

**PRINCIPALS' LITERACY IN INFORMATION AND COMMUNICATION
TECHNOLOGY (ICT): TOWARDS IMPROVING SECONDARY SCHOOL
PERFORMANCE IN KENYA**

by

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DECLARATION

I declare that PRINCIPALS' LITERACY IN INFORMATION AND COMMUNICATION TECHNOLOGY (ICT): TOWARDS IMPROVING SECONDARY SCHOOL PERFORMANCE IN KENYA is my original work. All sources that have been used or quoted have been indicated and acknowledged by means of complete references.

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SUMMARY

This thesis is a study of the extent of ICT literacy among secondary school principals in the Western province of Kenya. A contemporary issue in the improvement of quality in school leadership relates to use of ICT; the assumption is that improving leadership is the key to good school performance. The research was triggered by the need for quality among secondary school principals and their preparedness to cope with technology change.

A mixed mode methods research was conducted involving both quantitative and qualitative approaches. In this research 188 secondary school principals in the Western province were used for data analysis. An empirical investigation was conducted. School principals responded to questionnaire 1 which investigated ICT literacy. Deputy principals responded to questionnaire 2 which investigated school performance. Open-ended questions, semi-structured interviews and observation schedules were used to obtain qualitative data.

From both the literature review and empirical research findings, it was clear that:

- i) factors that influenced ICT literacy level among principals were gender, age, education level, level of ICT training and proximity from a town.
- ii) School performance correlated positively with a principal's ICT access, ICT knowledge and ICT application in school leadership functions.
- iii) About 42% of principals had access to ICT, 32% of principals were ICT knowledgeable and about 27% of principals applied ICT in school leadership functions.
- iv) Challenges facing ICT correlated negatively with school performance and they varied among principals in different schools.

It was concluded that the ICT literacy of a principal correlates positively with school performance and plays a significant role in influencing school performance. Recommendations made were:

- i) Concerned stakeholders the Ministry of Education, Kenya Education Staff Institute, Teachers Service Commission, universities and teacher training colleges, ICT service providers and financing bodies should emphasise ICT literacy development among school principals. This can be through decentralising ICT training by organising for

ICT training centres at zonal educational offices and providing mobile ICT training services in schools.

- ii) Concerned parties should standardise the quality of ICT training courses for educators by providing standard Management Information Systems to schools and controlling the relevance of ICT literacy content offered to principals.
- iii) MoE should encourage ICT application in school management by communicating to principals using digital media only in order to compel them to learn ICT skills.

KEY TERMS: Planned change management, leadership quality, secondary school principals, school performance, performance improvement, ICT literacy, ICT access, ICT knowledge and ICT application.

TABLE OF CONTENTS

CHAPTER ONE	1
ORIENTATION OF THE STUDY	
1.1 INTRODUCTION	1
1.2 THE POLICY CONTEXT OF ICT INTEGRATION IN EDUCATION IN KENYA	5
1.2.1 The Millennium Development Goals	5
1.2.2 Sessional Paper no. 1 of 2005	6
1.2.3 The National Information and Communication Technology Strategy for education and training	6
1.2.4 Kenya Education Sector Support Program (KESSP)	7
1.2.5 Kenya Vision 2030	8
1.2.6 Ministry of Education Strategic Plan (2006 – 2011)	8
1.3 RESEARCH PROBLEM	10
1.4 RESEARCH AIMS AND HYPOTHESES	12
1.4.1 Research aims	12
1.4.2 Research hypotheses	13
1.5 MOTIVATION	13
1.6 RESEARCH DESIGN	15
1.6.1 Research design	15
1.6.1.1 Quantitative approach	16
1.6.1.2 Qualitative approach	16
1.7 RESEARCH METHODS	17
1.7.1 Population	17
1.7.2 Sample selection	17
1.7.3 Data collection techniques	18
1.7.3.1 Questionnaire	18
1.7.3.2 Interviews	18
1.7.3.3 Observation	18
1.7.3.4 Document analysis	19

1.7.4 Ensuring validity and reliability	19
1.7.5 Ensuring ethical acceptability	19
1.8 DEFINITION OF TERMS	20
1.9 ASSUMPTIONS UNDERLYING THE STUDY	22
1.10 ORGANISATION OF THE STUDY	22
1.11 CONCLUSION	23
CHAPTER TWO	
CHANGE MANAGEMENT, LEADERSHIP QUALITY AND SCHOOL PERFORMANCE	
2.1 INTRODUCTION	24
2.2 CHANGE MANAGEMENT	24
2.2.1 The meaning of change	24
2.2.2 The process of planned change	25
2.2.3 The leadership role in planned change	26
2.2.4 The role of the secondary school principal as a change agent	27
2.2.5 Approaches to change management	30
2.2.5.1 Total Quality Management	31
2.2.5.1.1 The meaning of Total Quality Management	31
2.2.5.1.2 The role of Total Quality Management in improving leadership	33
2.2.5.2 Actor Network Theory	33
2.2.5.2.1 Basic concepts of Actor Network Theory	34
2.2.5.2.2 The relationship between Actor Network Theory and technological change management	35
2.2.5.2.3 Application of Actor Network Theory in change management.	35
2.2.5.3 Fullan's change management theory	36
2.2.5.4 The Learning Organisation Approach	37
2.2.5.5 Kurt Lewin's Force Field Theory	39
2.3 QUALITY AND PERFORMANCE IMPROVEMENT	41
2.3.1 The meaning of quality	41
2.3.2 Dimensions of quality	44
2.3.3 Characteristics of quality leadership	45

