CHAPTER NINE
Conclusions and Recommendations

> When, after several hours, I came to myself again, I asked myself what it was that had so fascinated me. The answer is simple. The results were not presented as ready-made, but scientific curiosity was first aroused by presenting contrasting possibilities of conceiving the matter. Only then the attempt was made to clarify the issue by thorough argument. The intellectual honesty of the author makes us share the inner struggle in his mind. It is this which is the mark of the born teacher. Knowledge exists in two forms - lifeless, stored in books, and alive, in the consciousness of men. The second form of existence is after all the essential one; the first, indispensable as it may be, occupies only an inferior position. (Einstein, 1954, p. 80)

Providing quality education is a major concern for the South African government. Since 1995 the government has invested large portions of the GDP to improve education and rectify the educational inequalities of the apartheid era (National Treasury Republic of South Africa, 2005). Although there has been increased enrolment in RSA schools since 1995, the quality of education and poor learner performance remains a concern (Taylor, et al., 2003). It is often thought that increased funding will improve educational provision and consequently learner performance, but internationally increased expenditure in education has not delivered on this promise (Cassassus, 2001; Hayward & Hedge, 2005; Hattie, 2005).

Many believe that educational improvement can only be accomplished through feedback of educational data to schools (Coe, 2002). In RSA a wealth of educational data are generated through systemic evaluations, national and international assessments, whole school evaluations and classroom assessments. The availability of these data alone cannot improve learner performance, the data also needs to be returned to schools and appropriately employed by schools for planning, decision-making and action. Not all feedback translates into improvement, feedback often results in a negative effect (Fitz-Gibbon & Tymms, 2002; Kluger & DeNisi, 1996). This thesis examined how to bridge this gap between the availability of learner performance data and the feedback of the data in a manner that facilitates use of the data to inform planning and action in schools. (See Section 1.3 for a full discussion of the problem statement and rationale)

For the purpose of this study, an existing feedback system known as the South African Monitoring system for Primary schools (SAMP) was optimised. SAMP is currently facilitated externally by the Centre for Evaluation and Assessment (CEA). The system produces learner performance data for Grade 1 learners that are also aggregated to school level. The data from SAMP are employed to inform individual learner intervention, classroom practice, and school level planning and action. (For a full discussion of SAMP consult Chapter 2)

This final chapter concludes the research for this thesis. The research process is summarised in Section 9.1, followed by reflections on the conceptual framework (Section 9.2) and a summary of the research findings according to the research questions (Section 9.3). This is followed by reflections on the methodology (Section 9.4) and on the role of the researcher (Section 9.5). The conclusions and recommendations are represented in Sections 9.6 and 9.7 respectively.

9.1 Summary of Research Process

The aim of this study was to identify and understand the characteristics of an effective feedback system and the use thereof in order to design and optimise a system that facilitates the use of learner performance data in RSA within the school environment. The research question and sub-questions were as follow:

What are the characteristics of an effective feedback system and the use thereof in order to design an optimum feedback system to facilitate appropriate use of learner performance monitoring in primary schools in South Africa?

1. How can an existing learner performance monitoring system be appropriately adapted, contextualised and translated to the South African context?
2. What are the characteristics documented in literature of an optimal feedback system for use in school-based monitoring?
3. What pre-existing conditions need to be established in the feedback system to facilitate the use of the learner performance feedback system?
4. How do schools use feedback?
5. How effective is the feedback system in enhancing classroom practices, management and planning activities?

6. Which design guidelines for the development of an effective feedback intervention for school-based monitoring can be identified?

This research aimed not only to generate knowledge by describing the characteristics of an effective feedback system and developing design guidelines, but also to design and develop a well functioning feedback system. The main research question lends itself to a design research approach that aims to align research and utility (De Villiers, 2005; Van den Akker, 1999). The design research process is iterative and follows a cyclical pathway of development combining design, development and implementation, with formative evaluation to understand issues of application. In this study, each cycle of design research consists of the design and introduction of a version or prototype of the feedback system. This in turn is formatively evaluated leading to a further cycle of development with a new prototype.

The design research process for this thesis moved through 3 phases encompassing multiple design cycles:

- ***Preliminary Phase (one cycle):*** This phase focused on research sub-questions 1 and 2:

  1. How can an existing learner performance monitoring system be appropriately adapted, contextualised and translated to the South African context?
  2. What are the characteristics documented in literature of an optimal feedback system for use in school-based monitoring?

Sub-question 1 was addressed in Chapter 2 by examining how SAMP was adapted to the South African context, as part of the preparation for the Preliminary Phase. Sub-question 2 was addressed through the needs and context analysis, including a literature review (Chapter 3) and an exemplary case study of NZ (Chapter 5). The emphasis of this phase was to conceptualise the feedback system and define the design specifications. The evaluative foci for this phase were relevance and consistency (Section 5.2). Data for the NZ case study were collected through document analyses as well as interviews with school users, NZ Ministry of Education officials, asTTle development team members, professional developers and researchers using asTTle.

- ***Prototyping Phase (three cycles):*** Research sub-questions 3-4 were address in this phase:

  3. What pre-existing conditions need to be established in the feedback system to facilitate the use of the learner performance feedback system?
  4. How do schools use feedback?

This phase consisted of the iterative research cycles during which Prototypes I-III of the feedback system were developed, implemented and formatively evaluated (Chapters 6-7). The emphasis of the cycles shifted throughout the Prototyping Phase focussing first on how to establish conditions for use in Cycles 1 and 2 (Chapter 6) and then on how to transform these conditions for use into action in Cycle 3 (Chapter 7). Cycles 1-2 concentrated on research sub-question 3 with the evaluations concentrating on relevance, consistency and practicality. Cycle 3 examined research sub-question 4 with the evaluative foci of actual practicality and expected and actual efficacy.

For the first cycle, data were collected through expert evaluation reports and the Delphi technique with school users. The second cycle's data were generated through teacher and principal questionnaires. For the third cycle, questionnaires were again employed for teachers, principals and HoDs. This was supplemented with the examination of three schools' data-use processes through observations of school meetings, reflective journals for teachers and interviews with teachers, HoDs and principals.

- ***Assessment Phase (one cycle):*** This phase represents the semi-summative evaluation that examined the functioning of Prototype IV as an integrated system (Chapter 8). The phase therefore re-examined research sub-questions 2-4, but specifically focused on sub-question 5:

  5. How effective is the feedback system in enhancing classroom practices, management and planning activities?

The evaluative foci for this phase were therefore practicality and efficacy, both expected and actual. The semi-summative evaluation was conducted through questionnaires for both school management and teachers, as well as reports from

expert evaluators. This is the final phase of the design research process for this thesis, although further development may take place as part of the work of the CEA.

The design research approach for this study incorporates various combinations of qualitative and quantitative methodologies during each evaluation cycle of the prototypes. The different qualitative and qualitative procedures employed in this study are illustrated in Figure 9.1. The data from each evaluation served to develop design principles to inform the development of the next prototype which was again evaluated.(The overall research methodology is discussed in full in Chapter 4). In the next section, the conceptual framework is discussed as it framed this investigation.

