complexity of the task of planning, instruction and training has an influence as well as the fact that there should be sufficient opportunity for hands-on experience (Theroux, 2004, p. 2). The presence of incentives will motivate teachers to implement ICT in their teaching and learning. Leaders actively involved in the different activities for ICT integration are seen as role models that provide support and encouragement to teachers. Commitment from the teachers is crucial and can be obtained by involving them in the decision-making process and by leaders who expect and encourage their involvement. Leadership especially at school level make a considerable difference in terms of improvements in teaching and learning practices and it is the responsibility of that leadership to establish explicit ICT policies, goals, strategies and specific implementation plans for the current school year and in future (Plomp et al., 2003, p. 9).

2.6 Summary

Various studies indicate that many attempts have been made for teachers to integrate ICT successfully into their teaching and learning practices. However, unfortunately most of these attempts were not very successful. I have identified a number of barriers and enablers that influence teachers' successful integration of ICT, as well as factors concerning knowledge about teachers' individuality, community of practice and professional development. Although these factors are encountered in combination to contribute to teacher's effective

implementation of ICT into their teaching and learning practices, the role of the principal seems to be a prime determinant for the successful implementation of ICT. Principals that want the education of learners at their schools to be in line with required 21st century skills will have to ensure that their teachers receive appropriate TPD on the effective integration of ICT in their teaching and learning practices.

While Thomas (2004, p. 41) states that “The fact that the dynamic interrelatedness of all of the identified influences might affect the implementation and sustainability of such projects, in the form of integrated systematic processes, is not considered in the literature at all.” Foskett and Lumby (2003, p. 193) indicate that: ”There are not yet satisfactory tools for measuring leadership and its effect.” From this review of the literature it becomes clear that there is insufficient research on the relationship of critical factors for the integration of ICT in schools in relation to the specific role of the principal in TPD (Akbulut et al., 2007).

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