2.3.4	Performance improvement tools and techniques	47
2.3.4.1	Scatter diagrams	47
2.3.4.2	The Fishbone diagram	48
2.3.5	Strategies for performance improvement	49
2.3.5.1	The International Quality Standards in education	50
2.3.5.1.1	Advantages of an ISO standard for education	52
2.3.5.1.2	Disadvantages of an ISO standard for education	53
2.3.5.1.3	Principles of Quality Management Systems in education	53
2.3.5.1.4	The Quality Management Systems Model	54
2.3.5.1.5	The role of school leadership in implementing Quality Management Systems	55
2.3.5.2	The Performance Excellence Framework.	57
2.3.5.2.1	Interpreting the Baldrige Performance Excellence Framework	59
2.3.5.2.1.1	Leadership	59
2.3.5.2.1.2	Strategic planning	59
2.3.5.2.1.3	Customer and market focus	59
2.3.5.2.1.4	Measurement, analysis and knowledge management	59
2.3.5.2.1.5	Workforce or human resources focus	60
2.3.5.2.1.6	Process management	60
2.3.5.2.1.7	Business results	60
2.3.5.2.2	Interpreting the school Performance Excellence criteria	60
2.3.5.2.2.1	Product outcomes	61
2.3.5.2.2.2	Student-focused outcomes	61
2.3.5.2.2.3	Workforce-focused outcomes	61
2.3.5.2.2.4	Process effectiveness outcomes	62
2.3.5.2.2.5	Financial and market outcomes	62
2.3.5.2.2.6	Leadership and social responsibility	62
2.3.6	Determinants of school performance in Kenya	62
2.4	CONCLUSION	63

CHAPTER THREE
INFORMATION AND COMMUNICATION TECHNOLOGY (ICT)

3.1	INTRODUCTION	64
3.2	INFORMATION AND COMMUNICATION TECHNOLOGY (ICT)	64
3.2.1	The meaning of ICT	64
3.2.2	The history of ICT in education	65
3.3	ICT LITERACY	67
3.3.1	The concept of ICT literacy	67
3.3.2	ICT literacy dimensions	70
3.3.2.1	ICT access	72
3.3.2.1.1	The meaning of ICT access	72
3.3.2.1.2	The relationship between ICT access and performance	73
3.3.2.2	ICT knowledge	73
3.3.2.2.1	The meaning of ICT knowledge	73
3.3.2.2.2	The relationship between ICT knowledge and performance	75
3.3.2.3	ICT application	75
3.3.2.3.1	The meaning of ICT application	75
3.3.2.3.2	The relationship between ICT application and performance	76
3.3.2.3.3	Advantages of ICT application in school management	77
3.3.2.3.4	Disadvantages of ICT application in school management	77
3.3.3	Measuring ICT literacy	78
3.3.4	Factors influencing ICT literacy development	79
3.3.4.1	Gender	80
3.3.4.2	Age	80
3.3.4.3	Education level	81
3.3.4.4	Level of ICT training	82
3.3.4.5	Period of experience with ICT	82
3.3.4.6	Proximity from a town centre	83
3.3.4.7	Government policy on ICT literacy	83
3.3.5	Challenges facing ICT literacy development	84

3.3.5.1	Financial constraints	84
3.3.5.2	Lack of ICT infrastructure	85
3.3.5.3	Inappropriate ICT training curricula	86
3.3.5.4	Improper quality control	86
3.3.5.5	Negative attitude towards ICT	87
3.3.5.6	Lack of interest in ICT	87
3.3.5.7	Lack of enough technical support and maintenance	88
3.3.6	Strategies for developing ICT literacy development	88
3.3.6.1	ICT human capacity development	88
3.3.6.2	Structuring ICT policy development and implementation	90
3.3.6.3	Improving the quality of training programs and their content	92
3.3.6.4	Reducing the cost of ICT products and services	93
3.3.6.5	Pooling of resources to develop ICT infrastructure	94
3.3.6.6	Formation of leadership networks	95
3.3.7	The role of ICT literacy benchmarking in improving performance	95
3.4	CONCLUSION	97

CHAPTER FOUR

RESEARCH DESIGN AND METHODS

4.1	INTRODUCTION	98
4.2	RESEARCH QUESTIONS RESTATED	98
4.3	RESEARCH AIMS AND OBJECTIVES RESTATED	99
4.4	THE NULL HYPOTHESES	99
4.5	RESEARCH DESIGN AND METHODS	100
4.5.1	Quantitative research	100
4.5.2	Qualitative research	101
4.5.3	Mixed mode research approach	102
4.5.3.1	Characteristics of a mixed mode research approach.	103
4.5.3.1.1	Assumptions about the world	103
4.5.3.1.2	Context sensitivity	103

4.5.3.1.3	Multi-method strategies	103
4.5.3.1.4	Goals	104
4.5.3.1.5	Researcher's role	104
4.5.3.2	Advantages of a mixed mode research approach	104
4.6	ETHICAL MEASURES	105
4.6.1	Informed consent as dialogue	105
4.6.2	Voluntary participation	105
4.6.3	Confidentiality	106
4.6.4	Researcher competence and relationship with participants	106
4.7	RESEARCH SETTING	106
4.8	RESEARCH METHODS	107
4.8.1	Population	107
4.8.2	Sampling	107
4.8.2.1	Stratified random sampling	109
4.8.2.2	Simple random sampling	109
4.8.2.3	Deciding on a suitable sample size	109
4.8.3	Data collection techniques	111
4.8.3.1	The questionnaire	111
4.8.3.2	Semi-structured interviews	112
4.8.3.3	Observation	112
4.8.3.4	Document analysis	113
4.8.4	The pilot sample	113
4.8.5	Data collection procedure	114
4.9	VALIDITY AND RELIABILITY	115
4.9.1	Validity	115
4.9.1.1	Validity in quantitative research	115
4.9.1.1.1	Face validity	115
4.9.1.1.2	Content validity	116
4.9.1.2	Validity in qualitative research	117
4.9.2	Reliability	118
4.10	DATA ANALYSIS	119

4.10.1	Response rate	119
4.10.2	Quantitative data analysis	120
4.10.3	Qualitative data analysis	122
4.11	CONCLUSION	122

CHAPTER FIVE
RESEARCH FINDINGS: ANALYSIS AND DISCUSSIONS

5.1	INTRODUCTION	124
5.2	SOCIO-DEMOGRAPHIC FACTORS INFLUENCING ICT LITERACY AMONG PRINCIPALS	125
5.2.1	The distribution of respondents by gender	126
5.2.2	The distribution of respondents by age	126
5.2.3	The distribution of respondents by education level	127
5.2.4	The distribution of respondents by level of ICT training	128
5.2.5	The distribution of respondents by period of experience with ICT	129
5.2.6	The distribution of respondents by distance of school from the nearest town	130
5.3	DATA ANALYSIS ACCORDING TO RESEARCH OBJECTIVES	131
5.3.1	Introduction	131
5.3.2	The relationship between ICT access of a principal and school performance	132
5.3.2.1	Access to ICT hardware	133
5.3.2.1.1	Access to electricity infrastructure	135
5.3.2.1.2	Access to computer	134
5.3.2.1.3	Access to Internet/e-mail infrastructure	135
5.3.2.1.4	Access to the school telephone	136
5.3.2.1.5	Access to digital/video camera	136
5.3.2.1.6	Access to a printer	137
5.3.2.1.7	Access to a scanner	138
5.3.2.1.8	Access to a fax machine	139
5.3.2.1.9	Access to a copier	139
5.3.2.1.10	Access to a surveillance camera	140