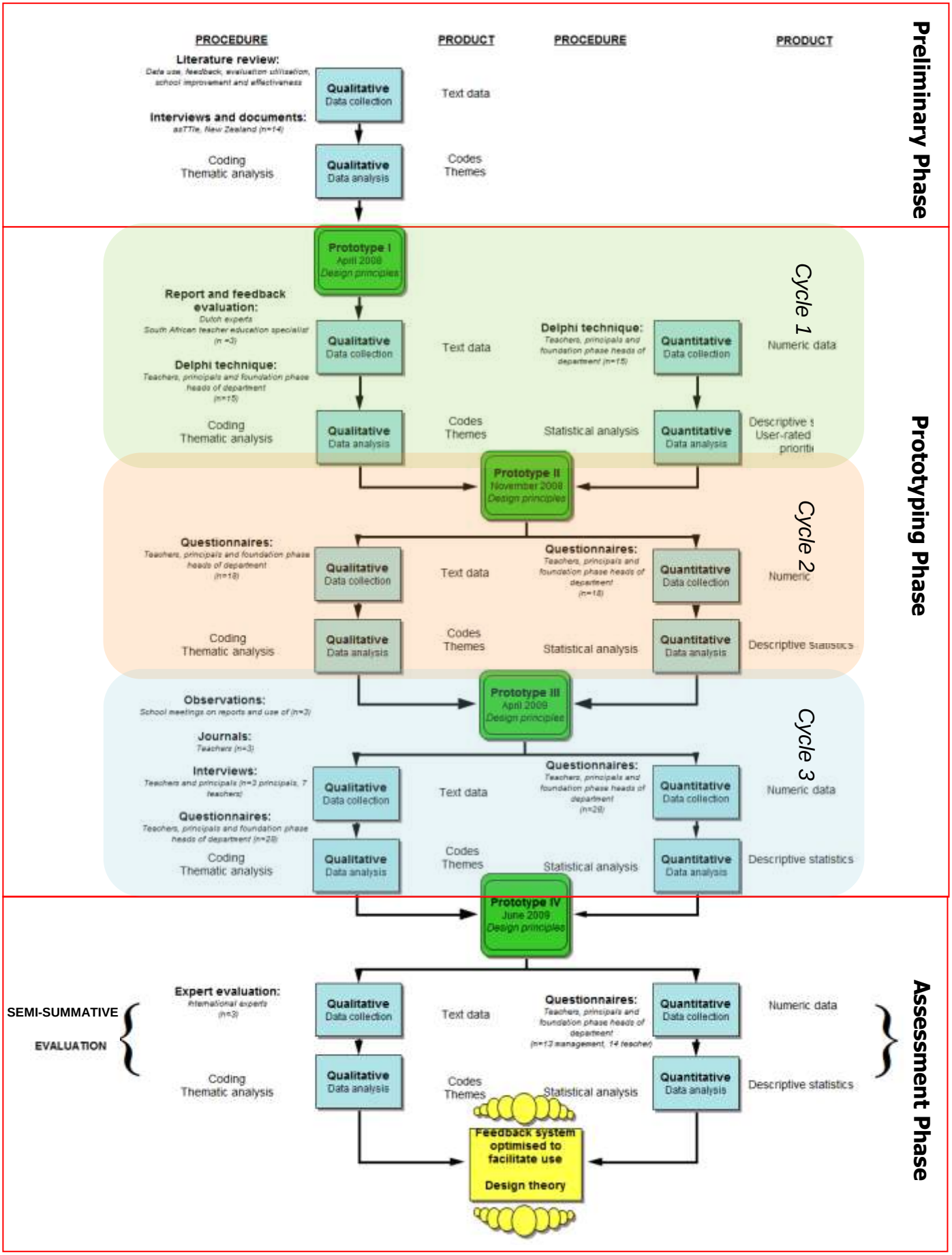

Figure 9.1: Research procedures

9.2 Reflections on the Conceptual Framework

The conceptual framework for use in this study (Figure 9.2) was developed from the literature on evaluation utilisation, SPFSs, feedback, school effectiveness and school improvement within a systems theory framework. How data are used in schools is often still a mystery and complicates the task of feedback facilitators in providing feedback that suits schools' data-use needs. Knowledge on data-use is mainly derived from organisational settings, psychology and the theoretical underpinnings of education as well as the field of evaluation (Coe, 2002; Kirkhart, 2000).

When examining use of feedback it is important to realise that use does not only pertain to direct use, but lies on a continuum from direct use to use purely for informational purposes without resulting in action (Alkin & Taut, 2003; King & Pechman, 1984; Weiss, 1981). Use in this research specifically refers to the process of applying the knowledge received toward a solution of a problem or the attainment of a predetermined goal (Love, 1985; Schildkamp & Kuiper, 2009). The application of the information may include direct use (instrumental use), delayed use or diffused conceptual use (Beyer, 1997; Estabrooks, 1999; Harnar & Preskill, 2007; Love, 1985).

Feedback interventions are often not used by schools, and if used in schools, often do not lead to improvement and under certain conditions even have an adverse effect (Kluger & DeNisi, 1996). The research focus has therefore shifted to facilitate the use of feedback to provide powerful opportunities for individual schools to analyse and improve quality of their education (Van Petegem & Vanhoof, 2005). The most salient feature influencing how receptive and responsive schools are to feedback seems to be the culture of the school (Salpeter, 2004). Schools that possess problem-solving capacity, innovation capacity and attitude, extra resources allocated to data-use in addition to tailored support and training, are more likely to show improvement due to feedback of data (Hulpia & Valcke, 2004). The school data-use culture is dynamic and can be altered through development, interaction with the feedback system and positive experiences of data-use (Schildkamp & Kuiper, 2009).

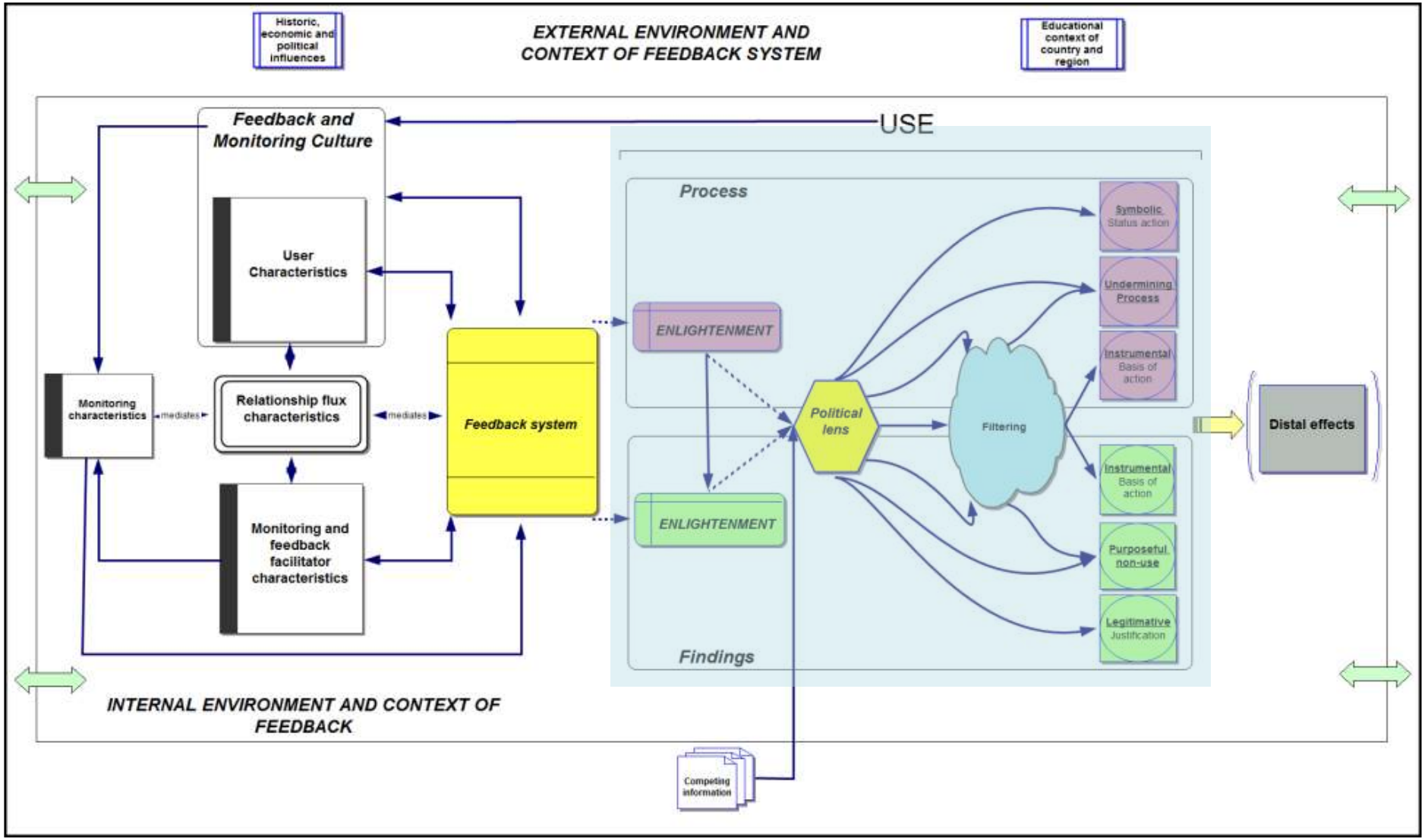

Figure 9.2: Original conceptual framework for use of monitoring feedback use

Data quality is important to facilitate use, data should also be relevant, reliable, valid, up-to-date, anonymous or confidential, have differential effectiveness and evoke positive reactivity. Presentation of data is also important, two-way communication and multiple modes of feedback presentation that considers user's level of data-literacy is more likely to evoke positive response (Bosker, et al., 2007; Brinko, 1993; Hulpia & Valcke, 2004; Schildkamp, et al., 2009)

A systems theory influenced the design of the conceptual framework. The framework acknowledges the interaction between various components in the feedback system that influence how feedback is received and how likely it is for the feedback to be used appropriately for decision-making and planning in the school environment. The original framework is shown in Figure 9.2.

The conceptual framework is a nested system acknowledging that any feedback is situated in the greater external education, monitoring and feedback environment in the country as well as in the immediate, internal context in which the feedback system and schools function. The use of feedback is influenced by the interaction of the feedback and monitoring culture of the schools, the characteristics of the monitoring system through which the data are generated, as well as by the characteristics of the feedback and monitoring facilitator. Combined with the characteristics and approach used in the feedback of the data these four groups of characteristics interact to determine the dynamic or flux characteristics (credibility, trust and sense of ownership) of the relationship between the users (schools, teachers and principals) and the monitoring and facilitator characteristics.

It is in this context that the data are provided through the feedback system which is characterised both by substantive and approach elements. Based on this two distinct types of use may take place, either process use based on what is learnt during the monitoring and feedback process or findings use which focuses on the data itself. In both cases of use, enlightenment or an enlargement of the body of knowledge first takes places. The information is then viewed through a political lens and then tested for reasonability and feasibility before it results in the different types of use. Every time use and participation in the feedback system takes place the monitoring and

feedback culture and experience of the users change and influence following cycles of feedback and use.

In view of these results, further adaptations were made to the final conceptual framework. The final conceptual framework for monitoring feedback use is shown in Figure 9.3. In the original conceptual framework, it was conceptualised that the feedback system only has an impact at the start of this process of use, providing data for enlightenment. The feedback system therefore was conceptualised as having limited influence on how the rest of the process of use takes place. Through the course of this research, it became clear that understanding of the data was seldom a concern, but rather, use was hindered when schools felt that they did not have resources to address the issues highlighted by the data. The feedback therefore failed the feasibility test. After deliberation with the research team, teachers, principals and HoDs it was determined that a multitude of education resources were freely available to support action and make acting on the data feasible, however three things prevented this process:

- Schools were often not aware of the availability of these resources.
- Resources, although freely available were often not collected in a central database, but scattered among resources from the DoE, the internet or at tertiary institutions or developed by specific schools and not shared with other schools. Internet resources were also available but the lack of internet access at schools meant that the resources were not accessible.
- Even if schools had the resources, they struggled to decide which resources to apply to the issues identified by the feedback.