5.3.2.1.11	Access to a projector	141
5.3.2.2	Access ICT software among principals	141
5.3.2.2.1	Access to word processing	142
5.3.2.2.2	Access to spreadsheets	142
5.3.2.2.3	Access to databases	143
5.3.2.2.4	Access to PowerPoint	144
5.3.2.3	Testing hypothesis 1	145
5.3.3	The relationship between ICT knowledge of a principal and school performance	146
5.3.3.1	Ability of a principal to perform specified ICT tasks	147
5.3.3.1.1	Ability to start and shut down a computer	147
5.3.3.1.2	Ability to use Internet/e-mail	148
5.3.3.1.3	Ability to use word processing	150
5.3.3.1.4	Ability to use spreadsheets	151
5.3.3.1.5	Ability to use databases	152
5.3.3.1.6	Ability to use PowerPoint	153
5.3.3.2	Frequency of ICT use	153
5.3.3.2.1	Frequency of starting and shutting down a computer	154
5.3.3.2.2	Frequency of Internet/e-mail use	154
5.3.3.2.3	Frequency of word processing use	155
5.3.3.2.4	Frequency of spreadsheets use	156
5.3.3.2.5	Frequency of databases use	157
5.3.3.2.6	Frequency of PowerPoint use	159
5.3.3.3	Testing hypothesis 2	159
5.3.4	The relationship between ICT application in leadership functions and school performance	161
5.3.4.1	Organisation of the approved school curriculum	162
5.3.4.1.1	Application of ICT in monitoring the school timetable	162
5.3.4.1.2	Application of ICT in monitoring teachers schemes of work	163
5.3.4.1.3	Application of ICT in monitoring learners progress reports	164
5.3.4.1.4	Application of ICT in monitoring learning sessions	165
5.3.4.2	Control school finance and stores	165

5.3.4.2.1	Application of ICT in monitoring school financial transactions	166
5.3.4.2.2	Application of ICT in monitoring school procurement documents	167
5.3.4.2.3	Application of ICT in controlling school stores	167
5.3.4.2.4	Application of ICT in monitoring of the library catalogue	168
5.3.4.3	Management of human resources	169
5.3.4.3.1	Application of ICT in monitoring staff personal information records	169
5.3.4.3.2	Application of ICT in monitoring learners' admission details	170
5.3.4.3.3	Application of ICT in monitoring staff responsibilities records	171
5.3.4.3.4	Application of ICT in communicating with school staff	172
5.3.4.4	Maintaining correspondence with stakeholders	173
5.3.4.4.1	Maintaining correspondence with BOG/PTA	173
5.3.4.4.2	Maintaining correspondence with education offices	174
5.3.4.4.3	Management of school physical facilities	175
5.3.4.6	Testing hypothesis 3	176
5.3.5	The relationship between challenges facing ICT literacy development among principals and school performance	178
5.3.5.1	Financial constraints	178
5.3.5.2	Lack of time	178
5.3.5.3	Lack of ICT learning centres	180
5.3.5.4	Lack of ICT infrastructure	181
5.3.5.5	Negative attitude towards ICT	182
5.3.5.6	Lack of interest to learn ICT skills	183
5.3.6	Testing hypothesis 4	184
5.3.7	The relationship between ICT literacy level and school performance	186
5.3.8	Strategies for enhancing ICT literacy development among secondary school principals	187
5.4	CONCLUSION	189

CHAPTER SIX

FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

6.1	REVIEW OF THE RESEARCH	190
6.1.1	Introduction	190
6.1.2	Aims of the study	190
6.1.3	Problem analysis and demarcation	191
6.1.4	Methodology	191
6.1.5	The sample	191
6.2	FINDINGS FROM THE LITERATURE STUDY	192
6.2.1	Introduction	192
6.2.2	The leadership role in managing planned change	192
6.2.3	ICT literacy as a strategy for continuous improvement	192
6.2.4	Performance is a dimension of quality	193
6.2.5	Determining the ICT literacy level	194
6.2.6	Factors influencing ICT literacy	194
6.2.7	Challenges facing ICT literacy development	195
6.2.8	Strategies for enhancing ICT literacy development	195
6.3	FINDINGS FROM THE EMPIRICAL STUDY	195
6.3.1	Introduction	195
6.3.2	Socio-demographic factors influencing ICT literacy of a principal	196
6.3.3	Extent of ICT access to a principal and school performance	196
6.3.4	Extent of ICT knowledge of a principal and school performance	196
6.3.5	Extent of ICT application in leadership functions and school performance	197
6.3.6	Challenges facing ICT literacy development and school performance	197
6.4	CONCLUSIONS	197
6.4.1	Research question 1	198
6.4.2	Research question 2	198
6.4.3	Research question 3	199
6.4.4	Research question 4	200
6.4.5	Research question 5	200
6.5	RECOMMENDATIONS	203

6.6	SUGGESTIONS FOR FURTHER RESEARCH	205
6.7	LIMITATIONS OF THE STUDY	206
6.8	CONCLUDING REMARKS	206
	BIBLIOGRAPHY	208
	APPENDICES	224
LIST OF TABLES		
2.1	ICT literacy development	41
2.2	Dimensions of quality	44
3.1	History of Information Technology	66
3.2	ICT literacy dimensions: Conceptual labels and descriptions	71
5.1	Distribution of respondents by gender	126
5.2	Distribution of respondents by age	126
5.3	Distribution of respondents by education level	127
5.4	Distribution of respondents by level of ICT training	128
5.5	Distribution of respondents by period of experience with ICT use	129
5.6	Distribution of respondents by distance of school from town	130
5.7a	Relationship between ICT access to electricity infrastructure and school performance	133
5.7b	Relationship between ICT access to computer and school performance	134
5.7c	Relationship between ICT access to Internet/e-mail infrastructure and school performance	135
5.7d	Relationship between ICT access to school telephone and school performance	136
5.7e	Relationship between ICT access to digital/video camera and school performance	137
5.7f	Relationship between ICT access to a printer and school performance	137
5.7g	Relationship between ICT access to scanner and school performance	138
5.7h	Relationship between ICT access to fax machine and school performance	139
5.7i	Relationship between ICT access to copier and school performance	140
5.7j	Relationship between ICT access to surveillance camera and school performance	140
5.7k	Relationship between ICT access to a projector and school performance	141
5.8a	Relationship between access to word processing and school performance	142
5.8b	Relationship between access to spreadsheets and school performance	143