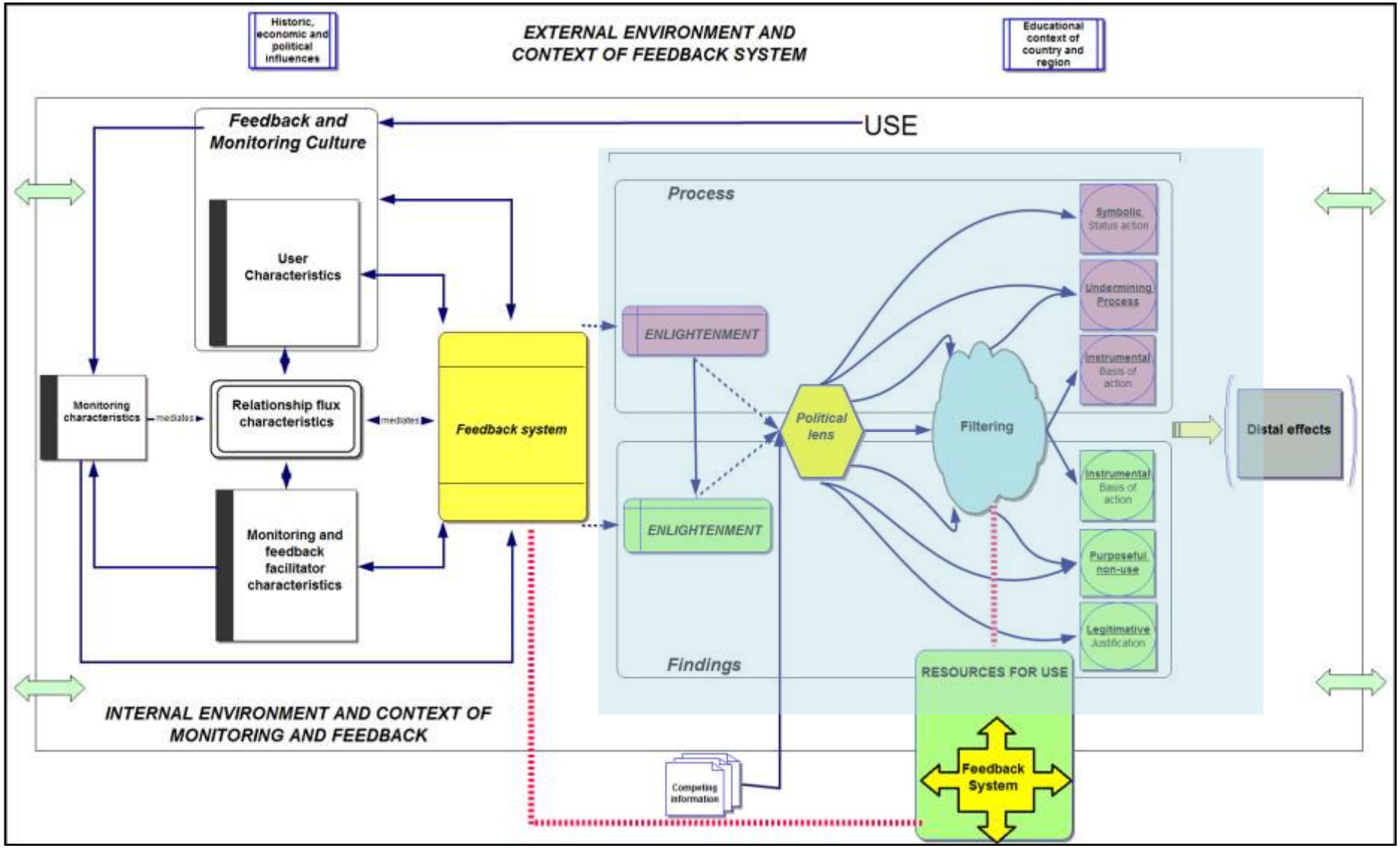

Figure 9.3: Conceptual framework for monitoring feedback use

An additional component was thus included in the conceptual framework. The feedback system was expanded to include a database of resources and provide links to resources to address certain learning areas and provide support materials to parents and caregivers. This was done by collecting the resources on a DVD/CD for schools so no internet access was required and publishing the resources on a web-page. All examples of interpreting and using data also now included a final section showing how the new resource database could be used to support improvement action. This shift meant that the feedback system's input in the process of use did not end with the provision of the data, but provided links to resources, which could positively influence whether or not the schools felt it was feasible to act on the data.

The contribution of this conceptualisation to the scientific body of knowledge on feedback systems for schools is that, although the context and feedback and monitoring culture of a school (Salpeter, 2004; Schildkamp & Kuiper, 2009) are paramount in how receptive and responsive schools are to feedback, these aspects can be influenced by the feedback system. Through the approach in development and interactions with schools, the culture of the school surrounding data-use can be influenced. At the same time providing links and a database of existing resources changes the awareness of the schools of the availability of resources that positively impact whether or not the data is acted upon.

Another shift in conceptualising of feedback systems is the shift in approach to facilitating understanding of the data. Often times the emphasis of support for understanding data built into feedback systems is on increasing the statistical literacy of users through for instance workshops, videos and materials that provide guidance on understanding the results (often very academic representations) as produced. Data complexity and lack of data-literacy are well documented as barriers to use of feedback for evidence-based practise (Black & Wiliam, 1998; Schildkamp, 2007; Schildkamp & Kuiper, 2009; Schildkamp & Teddlie, 2008; Visscher, 2002). This thesis advocates for an alternative approach where the existing processes and data-use styles of the users are examined in order to represent data in a manner

that is fairly intuitive and appropriate for the data-literacy level of the users. The data should still be presented in a statistically sound manner, but multiple data presentation forms can be used to reiterate reporting and make provision for different preferences of the users. Support to increase data-literacy should still be provided, but the focus should not only be statistical literacy. Rather, the support should be extended to understanding and interpretation of the data to be able to transform the data into planning, decision-making and action.

9.3 Summary of Results

The research results are presented in this section with specific reference to each research sub-question that was addressed. Reference is made to the chapters in which the full results for each sub-question can be found.

The overall research question for this thesis is:

> *What are the characteristics of an effective feedback system and the use thereof in designing an optimum feedback system to facilitate appropriate use of learner performance monitoring in primary schools in South Africa?"*

In order to address the overall research question, a number of specific sub-questions were explored. In this study, six specific questions were employed to answer the main research question. Each question and the relevant results are summarised separately.

9.3.1 Sub-question 1

> *How can an existing learner performance monitoring system be appropriately adapted, contextualised and translated to the South African context?*

Sub-question 1 was addressed in preparation for the Preliminary Phase. The question was addressed by documenting how the UK PIPS instrument was successfully translated, contextualised and adapted for use in RSA for Afrikaans, South African English and Sepedi (Chapter 2). The process incorporated statistical methods including an examination of reliability of

subtest and scales, Item facility and discrimination values and Rasch Analysis. The statistical data provided indications of scales, subtests and items that were of concern and required further examination. The data employed were the 2005 assessment data consisting of 417 learners. This was supplemented by teacher evaluations (n=6, two from each language group: Afrikaans, English and Sepedi) and the use of an expert panel (n=11, two educational psychologists, three teachers, two educational researchers and two subject experts involved in teacher education at a tertiary institution). The statistical analyses and evaluations also provided the means of re-examining the items after changes were implemented to ensure that the items were functioning appropriately and that valid inference could be made from the results. These processes were also supplemented by evaluations by two educational psychologists to map the overlap between the instruments and the curriculum. Substantial instrument-curriculum overlap was found with the Foundation Phase learning areas of Literacy and Numeracy. These curriculum links were included in the description of subtests in the instrument manual.

There are many approaches to adapt, contextualise and translate learner performance monitoring systems. However, it seems that any successful adaptation process cannot solely rely on statistical processes, but necessarily has to incorporate input from experts and users. This inclusion helps determine why certain items are problematic, increases contextual sensitivity, engenders trust and ownership and provides users with the opportunity to increase their statistical literacy.

9.3.2 Sub-question 2

> *What are the characteristics documented in literature of an optimal feedback system for use in school-based monitoring?*

The Preliminary Phase of the research design examined the characteristics documented in literature of an optimal feedback system (Chapter 4). A literature review was conducted and four international SPFS, namely SAM (Louisiana), asTTle (NZ), the CEM Suite (UK) and Zebo (Netherlands) were examined. The identified characteristics can be clustered into three groups:

technical characteristics; rollout and development characteristics and characteristics that alter the school environment.

Technical characteristics:

- ***Data*** must be relevant, reliable, valid, up to date, anonymous or confidential, allow for comparison, have differential effectiveness and evoke positive reactivity. (Angelle, 2004; Bosker, et al, 2007; Crooks 2002; Hattie, 2005; Hendriks, et al., 2001; Hulpia & Valcke, 2004;Tymms & Coe, 2003).
- ***Feedback*** should be thoughtful, reflective and focused to allow for exploration and understanding as well as two-way communication (Brinko, 1993; Bosker, et al, 2007; Hulpia & Valcke, 2004). Data is thus not just represented as fact, but presented in a way that invites interrogation and interaction. The feedback should also be provided in multiple manners employing for instance written reports, face-to-face feedback sessions and electronic representations (Brinko, 1993; Coe, 2002). The multiple representation styles accommodate various learning styles and preferences for users and provide multiple opportunities to interact with the data which may also reduce some users' anxieties about data-use and data-literacy. Short turn-around time for feedback is essential to ensure data are still relevant. This can be facilitated by ICT solutions that automate certain reporting functions (Angelle, 2004; Hattie, 2005; Hendriks, et al., 2001; Teddlie, et al., 2002).
- ***Reporting*** should consider user experience in data-use. This can be facilitated by employing different modes of presentation to accommodate user preferences (Brinko, 1993; Coe, 2002). The modes of presentation relates to how the data is presented (for instance graphically, textually or tabulated). Some users may prefer a specific data representation and using multiple presentations means that they may select how to view data and may even increase their data literacy through exposure to different data representations.

- ***Support*** should include tools to support school improvement-driven practices, (Angelle, 2004; Hendriks, et al., 2001; Teddlie, et al., 2002). These tools may include links to resources (either paper-based, electronic or web-based) but also includes making linkages between the data and curriculum apparent. Non-use of feedback is often due to a lack of knowledge of how to implement the feedback, not a lack of understanding of the data. Schools therefore do not know how to implement changes feasibly. Provision of tools to support use makes it easier for the feedback to pass the feasibility test and be used appropriately.

Rollout and development characteristics:

- ***User inclusion*** in the development processes through evaluations and consultation ensures contextual appropriateness and a sense of ownership (Hendriks, et al., 2001; Tymms & Coe, 2003). This in turn increases user familiarity with the feedback system and receptiveness to the feedback.
- ***Implementation through exemplars*** is recommended, e.g. starting with a small group to serve as living examples to other schools and teachers, followed by gradual dissemination of the approach (Black & Wiliam, 1998; Salpeter, 2004). Such an approach not only builds trust in the intervention's effectiveness in the context but also provides a network of users to discuss experiences and challenges in implementation.

Characteristics that alter the school environment:

- ***Data-literacy:*** Once again, the level of users' exposure to data-literacy can be improved by using multiple representations of the data and examples of how to use it, thus ensuring users are better equipped to work with data in the future. (Schildkamp & Kuiper, 2009; Van Petegem & Vanhoof, 2005). As data-literacy not only focuses on understanding data, but also the ability to use the data, support may also focus on improving the schools' problem solving and innovation capacity (Hulpia & Valcke, 2004)

- ***School culture*** directly influences how receptive and responsive schools are to feedback (Hulpia & Valcke, 2004; Salpeter, 2004; Schildkamp & Kuiper, 2009). Positive experiences of the feedback system and data-use in a non-threatening environment that is sensitive to user needs and input encourages a more data-friendly and responsive school culture (Hattie, 2005; Tymms & Albone, 2002; Schildkamp & Kuiper, 2009).

9.3.3 Sub-question 3

What pre-existing conditions need to be established in the feedback system to facilitate the use of the learner performance feedback system?

This research question was addressed during the Prototyping Phase, employing expert evaluations (n=3), the Delphi technique (n=15), a feedback session questionnaire (n=18) and a report questionnaire (n=28), discussed in full in Chapters 6-7. The exemplary case study of asTTle in NZ also provided additional information (Chapter 5). The research revealed that six components needed to be considered and attended to in order to have a successful feedback system.

1. ***Instruments*** must be designed, adapted, translated and contextualised in such a manner that they are not only valid and reliable, but also credible and trusted by the users. Participation of users in this process contributes to user sense of ownership of the feedback system and trust, which positively influence the monitoring and feedback culture of the school.
2. ***Reporting*** must be considered at all stages, i.e. during all parts of the feedback system the main goal of facilitating action and decision-making through reporting must be considered. Data must also be presented in a variety of formats, using different modes of feedback from written to face-to-face. This means that users may attend to feedback in the format with which they are most comfortable. In this way, users are not forced to adapt to a mode of feedback they are

uncomfortable with and can rather focus all their resources on understanding and using the data.

3. ***Support*** must be provided for ***understanding*** the data. Understanding the data is the first step in using the feedback appropriately. Such support should not only improve the users ability to understand the specific data, but also provides the opportunity to increase general data-literacy.

4. ***Support*** must also be provided for ***using data*** in schools, i.e. how to transform the data into action and decision-making in the schools. Once data is understood and problem areas identified for improvement, schools need several skills to use the feedback for decision-making, planning and improvement, for instance problem-solving, goal setting and monitoring skills. By modelling these skills in the feedback system (e.g. manuals, presentations, reports and electronic resources) and through examples, the users may improve these skills through process use. The provision of tools and links to resources also make it more feasible for schools to bridge the gap between understanding and effectively using the feedback, thus decreasing the barriers to use.

5. Throughout, attention must be paid to the ***relationships and communication between the schools and feedback system facilitators*** as these influence the trust, ownership and credibility of the feedback and the school's culture of data-use. Mutual respect is essential and can be shown through clear, concise meaningful communication, careful attention to logistical matters and training of the research and fieldwork teams.

6. These five components must all show a congruency that supports an underlying philosophy of assessment for learning and use of data for evidence-based practise as opposed to pure statistical understanding. This will support a ***paradigm shift*** in users, which may through process use be transferred to other aspects of teaching and management in the school environment.

(See Chapter 5-8) for a full discussion of these various elements)

9.3.4 Sub-question 4

How do schools use feedback?

This question was addressed in Cycle 3 of the Prototyping Phase by observing how three schools used the feedback from SAMP (Chapter 7). Observations, interviews and semi-structured journals were employed to examine the actual and expressed use of the feedback. This data were supplemented with data from the Assessment Phase questionnaires (management n=13, teachers n=14) in Chapter 8. The three schools investigated showed different levels of data-use sophistication, but all three schools used the data as the basis for planning, decision-making and action. All three schools used the data for several purposes: to support conversations with multiple stakeholders (amongst others HoDs, principals, other teachers, parents and departmental representative); to guide professional development; for curriculum development and planning; to meeting accountability demands; for triangulation; for further analyses, goal setting and monitoring

Three distinct approaches to data-use that appear to be effective emerged: *Team*, *Top-down* and *Cascade* (For a full discussion see Chapter 7). The most appropriate and effective model for data-use seemed to depend on the culture of the school, school leadership approach, level of teacher development, context and current level of functioning of the school. It was clear that a more advanced, sophisticated approach to data-use may be disheartening and inappropriate in certain contexts.

Once it was determined how schools use the data from the feedback system, it was necessary to examine how effective the SAMP feedback system was in enhancing classroom practices, management and planning. This was addressed through answering sub-question 5.

can be clustered according to guidelines for: instruments, reporting, support to understand data, support to use data, school relationship management and support for paradigm shift. The detailed design guidelines can be found in Chapters 5-8 and are only summarised here.

Instruments

The data generated to be provided through the feedback system must be shown to be reliable and allow for valid inferences for a feedback system to be effective. User involvement in adaptation, translation, contextualisation, development or evaluation of instruments is strongly advised to encourage trust, credibility and sense of ownership. Data must be differential to have diagnostic value and be curriculum-aligned to facilitate using data for decision-making and planning.

Reporting

User preferences should be accommodated through different modes of feedback (for example face-to-face, written and electronic) and incorporate various data representations (for example tables, graphs and text). Data must have comparative elements and should be confidential. Reporting should include both positive and negative feedback and include interpretations and recommendations to support evidence-based improvement practise. Employing these guidelines decreases the demands on the statistical-literacy of the users, provides opportunities for users to improve their data-literacy and increases the school's receptiveness and responsiveness to the feedback.

Support to understand the data

Incorporating various formats of data representation facilitates understanding of data, but should be accompanied by explanations, examples and support material. Support must be provided in a variety of manners such as written manuals, electronic support, web support and live interaction through feedback sessions and telephonic support, some of which should be available around the clock. This type of support provides users with the opportunity to select the most appropriate support for them and accommodates users with different levels of data-literacy skills.

Support to use the data

Once users understand the data, the next step is to use the data for improvement action in the schools. This can be supported by including interpretations, recommendations and links to tools for action in the feedback. This type of support should again be represented in a variety of modes with some support being available around the clock, e.g. printed materials, electronic resources and web-based support.