5.8c	Relationship between access to databases and school performance	144
5.8d	Relationship between access to PowerPoint and school performance	144
5.9a	Relationship between ability to start and shut down a computer and school performance	147
5.9b	Relationship between ability to use Internet/e-mail and school performance	149
5.9c	Relationship between ability to use word processing and school performance	150
5.9d	Relationship between ability to use spreadsheets and school performance	151
5.9e	Relationship between ability to use databases and school performance	152
5.9f	Relationship between ability to use PowerPoint and school performance	153
5.10a	Relationship between frequency of starting and shutting down a computer and school performance	154
5.10b	Relationship between frequency of Internet/e-mail use and school performance	155
5.10c	Relationship between frequency of word processing use and school performance	156
5.10d	Relationship between frequency of spreadsheets use and school performance	157
5.10e	Relationship between frequency of databases use and school performance	158
5.10f	Relationship between frequency of PowerPoint use and school performance	159
5.11a	Relationship between ICT application in monitoring the timetable and school performance	162
5.11b	Relationship between ICT application in monitoring teachers schemes of work and school performance	163
5.11c	Relationship between ICT application in monitoring learners' progress reports and school performance	164
5.11d	Relationship between ICT application in monitoring learning sessions and school performance	165
5.12a	Relationship between ICT application in monitoring financial transactions and school performance	166
5.12b	Relationship between ICT application in monitoring procurement documents and school performance	167
5.12c	Relationship between ICT application in controlling stores and school performance	168

5.12d	Relationship between ICT application in monitoring the library catalogue and school performance	169
5.13a	Relationship between ICT application in monitoring staff personal information records and school performance	170
5.13b	Relationship between ICT application in monitoring learners' admission details and school performance	171
5.13c	Relationship between ICT application in monitoring staff responsibilities records and school performance	172
5.13d	Relationship between ICT application in communicating with staff and school performance	173
5.14a	Relationship between ICT application in maintaining correspondence with BOG/PTA and school performance	174
5.14b	Relationship between ICT application in maintaining correspondence with education offices and school performance	175
5.15	Relationship between ICT application in monitoring maintenance manuals for physical facilities and school performance	176
5.16a	Relationship between financial constraints and school performance	179
5.16b	Relationship between lack of time and school performance	180
5.16c	Relationship between lack of ICT learning centres and school performance	181
5.16d	Relationship between lack of ICT infrastructure and school performance	182
5.16e	Relationship between negative attitude towards ICT and school performance	183
5.16f	Relationship between lack of interest to learn ICT skills and school performance	184
5.17	Relationship between ICT literacy level and school performance	187

LIST OF FIGURES

2.1	Kurt Lewin's force-field diagram	40
2.2	The scatter diagram for performance improvement	47
2.3	Interpretation of the Fishbone diagram for ICT integration	49
2.4	Interpretation of the Process-based Quality Management Systems model	55
2.5	The Baldrige Performance Excellence Framework	58
3.1	The Relationship of ICT literacy proficiencies	68
3.2	Steps in benchmarking	96

6.1	Proposed model for ICT literacy integration in school leadership in Kenya	201
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LIST OF CHARTS

5.1	Relationship between ICT access of a principal and school performance	145
5.2	Relationship between ICT knowledge of a principal and school performance	160
5.3	Relationship between ICT application in leadership functions and school performance	177
5.4	Relationship between challenges facing ICT literacy development and school performance	185

LIST OF ABBREVIATIONS

BOG:	Board of Governors
CFSK:	Computers for Schools Kenya
GoK:	Government of Kenya
HAS:	High Achieving Schools
ICT:	Information Communications and Technology
ISO:	International Standards Organisation
KESI:	Kenya Education Staff Institute
KNEC:	Kenya National Examinations Council
LAS:	Low Achieving Schools
MoE:	Ministry of Education Science and Technology
PTA:	Parents Teachers Association
QMS:	Quality Management Systems
TQM:	Total Quality Management
TSC:	Teachers Service Commission

CHAPTER ONE

ORIENTATION OF THE STUDY

1.1 INTRODUCTION

Education is in the process of a major change, where through innovations in technology and teaching methodology, academic institutions are being given an opportunity to work for the benefit of the student (Cotton, 2001: 4). Doss and Kamery (2005:1) suggest that for organisations to compete in a global economy, quality management within the organisational environment is of paramount importance to strategic pursuits, competitive advantage and corporate survival. Wango (2009: 1) suggests that the quality of education can be enhanced through improved school administration and management. The increasing complexity of educational leadership and the need for creative, divergent and unexpected solutions to school situations and problems require a challenging approach to the field of educational management (Steyn & Kamper, 2001:36). In order to deal with this complexity, the issue of educational management in the information age cannot be ignored. Improving school leadership is essential in view of the current global revolution in education due to the changing nature of work, the realities of the information age, new global partnerships and awareness of technological changes (Feldner, 2003:1).

In order to accomplish the mission, goals and objectives of a school, principals must integrate the three facets of administrative practice, which include administration, management and leadership (Brennen, 2007:2). Brennen defines administration as the universal process of efficiently planning, organising, leading and controlling people and resources. According to Young and Dulewicz (2008: 1), management involves organising, planning, staffing, directing and controlling, where the aim of a manager is to maximise the output of the organisation through administrative implementation. Management is an executive function which does things right and puts into action the policies, plans and decisions within the framework set by the administration (Brennen, 2007:1). Leadership, on the other hand, is the exercise of high-level conceptual skills and decisiveness, mission, developing strategy, inspiring people and changing culture (Collins, 2001: 11). Rather than controlling others, leaders let vision, strategy, goals and values be the guide-post for action and behaviour. In addition, leaders should have analytical and problem-

solving skills in order to deserve power and authority inherent in the administrative function (Brennen, 2007:2; Wango, 2009: 5). According to Young and Dulewicz (2008: 12), leadership is oriented towards driving change, empowering others and building systems to support organisational goals. Wango (2009: 1) feels that educational leadership and its development is essential in improving school performance; hence raising educational standards. He concludes that it is important to view leadership and management as the major determining factors of the quality of education and thus school performance.