School relationship management

Every interaction with the schools provides an opportunity to alter perception and increase the receptiveness of the school users to the feedback. The quality of interactions is more important than the frequency of interactions. Communications should be clear, concise, respectful and encourage two-way communication that values user input. Fieldworker training is an essential component of school relationship management. A record keeping system of communications is essential to prevent duplication of communication by other team members. Professional execution of logistical matters provides an opportunity to show respect for users and improve the relationship flux characteristics between the feedback facilitator and users.

Support for paradigm shift

A learner performance feedback system can be a powerful tool to facilitate paradigm shifts. In this case, the feedback system aimed to entrench certain concepts with the users: use of data for evidence-based practise; the need for differential teaching; assessment for learning as opposed to assessment of learning; greater understanding of the curriculum. Whatever the underlying paradigm of a feedback system, all the elements of the feedback system should embody this and be congruent with the other elements. For example, modelling the approach to interpretation, planning and action based on the data, can be a powerful tool to embody the paradigm and support process use of these skills in the schools.

9.4 Reflections on Methodology

The use of a design research approach was highly effective for the design and adaptation of the feedback system. Feedback systems must be contextually appropriate and suit the preferences of the users while reporting the data in a reliable manner that provides the opportunity for valid inferences and achieves consequential validity through evidence-based practise in the schools. The design research approach allowed the opportunity to design, implement and evaluate various prototypes, which slowly started to approximate the ideal for the specific context. Design research includes representatives of the target users in designing the interventions. This meant that users could feel a greater sense of ownership of the feedback system, making them more receptive and responsive to the data. The design research approach had a greater cost benefit than carrying out a traditional design experiment to evaluate the existing feedback system that would merely have shown the limited effectiveness of the original system. Such an experiment would then have to have been followed up with further costly design to address the problems.

The design research approach also allows for the use of mixed methods as employed in the study. The combination of methods meant that the different weaknesses inherent in qualitative and quantitative methods could be supplemented with the different strengths of the methods, leading to more robust results. For this study the quantitative methods provided statistical data that were essential to evaluate and rate the effectiveness of the system and design the instruments. The qualitative methods provided insight into the user experiences and processes of use, which were essential to study how the data were used and study the feedback and evaluation cultures in the schools. The mixed methods approach also ensured multiple points of data source triangulation. Design research also requires input from both experts and users, which provided insight from both an academic and contextual level. The design research philosophy of viewing the users as true partners and collaborators in the design process was congruent with the collaborative approach used in the feedback system. The participation in the design research process also afforded users the opportunity for process learning about evaluation processes and furthered data-literacy of the participants.

A design research approach is very labour intensive and cannot be conducted in a short time frame. This has the benefit of prolonged engagement, but has cost implications. In this research four different prototypes of the feedback system were developed over a period of four years. This research concludes at this point and it seems that all the necessary evaluative criteria have been fulfilled. However, a cost-benefit analysis will still have to be conducted to determine if further development of the system is required.

Small sample size is a characteristic of design research (Plomp, 2009). In this research this can be seen in particular in Cycle 3 where the various approaches to use were examined. Only three schools could be followed. It is highly possible that additional approaches to effective use could be identified by studying a greater sample. The three schools were also specifically chosen as they were using the feedback effectively. Studying poor use, or non-use of data would provide the opportunity to gain a greater understanding of use, especially through comparison of approaches to effective and in-effective use or non-use of data. Unfortunately, this was beyond the scope of this thesis.

Some known design research dilemmas include the complication of working in a real world setting, where you as researchers may be a cultural stranger and need to be adaptable (Plomp, 2009). In this research, the researcher was a cultural stranger in the school environment. This was however overcome by collaboration and forming mutually beneficial relationships with the school users. The design research must be adaptable as each cycle is based on the previous. In a real-world setting changes in the research design are inevitable. Some consistency is essential though and this was ensured by having an explicit conceptual framework (Section 3.5) and congruent study design (Chapter 4), employing both deductive and inductive reasoning as well as rich descriptions.

One of the larger dilemmas in this study relates to the dual role as evaluator and facilitator of the feedback system, a characteristic of design research. Several measures suggested by Plomp (2009) were taken to compensate for this potential conflict of interests:

- ***Opening the research to professional scrutiny to people outside the project,*** including the three expert evaluators, research and educational psychologists and colleagues acting as critical friends.

- ***Shifting from the 'creative designer' perspective to the 'critical researcher' perspective as the research progresses:*** In the Preliminary Phase and early Prototyping Phase methods were used that explored and generated ideas, e.g. the NZ case study and Delphi technique. Later, methods such as the questionnaires and final expert evaluation reports were aimed at a more critical research perspective.

- ***Having a good quality of research design:*** Throughout the various design research phases, each cycle was given equal importance and attention. This helped establish a *strong chain of reasoning* (Krathwohl, 1998). Triangulation of method (qualitative and quantitative) and sources (users and experts) was employed to *explore empirically* the consistency, relevance, practicality and effectiveness of the intervention. Process notes, memos (*Atlas.ti)*, reflections (research diary) and member checks (interviews) were *systematically documented* to provide an audit trail. Teachers, HoDs and principals as well as the expert evaluators and colleagues acted as *critical friends*. The *quality of the data and instruments* was ensured through the methods discussed in Chapter 2 as well as trialling of evaluation instruments. The dual role of the researcher is discussed in depth in the next section.

9.5 Reflections on the Role of the Researcher

During this research, I held the roles of monitoring and feedback facilitator, as well as evaluator during the design research process. I explore these roles and implications for this research along with the role of self-reflexivity in managing these roles and the tensions in Section 4.3.1.

One of the main concerns with holding these multiple roles was how the act of evaluation would affect the attitudes of the feedback users towards the feedback system:

> Every time I have to ask the teachers, principals and HoDs to complete a questionnaire or participate in an interview or one of the other data collections. As a feedback facilitator I am always aware of the high administrative demands placed on teachers, principals and HoDs in schools in South Africa. Time to work with data is limited and I always try to make the feedback as user friendly as possible to ensure that the limited time is spent on deciding and planning how to act on the data as opposed to trying to make sense of it. It keeps feeling that the act of evaluation will have a quantum effect, negatively influencing the school's attitudes to the feedback system as a whole or taking time away from using the data in the schools. (Research diary 26/05/2008)

It soon became apparent that this was not necessarily the case:

> After the feedback session I realised that the schools actually appreciate the opportunity to give feedback. The key seems to be that the schools feel that their feedback is taken seriously and impacts how they receive feedback. If anything, the schools seem thankful for the opportunity and see it as a way of expressing their thanks for the feedback, which they find very useful. (Research diary 01/12/2008)

The evaluation process also increased the schools' sense of ownership of the data, gave them some insight into how evaluations can be conducted, and increased the users' familiarity with and understanding of the data and presentation formats. In effect, the evaluation process may have had a positive impact on the feedback and evaluation culture in the schools and receptiveness of the schools to use the feedback. It also seemed to have had a positive effect on the trust, credibility and mutual respect developed between the users and facilitator. This re-emphasised the need to try to represent the input of the users as well as possible and to reproduce their voices authentically in their evaluations and in the way I developed prototypes based on the feedback. In many cases, things that I was concerned about in prototypes were not the main priorities for schools and I had to pay attention to maintaining a balance between my own and evaluator inputs as well as user inputs.

The users' high levels of willingness to participate in the evaluations raised a new concern that the users were providing socially desirable responses, but

the multiple points of triangulation of sources showed a consistency of responses. Sensitivity about the demands placed on the users through the evaluation also provided extra impetus to design each evaluation very carefully and to ensure that evaluations were as clear as possible and took up the least amount of time, while still fully addressing the specific questions.

From a researcher facilitator point of view also being the evaluator meant that it was easier for me to be cognisant of the users' ownership and contribution to the feedback system. This made it easier to see the users as full partners in the feedback system and always ensure two-way communication.

From a very personal point of view I can be a bit controlling and the size of the study necessitated that I used multiple fieldworkers and a feedback facilitation team.

> I constantly have to try and moderate my own fear and need to control all communications with the school. If I gave in to it I would do all the phoning, faxes, letters and fieldwork myself and this is just impossible. One of the hardest things to do is to let go. The team has been amazing though, it seems that the training and guidance I provided on communicating with schools based on the underlying values of true partnership and respect is paying off. Feedback from the schools on the team is amazing and schools often seem surprised to be treated with respect by researchers and the team. (Research diary 28/02/2007)

I soon realised that I had to deal with this fear and that the solution was not to let go of all responsibility, but to entrench in the team the spirit of our collaboration with the schools and the importance of the contribution of the schools. To allow for further expansion of the project, good training for the entire team is required. Training should not just concentrate on logistics and procedures, but also on the quality of the relationship being sought. Procedures for checking and revising written communications and record keeping of interactions with schools so duplication does not take place are also essential. If the core values of trust and respect are not built into training for the team of a feedback system, these values will be lost during expansion of the system and introduction of new team members.

9.6 Conclusions

Six major conclusions were generated from the research results of this thesis:

1. *An effective feedback system facilitates appropriate use through a gradual process of enlightenment, is flexible and responsive to user inputs, values collaboration and includes instrument, reporting and support components in its design.*

This research shows that appropriate use of feedback is not facilitated by a single event or component in the feedback system, but through the interaction of the various components of the system and repeated exposure of the users to feedback (through for instance reports, feedback sessions and electronic resources). This results in enlightenment, which may lead to further use (Chapter 3). To succeed, a feedback system must be flexible and responsive to user inputs as users are the only true experts on their own context and the context is always in flux. By truly valuing collaboration, feedback becomes a bi-directional process that encourages ownership, trust and respect. This, in turn influences the feedback and monitoring culture to be more receptive and responsive to feedback.

An effective feedback system must also incorporate three components: instruments, reporting and support. The quality of the feedback system is not independent from the monitoring instruments, as appropriate use cannot take place unless the instrument generates reliable data from which valid inferences can be made for the context. Involving users in the development or contextualisation of such instruments helps to establish the credibility of the instruments and the data they generate as discussed in Chapter 3 and supported by authors such as Nevo (2001) and Patton (Patton, 1997). Instrument quality was addressed under sub-question 2 in Chapter 2.

The reporting components are essential to the feedback system and multiple guidelines for effective reporting have been generated in this thesis (Chapters 5-8). The reporting component includes aspects such as feedback sessions, reports and manuals. The reporting must however be supplemented by a support component to facilitate the appropriate use of the feedback. Support

must be provided on two fronts: firstly on the statistical-literacy front in order to help users to understand the data (Earl & Katz, 2006; Schield, 2004) and secondly on the front of data-use (Sub-questions 3-4 in Chapters 5-8).

2. *An optimum feedback system positively influences school data-use culture.*

The school culture of feedback and monitoring use is a major determinant in how receptive and responsive schools are to feedback (Salpeter, 2004). Some authors have argued that this culture need not be seen as a fixed variable in the feedback use equation (Schildkamp & Kuiper, 2009). The monitoring and feedback culture of a school not only relates to previous experiences of data-use, monitoring and feedback, but also to the exposure and level of data-literacy of users as some data-literacy, including statistical literacy is essential in using feedback effectively (Cradler, 2008; Earl & Katz, 2006; Schield, 2004).

This research has shown that a feedback system can positively mediate the feedback and monitoring culture of a school on both these fronts, thereby improving the receptiveness and responsiveness of the school to further feedback. This is firstly accomplished by providing a non-threatening, collaborative atmosphere that encourages respectful communication and positive experiences of feedback use. This approach to feedback is also supported by Bosker, et al.(2007), Brinko (1993) and Hulpia and Valcke (2004). Secondly, the feedback system can help increase user data-literacy by providing examples of interpretation, multiple presentations of data and guidance. This may improve users' sense of self-efficacy and knowledge of data-literacy, thereby encouraging use of feedback and preparing users for future feedback. This conclusion relates to research sub-question 3, Chapters 6-8.

9.3.5 Sub-question 5

How effective is the feedback system in enhancing classroom practices, management and planning activities?

The question relates not only to the expected efficacy of the system, but also to examples of actual efficacy. Cycle 3 of the Prototyping Phase as well as the Assessment Phase related to this question. Actual efficacy was examined in a limited fashion through the observations, interviews and journals kept by the three cases of school use discussed above (see Chapter 7 for a full discussion). During the Assessment Phase, specific questions in the final evaluation questionnaires (management n=13, teachers n=14), as well as the final evaluation reports of the expert evaluators contributed further data on efficacy. The final evaluation questionnaire ratings for both management and teachers indicated that all elements of the feedback system were rated as highly effective with mode ratings of 4 or 5 out of a possible 5 for all elements. The evaluations showed that the data were employed for ***practise*** in the schools, including for instructional purposes, encouraging self directed learning and motivation. The data also contributed to teachers' understanding of their own practice and professional development needs. The data were used by ***management*** for policy development, professional development as well as monitoring of assessment and educational standards. The data were employed in ***planning*** about learners, curriculum planning, professional development planning and for supporting conversations with other stakeholders. The final research question is dealt with in the following section and relates to the design guidelines for the development or adaptation of an effective feedback system.

9.3.6 Sub-question 6

Which design guidelines for the development of an effective feedback intervention for school-based monitoring can be identified?

Design guidelines were developed throughout all three phases of the design research process, based on the various evaluations. The design guidelines

3. *An effective feedback system must offer a comprehensive package to accommodate different users, with various levels of data sophistication, functioning in diverse contexts.*

The data from sub-question 4 (Chapter 7) identified three different approaches to appropriate data-use (Team, Cascade and Top-down approaches) and there may be many more possible approaches. The level of sophistication of the data-use in the schools in this study also varied drastically. It would seem that the most appropriate and effective approach to use may well depend on the culture of the school, school leadership approach, level of teacher development, context and current level of functioning of the school. A more advanced, sophisticated approach to data-use may not always lead to better data-use and may be disheartening and inappropriate in certain contexts (Chapter 7).

Some authors such as Fullan (2006) believe that context has such a large impact that there cannot be one intervention that suits all contexts. It would however be impossible to design and implement different feedback systems for each approach and level of sophistication of data-use. This researcher proposes that an effective feedback system should provide data in a variety of manners (e.g. textual, graphic, tabulated and electronic), with various presentations (e.g. face-to-face, electronic and written) and levels of sophistication, so that schools can use data as per their needs and level of data-literacy.

The feedback system in this thesis thus represents a comprehensive package with data presented in a variety of formats and disseminated through different modes. Users will therefore typically use a core section of the feedback i.e. the summarised school results as well as tabulated learner results and then select which of the other data is appropriate to address the issues with which they are grappling in their own schools. Users may also focus on their preferred mode of feedback to suit their preferences. In this way, one feedback system can be appropriate for multiple user profiles.