The focus of this study is educational leadership and a strategy to deal with technological change. The strategy in this case is Information and Communication Technology (ICT) literacy development among secondary school principals who can integrate ICT in school operations. In the study it is implied that the administrative leadership functions of a secondary school principal involve the three facets of administrative practice: administration, management and leadership; hence a quality school leader is one who has characteristics of an administrator, a manager and a leader. These characteristics are especially important in the effective integration of ICT in school operations.

According to Bottoms and O'Neill (2002:7-10), a school as a formal organisation requires a principal with excellent leadership skills to manage school organisation, operations and resources for a safe and orderly learning environment. Souls (2005:1) agrees that the secondary school principal's major task in improving school performance is to provide sound school leadership. Fry and O'Neill (2002:1) observe: "We know that if we can have a dramatic impact on raising the quality of school leadership, we will have a dramatic improvement in student achievement across the board." Spiro (2009:2) reports in the Wallace Foundation that school leadership influences performance and notes:

There are virtually no documented instances of troubled schools being turned around without intervention by a powerful leader. Many other factors may influence school performance, but leadership is the catalyst.

Wilding and Blackford (2006:1-3) in their research report argue that educators need to experience a major technological change management program in order to start addressing the new situation.

This will improve the quality of leadership which will consequently influence school performance. Besterfield, Michna, Besterfield and Sacre (2003: 1) explain that the quality of management should improve in totality and they call this Total Quality Management (TQM). Total Quality (TQ) is the most important and thought-provoking revolution in the world of modern management (Cotton, 2001:4). Besterfield *et al.* (2003: 1) add that TQM enhances the traditional way of doing thing and that the management of an organisation must participate in the quality program because today's world demands a workforce that understands how to use technology as a tool to increase productivity and creativity. They also emphasise that by changing the actions of leadership, the culture and actions of an entire organisation can be transformed. Based on this argument, the study focuses on improving the quality of secondary school leadership for increasing school performance.

In Kenya for instance, secondary school principals have several leadership functions which according to the Teachers Service Commission (TSC, 2007:9-11) are their responsibilities. These include the organisation and management of the approved school curriculum; the management and control of school finances and stores; the management and motivation of human resources in the school; functioning as a secretary to the school Board of Governors (BOG) and the Parents Teachers Association (PTA) and the management and maintenance of the school plant and equipment. Since this workload is enormous, it is important for ICT literacy to be integrated in school leadership in order to improve performance. The Kenya government has therefore seen the need to include relevant technology for educational management as supported by the Kenya National ICT Strategy for Education and Training (MoE, 2006a: 4). In this strategy, it is implied that although the impact of ICT on education goals is still inconclusive, reported observations include rapid expansion of knowledge, improved examination outcomes, enhanced communication and technical efficiency.

Persaud (2006:180) concludes from his study that management tasks would be automated and streamlined, if ICT were integrated in leadership training, giving more time for managers to focus on instruction. In addition, Davies (2002:8) observes that the success of ICT rests on proactive school leaders who will give timely support to the integration of ICT in school operations. This study asserts that school principals have a responsibility to encourage teachers, students and other school personnel to appreciate technology integration into school operations. ICT integration has

become a global issue and Persaud (2006:23-24) notes that the process of integrating ICT into school leadership involves a paradigm shift, where new insights and information facilitates new forms of understanding. This kind of paradigm shift requires principals who will be able to cope with technological change in school leadership. There is therefore the need to take action towards developing ICT literacy among education leaders. In support of this, Selwood, Fung and O'Mahony (2003:65) argue that principals who become more comfortable with and competent in using ICT are likely to develop school-wide instructional and management responses to technology. Based on this argument, the researcher assumes that by being ICT literate, secondary school principals can influence school operations by encouraging ICT integration.

According to Collins (2001: 11), technology-driven change has nothing to do with igniting a transformation in an organisation, but can change it from good to great. He elaborates that although technology cannot cause a transformation, it can accelerate transformation. Hence greatness is not a function of circumstance, but a matter of conscious choice and to be successful in initiating change, leaders must understand the context within which the change takes place (Wango, 2009:255). Bober (2001:2) argues that ICT literacy is necessary for leadership that can enhance school performance. Today's principals are expected to be familiar with ICT to be able to cope with emerging technological changes, because successful change flows from learning, growth and development (Mitzberg, Ahlstrand & Lampel 1998:325). This study also focuses on the ICT literacy of school principals to enhance leadership quality and consequently influence school performance. The ICT literacy of a principal is a measure of the preparedness of principals to cope with technology change and utilise ICT skills.

This section has discussed the justification for ICT integration in educational leadership and has implied that the ICT literacy of a principal impacts on school leadership quality. This quality leadership may consequently influence school performance. The section that follows discusses the government's policy context about ICT application in education institutions in Kenya.

1.2 THE POLICY CONTEXT OF ICT INTEGRATION IN EDUCATION IN KENYA

This section provides an overview of the educational ICT policy context of the study. The section involves official government documents that provide a basis for literature review.

1.2.1 The Millennium Development Goals

In September 2000 heads of states and governments met at the Millennium Summit and agreed on a set of eight goals, 18 targets and 48 indicators on development and poverty eradication. This study is based on the last of the Millennium Development Goals (MDGs): to develop a global partnership for development. Of the eight targets of this goal, the study is based on target eight which states that “in co-operation with the private sector, governments should make available the benefits of new technologies especially information and communication technologies” (UN, 2000:1). Following the MDGs initiative, the New Partnership for Africa Development (NEPAD) prioritised efforts towards bridging of the digital divide between Africa and the developed world. This led to the NEPAD e-schools programme whose objective is to integrate ICT in education in order to improve access, quality and equity among member states (e-Africa Commission, 2005:2-4). Chatora (2007:1) adds that the e-schools initiative aims to roll out ICT literacy across the African continent.

The Kenyan government has undertaken many reforms in the education sector, which are aimed at addressing educational goals. These goals include the national economic recovery strategy and international commitments as outlined in the Millennium Development Goals (MoE, 2006a: V). According to the MoE (Ministry of Education) (2005: 105), the government appreciates and recognises that an ICT literate work force influences a country’s economy. Against this background, the government will make education the platform to equip the nation with ICT skills in order to create a dynamic and sustainable economic growth (*ibid.*:73).

1.2.2 Sessional Paper no. 1 of 2005

The MoE has put in place the national ICT policy and e-government strategy that provide guidelines for transformation of Kenya into a digital society (MoE, 2005: 12). It is in line with this policy that Sessional Paper no. 1 of 2005 was developed, where it is recognised that an ICT literate workforce is the foundation on which to develop a knowledge-based economy (*ibid.*:12). The underlying objective for the policy paper was to make Kenya globally competitive in a constantly changing world. In support of this, the then minister for education noted that Sessional Paper no. 1 of 2005 is a recent policy document on education based on a policy framework for education, training and research to provide new direction in the provision of education and training at all levels (MoE, 2006:12).

The education and training sector has a major role to play in the implementation of the proposed ICT policy, because education is a major user of ICT in management. The success in the use of ICT in all sectors will require sufficient and competent human resources that are developed and equipped in education and training. Post-graduate training in ICT for teacher management will be offered to improve aspiring and practicing principals' skills (MoE, 2005:6-7). In addition, the Sessional Paper no. 1 of 2005 underscores the importance of continuing adult education and non-formal education and indicates that teacher training would be demand-driven, of high quality, technologically informed, research-supported and globally marketable. The paper is based on the premise that quality education and training contribute significantly to economic growth and expansion of employment opportunities. Among the key plans in the policy document is the restructuring of secondary school teacher training programs to enhance ICT literacy.

1.2.3 The National ICT strategy for education and training

In June 2006 the MoE came up with the National ICT strategy for education and training, which was based on the vision that ICT is a universal tool in education and training (MoE 2006: v). In addition, the strategy is meant to integrate ICT in education and training to improve access, learning and administration. The overall objective of the strategy is to ensure that systematic efforts are made towards strengthening, adoption and use of ICT in the education sector (*ibid.*: vii). The ICT strategy was developed taking into consideration the policy environment captured

in the National ICT policy of 2006 and education sector policy in Sessional Paper No. 1 of 2005. In the ICT strategy, it is outlined that the overall goal of education is to achieve Education For All (EFA) by 2015 in tandem with national and international commitments; Universal Primary Education by 2010 and to increase the transitional rate from primary to secondary school from 47% to 70%. In order to realise the objectives, a commitment is made to integrate ICT in the delivery of the education curricula, to strengthen open and distance learning and promote effective and efficient administration at all levels of education (MoE, 2006:2). The strategy was developed in line with the e-government strategy of 2004 and the Economic Recovery Strategy Paper for Wealth and Employment Creation (ERSWEC) (*ibid.*: vii). The strategy fits into the Kenya Education Sector Support Programme (KESSP), which is the sector investment programme aimed at achieving EFA and MDGs. The strategy identifies strategic pillars for the education sector ICT implementation as:

- Digital equipment
- Connecting and network infrastructure
- Technical support
- Harnessing emerging technologies
- Integration of ICT in education
- Training
- Partnerships and resource mobilization.

In the strategic pillars, the integration of ICT in education is applicable to the study as it investigates ICT infrastructure and knowledge through training and application.

1.2.4 Kenya Education Sector Support Program (KESSP)

In order to operationalise the Sessional Paper No. 1 of 2005, the MoE developed the KESSP, which involves Educational Management Information Systems. In this regard, it is believed that the KESSP will make it possible to achieve the goals of Vision 2030, where the ministry believes will meet objectives of the Economic Recovery Strategy (ERS) and the Millennium Development Goals (GoK, 2006: v).

1.2.5 Kenya Vision 2030

According to the Government of Kenya (GoK) (2007: 3-11), the Kenya Vision 2030 is the country's new development blueprint covering the period 2006-2030. It aims at making Kenya a newly industrialising and middle-income country providing high quality life for its citizens by the year 2030. The vision is based on three pillars, namely: the economic, social and political pillars. The education sector, which belongs to the social pillar of the Vision 2030, seeks to build a just and cohesive society to which Kenya will provide globally competitive quality education and training with research for development. Vision 2030 comes after successful implementation of the Economic Recovery Strategy for Wealth and Employment Creation (ERSWEC), which has seen the country's economic growth from a GDP of 0.6% in 2002 to 6.1% in 2006. In Vision 2030, one of the specific objectives is modernisation of teacher training and strengthening partnerships with the private sector to develop ICT literacy among educators.

1.2.6 Ministry of Education Strategic Plan (2006 – 2011)

Apart from Vision 2030, the government has developed the MoE 2006 – 2011 Strategic Plan, which provides a framework for teamwork in order to achieve a competitive advantage in an increasingly globalised world (MoE, 2007:1). The plan articulates the government's vision for the development of Kenya's education system and identifies strategic imperatives necessary to realise the vision. One of the strategic goals in the MoE strategic plan is to improve the institutional framework and expand capacities for effective delivery and management of educational services (*ibid.*: 3). Successful implementation of the strategic plan is expected to improve quality of education provided to Kenyans and consequently improve human capital for Kenya's economy (*ibid.*: vi). The key concerns are access, retention, equity, quality, relevance and efficiency in the education system (*ibid.*: 1).

Values upheld by the MoE are based on the operational environment governed by a set of core values that constitute desired educational culture. Such values are:

- Team work: this includes collaboration both within the MoE and other partners in the provision of education service.

- Continual improvement: this involves setting and maintaining high standards of education and training through continual improvement of service delivery.
- Efficiency: the striving to achieve the highest value of benefit from the employment of the MoE resources (*ibid.*: 8).

According to the MoE (2007: 46-54), some of the Strategic Plan objectives to be achieved are to establish an efficient institutional framework for effective delivery of education services and to integrate ICT in education. To achieve these objectives, the the MoE will employ such strategies as:

- Creating awareness on the importance of ICT
- Improving ICT infrastructure in schools
- Equipping education institutions with ICT equipment
- Enhancing the development of digital curricula
- Increasing collaboration with other relevant government ministries to expand networks and connecting infrastructure
- Reducing the cost of ICT in education
- Developing the capacities of education managers
- Enhancing working partnerships in ICT.