4. *An effective feedback system mediates thinking about educational instruction and curriculum.*

All feedback systems have an underlying paradigm in which philosophy, values and pedagogy are made apparent in its various components (Chapters 5-7) The paradigm is present, even if not declared to users. In this research the feedback system aimed at facilitating use. The paradigm therefore encouraged:

- Use of data for evidence-based practise
- The need for differential teaching
- Assessment for learning as opposed to assessment of learning
- Greater understanding of the curriculum

If the paradigm is embodied in each component of the feedback system (from the language used to the congruence between the various elements in the feedback system), the feedback system itself can become a powerful vehicle to bring about changes in how schools think about educational instruction and curriculum. In this instance, the paradigm shift facilitated by the feedback system was a move from merely generating data to interpreting data, planning according to the data, setting goals and evaluating the success of actions. The feedback system therefore acted as a model of the type of appropriate use the system wished to facilitate in schools.

5. *Clear, simple, intuitive data presentation allows for experiential learning to increase user data-literacy.*

Feedback systems often present data in a traditional, academic fashion, which makes high demands of data-literacy, with support aimed at teaching statistical knowledge (Vanhoof, Verhaeghe, Van Petegem, & Valcke, 2010). While some statistical literacy is important (Cradler, 2008; Earl & Katz, 2006), this type of support can be confusing to users and diverts attention from using the data to trying to contend with how the data are presented. This research showed that providing data in a format that is more easily accessible to users through multiple data representations (e.g. graphs, tables and textual discussions) data becomes more accessible and user preferences are

accommodated (Chapters 7-8). This allows the user to focus on use as opposed to trying to understand the data and provides the opportunity to expand data-literacy experientially by interacting with the data. Employing this approach means that users' experiences of data-use must be taken into consideration (Coe, 2002; Hulpia & Valcke, 2004). It is therefore necessary to examine how users already interact with the data (Chapter 7-8). Other systems such as asTTle, where reporting formats were one of the first aspects examined, also support this approach to data representation (Meagher-Lundberg, 2001)

6. *Design research offers an appropriate and powerful approach to adapting, developing and optimising a feedback system.*

Finally, throughout this research the importance of context, consultation and true collaboration with users has been emphasised. Design research is an effective method of developing various prototypes in collaboration with users to ensure contextual appropriateness (Plomp, 2009). The process of participation in the design research itself encouraged ownership and familiarity with the feedback system. Employing a design research approach to develop or adapt a learner performance feedback system to a specific context therefore can have the benefit of improving the receptiveness and responsiveness of schools to feedback.

Design research also provides the opportunity for process use and learning on evaluation and data-use, gained through user participation in evaluations. Design research firmly supports true collaboration between researchers and users. This relationship supports and strengthens respectful, two-way communication (Lachat & Smith, 2005) which should be encouraged in an effective feedback system. The process also generated design principles (to address sub-question 6), which can be employed by other researchers wishing to develop or adapt an effective feedback system in other contexts (see Chapters 5-8)

9.7 Recommendations

The recommendations for this research are divided under research policy and practise. These are now discussed separately.

Research

The design research process for this thesis was ceased after four prototypes. Additional cycles may be required, but the evidence suggests that the feedback system is functioning well in the context for the languages for which it was adapted. Although the design research process was effective in designing the feedback system, it may be necessary to employ a randomised control study to establish fully the effectiveness of the feedback system as suggested by Nieveen (2009) and McKenney, Nieveen and Van den Akker, (2006). Such a study may provide data to support up-scaling of the project.

The feedback system studied here was of limited scale and concentrated on one geographic region, three language groups and only Grade 1 learners. Further research is required to ensure that the principles are transferable to other contexts and grades, language groups and secondary school level. Research that produces design principles on how to roll-out the feedback system in such a way that it remains sustainable and functions well on a large scale is also required.

The feedback and monitoring processes studied in this thesis were externally facilitated. Staff of the CEA administered the SAMP assessments, the data were analysed at the CEA and the CEA provided feedback to the schools. The long-term goal for this feedback system is that it be administered by schools for greater autonomy. This is an important step in making the feedback system part of the formal education system. The characteristics and design of a feedback system, which is internally facilitated and part of the formal education system, may differ from those discussed in this thesis and a further examination of use of feedback in such as system would be beneficial.

This study also only examined three different approaches to effective data-use in schools. A larger study of processes of data-use in schools may

uncover different approaches and identify more elements of effective use. This would provide further information for policy makers on how to support use of data in schools. A study of approaches that result in poor use, misuse and non-use may also provide additional data on how to facilitate use. As not all poor use, misuse and non-use are intentional, such research may provide information on barriers to appropriate use of feedback that exist and how to address them.

Policy

The Whole School Evaluation Policy in RSA already requires schools to participate in self-evaluation and report it to the DoE. Many schools are however, ill-equipped to conduct self-evaluations. The policy should be supported through access to approved existing feedback, monitoring and evaluation systems, which provide the opportunity for schools to develop their own self-evaluative skills.

From this study it is clear that there is not only one approach to effective data-use which would be appropriate for all school cultures, school leadership approaches, levels of teacher development, contexts and various levels of functioning of schools (Chapter 7). It would therefore be counter-productive for policy to prescribe a specific detailed approach to use of feedback and data. The policy should however make provision for time and resources for data-use to take place. The policy on school leadership training should also include training in data-literacy and should guide schools in effective data-use from understanding to evidence-based practise, possibly through exemplars of different approaches for effective data-use.

The current policy (currently under review) on assessment in schools dictates that a large amount of assessment takes place with accountability demands that require teachers spend a significant portions of their time on administration. A shift in policy is recommended, where the emphasis is not on over-assessing and reporting learner data. Fewer assessment opportunities aimed at guiding further teaching and planning are recommended. The decrease in administrative load would provide additional

time to interrogate and interact with the data and provide more time on task in the classroom.

In this thesis it has been shown that ICT has been used effectively internationally to facilitate use of feedback, decrease reporting turn around time and increase access to resources to facilitate use of feedback. In South Africa use of ICT is still limited, not only by challenges of access to ICT infrastructure, but also by limited ICT knowledge and exposure for school staff. It is recommended that the training policy for teachers and staff in schools include training in use of computers and basic data analysis software such as *Excel* as well as on how to access and evaluate resources available on the internet. Development of the ICT infrastructure need not focus on individual schools, but may employ a cluster approach where resources and capacity are improved for a group of schools to share. Such a policy would increase the ability of schools to understand, take ownership and greatly improve access to resources for responding to feedback.

Practice

The recommendations for practice are captured in the section on design guidelines in this chapter (see Section 9.3.6). It is clear that when designing or adapting a feedback system, the level of data-literacy of the users must be considered. Reporting must be planned and piloted with users well in advanced to ensure that data are presented in as clear and intuitive a manner as possible so that users can make sense of the data. All communication should be bi-directional communication between users and facilitators. This type of communication engenders trust, credibility and respect. Data must be represented in several manners and be detailed and have diagnostic value so it may suit the needs of various users. Providing links to resources to support use of feedback is essential to facilitate action. This provides a bridge between understanding and using the data. The culture of the school must also be considered. If ignored, an un-receptive culture may lead to failure of the feedback system, irrespective of its technical quality.

From this research, it is clear that employing evidence-based practice and data-literacy are still a challenge for most teachers in South Africa. It is suggested that training in evidence-based practices as well as basic data-literacy (being able to select and evaluate appropriate data for use, interpreting the data, planning and goal setting as well as evaluating the success of actions based on the data) be introduced into both pre-service and in-service training of teachers.