These strategies make it clear that ICT integration in education is a priority in the Kenya government. In the e-government strategy and the National ICT policy considerable attention is given to education, particularly to schools as agents with potential to address the digital divide and the expansion of learning opportunities (MoE, 2005:104). To meet the goals of the ICT policies, the government has set objectives to implement the Education Management Information System (EMIS). The system is intended to cover the management of the education data, provision of databases in schools and co-ordination of administration of the entire education sector (*ibid.*: 74).

These documents show a clear road map of Kenya's vision towards ICT integration in the education sector. In general, the aforementioned government policies on ICT give a rationale to carry out an investigation into the ICT literacy levels of practicing secondary school principals. A strategy authority Michael Porter notes that operational effectiveness and strategy are both

essential to superior performance and that strategy execution is crucial for quality results (Kaplan & Norton, 2008:1). This means that for the ICT strategies to be meaningful it is important to have a plan for their implementation. Secondary school principals are some of the government agents for implementing the stated ICT policies in education; hence their ICT literacy is a prerequisite for management of technological change and a step towards executing the planned ICT strategies.

1.3 RESEARCH PROBLEM

While literature indicates that the problem with technology leadership in public schools is that leaders lack necessary training, knowledge and skills, not much is known about specific areas of improvement (Persaud, 2006:5). Despite the fact that the role of the principal is significant in school improvement activities, little information exists which describe the specific roles and responsibilities of the principal as a technology leader (Davies, 2002:15).

Ngare (2007:60) in the *Daily Nation* quotes the Kenyan minister for education when addressing African education ministers: “Many teachers are computer-illiterate and not positioned to participate in implementing the new e-learning approach to teaching.” A report from Computers For Schools Kenya (CFSK, 2007:4) shows that the entire education system is characterised by a very low application of e-technology, a situation most apparent in the resource-starved public education sector. In addition, this lack of ICT in education and training translates into a poor application of the same in the economy at large. The MoE (2006: 14) reports that while some countries have reported up to 41% of ICT integration into teaching and learning, the proportion remains substantially low in Africa, Kenya included. In addition, training programs in ICT for the education management sector will be necessary since the rapid change in ICT demands continuous training at all levels (*ibid.*: 15). Maurizio and Wilson (2004:3) note that most states have not yet systematically integrated ICT literacy into education. They add that while in some places a lack of technology access remains a barrier to 21st century learning and skills, policymakers can lead the way by making a concerted and comprehensive commitment.

Despite government efforts targeting the implementation of ICT in schools, there are constraints facing several schools in terms of a poor road network, no connection to electricity, lack of modern computers, lack of available physical facilities in schools and lack of qualified technical

staff to handle ICT facilities (*ibid.*: 6). As indicated in the Kenya Vision 2030, among the Flagship Education and Training Projects for 2012 is the establishment of a computer supply program that will equip students with modern ICT skills raising the quality and relevance of education (GoK, 2007:13). It is also indicated that ICT training in Kenya is currently in a state of low-level crisis. School principals are being exhorted by the Kenya government to include ICT as a major element in the curriculum and school organisation. At the same time, there is massive investment in buying infrastructure, but principals' training does not appear to be a priority.

Therefore, taking action towards the integration of ICT literacy into state standards, assessments and policies can improve ICT skills. There is therefore a need for data that provides insight into the ICT literacy levels of principals, guidelines for a regulatory ICT infrastructure and a coherent national policy on ICT training of educational administrators. There is currently no standard assessment tool deemed appropriate for this purpose or information available that indicates the ICT literacy level of practicing principals in Kenya. In recognition of this situation, any corrective initiative must endeavour to provide an integrated solution to the problem of ICT in education and a comprehensive national policy on the matter (MoE, 2006: 11). It is therefore necessary to assess the level of preparedness of principals to cope with planned technology changes in the education system.

There are measures of performance excellence criteria as discussed in section 2.3.5.2.2. The measures include product outcomes, student-focused outcomes, financial analysis, workforce outcomes, process effectiveness outcomes and leadership outcomes. These performance measures together determine the level of school performance in the study. Using the results of the respondents in questionnaire 2 (Appendix D2), the researcher investigated whether the ICT literacy level of a principal correlated with the school performance index as discussed in section 4.10.2.

Following this study problem, the following main research question is addressed: What is the extent of ICT literacy among practicing secondary school principals of Kenya? Out of this main research question, the following sub-questions emerge:

- i) What is the level of ICT literacy among secondary school principals in the Western province of Kenya?
- ii) What socio-demographic factors influence ICT literacy among secondary school principals in the Western province of Kenya?
- iii) Is there a significant relationship between the level of ICT literacy of a principal and school performance?
- iv) What is the role of ICT literacy in improving secondary school performance?
- v) Can features of ICT integration in school leadership be combined in a model for purposes of improving secondary school performance?

Emanating from the stated problem, the following research aims and hypotheses are addressed:

1.4 RESEARCH AIMS AND HYPOTHESES

1.4.1 Research aims

The main aim is to ascertain the ICT literacy levels of principals in order to establish the potential of integrating technology in secondary school leadership for improving school performance. In order to describe the role of ICT literacy in improving school performance, the specific study objectives are to:

- i) Analyse the socio-demographic factors influencing the ICT literacy level of a secondary school principal.
- ii) Investigate how ICT access of a principal relates to school performance.
- iii) Investigate how ICT knowledge of a principal relates to school performance.
- iv) Find out how ICT application in school leadership functions relates to school performance.
- v) Investigate how challenges facing the development of ICT literacy among principals relate to school performance.
- vi) Provide guidelines on strategies for ICT literacy development among secondary school principals in Kenya.

In order to test the statistical relationship between ICT literacy and school performance, hypothesis testing is used.

1.4.2 Research hypotheses

H_{a1}: There is a statistically significant relationship between ICT access of a principal and school performance.

H_{a2}: There is a statistically significant relationship between the ICT knowledge of a principal and school performance.

H_{a3}: There is a statistically significant relationship between ICT application in school leadership functions and school performance.

H_{a4}: There is a statistically significant relationship between challenges facing the development of ICT literacy among principals and school performance.

1.5 MOTIVATION

Kenney (2006:3) reports that the nature, value and availability of information have changed enormously and this change impacts on the way we live, learn and work. In order to succeed, it is not enough to master technical skills, but one must also know how to apply them in an information society. According to Kaplan and Norton (2008:1), “planning a strategy without tactics is the lowest route to victory and tactics without strategy is the noise before defeat.” In view of this statement, preparing for technological change management in Kenya means executing planned ICT strategies in the education sector by ensuring ICT literacy of educational leaders. The World Bank points out that education and policy makers agree that ICT is of paramount importance to the future of education and that ICT in education initiatives are likely to contribute to meeting the Millennium Development Goals (Pernia, 2008: 12). She adds that this technology, most particularly in areas that are Internet-connected and capable of providing online information in real-time, increases access through distance learning, enables a knowledge network for students, trains teachers, broadens the availability of quality education materials and enhances the efficiency and effectiveness of an educational administration policy.

The Education Testing Service (ETS, 2002:5) points out that ICT has impacted on the quality and quantity of teaching, learning and research in teacher education. Educational leaders must be sensitised to ICT's potential benefits with their dangers and be proactive in addressing them; hence ICT literacy development provides an appropriate venue for this. Nzioka (2007:7) quotes the education permanent secretary in Kenya as saying, "ICT is cheap and cost-effective compared to current trends. If implemented, e-learning would enhance access, equity, relevance and quality in education content." ICT helps a Total Quality Management organisation achieve its goals (Besterfield *et al.*, 2003:223).

The focus of the researcher on ICT integration in school leadership comes after having done a Master of Education degree on *Delegation of duties to school personnel* and her research interest has been on improving the quality of secondary school leadership for improving school performance. The researcher has been a secondary school teacher for twelve years in secondary schools of the Western province of Kenya. The province had about 460 secondary schools registered at the Kenya National Examinations Council (KNEC) in 2006. The catchment area for these schools is the rural districts within the Western province of Kenya. The researcher has noticed and verified that principals of all the secondary schools are academically and professionally qualified. It is also noted, not surprisingly, that some of the High Achieving Schools (HAS) are technologically well equipped while the Low Achieving Schools (LAS) are not. The Kenyan government had, however, implemented a policy that all secondary schools should be connected to electricity by end of 2007. In the *Sunday Standard*, Otieno (2007:4) quotes the education minister of Kenya as stating:

Kenya is closing in on establishing rural digital schools following strong commitments by local and international ICT firms. ... The country had already connected electricity in several rural secondary schools by end of June 2007. The government is pooling resources in the ICT Trust Fund to ensure smooth implementation of technology in the education sector.

According to a report from CFSK (2007:4), Kenya had about 4000 secondary schools with an enrolment of approximately 1,000,000 students. Of these schools, 2600 (65%) had electricity while only 750 (19%) had computers, averaging 10 computers per school. The report adds that eighty-five percent of these schools are located in the rural areas where the majority of Kenyans

live. This being the case, the study investigates strategies for ICT literacy development of secondary school principals in the Western province of Kenya.

The development of an ICT integration model in schools is valuable for stakeholders in education to evaluate technology training for school leaders and create opportunities for principals to acquire ICT integration skills. The use of TQM in the study, teaches competitive advantage through process improvement in an organisation. Fullan's change management theory emphasises capacity building, hence the study on ICT literacy development of school principals. The application of Kurt Lewin's Theory and Actor Network Theory (ANT) in the study is essential to understanding the link between principals and ICT in appreciating technological change. The study may also further appreciation of the leadership role of principals as technology change agents and could possibly make principals cope with global technological changes in education. When school leaders allow technology integration through vision and expertise, schools can improve in instructional technology, which can lead to greater student achievement and better preparation for a technological society (Selwood *et al.*, 2003:11-13).

For the Kenyan situation, it is necessary to have a reference point for evaluation of ICT literacy levels of practising principals and subsequent integration of literacy in school leadership. It is hoped that ICT literacy integration can counteract obsolete management practices and improve networking with other principals in various aspects of school management. In addition, ICT can help improve on the collection, analysis, synthesis, storage, distribution and sharing of information to improve school leadership and governance (Kenney, 2006:3). The ICTs Education Options Paper (MoE, 2005:72) suggests several research areas for further investigation of which teacher education in ICT is one, hence the need for this study.

1.6 RESEARCH DESIGN

1.6.1 Research design

The study used non-experimental survey as a method of collecting, processing and analysing data. The nature of predictor variables used does not allow manipulation; hence the variables in the study were investigated in retrospect (Panneerselvam, 2008: 294). Results using this method

are interpreted with caution; they do not prove but only suggest cause and effect (Saunders *et al.*, 2007:135). The study adopts both a qualitative and a quantitative approach to social enquiry as Monyatsi (2002:15) indicates that the advantages of integrating the two are manifold. He explains that combining the approaches maintains a balance since qualitative research is strong in depth, while quantitative research can be generalised to a larger population; hence the two methods are not mutually exclusive, but complimentary. In this study, the mixed mode approach was suitable because the quantitative approach was used to measure the statistical relationships between ICT literacy levels of principals and school performance. The qualitative approach was used to outline the opinions of principals about ICT literacy, challenges facing the ICT literacy and strategies for ICT literacy development.

1.6.1.1 Quantitative approach

A descriptive study was used to outline and present circumstances and relationships concerning the research problem. This involved collecting data in order to answer research questions (Mohlokoane, 2004:8). In this study, the quantitative approach was applied through use of questionnaires (Appendices D1 & D2). Data obtained from the questionnaires was analysed using statistical analysis to answer research questions and verify the null hypotheses. The reported ICT literacy levels were analysed and correlated with school performance. The socio-demographic characteristics of the school principals included gender, age, education level, ICT training level, period of ICT experience and distance of a school from the nearest town.

1.6.1.2 Qualitative approach

The qualitative approach frequently uses observations and in-depth interviews where narrative or pictorial data are analysed in the form of words (Pole & Lampard, 2002: 191). This involves description in words exploring what is significant in the existing situation (Makgato, 2003:10). In the study, the open-ended items regarding the challenges principals face in an attempt to be ICT literate and suggested strategies for developing ICT literacy were analysed qualitatively. The responses from the interview schedule (Appendix D3) and data of the observation schedule (Appendix D4) were also reported qualitatively.

1.7 RESEARCH METHODS

1.7.1 Population

A study population is the totality of persons, events, organisation units, case records or other sampling units which concern the research problem (Mohlokoane, 2004:8). For administrative purposes, Kenya is divided into eight provinces of which Western province is one. The target population in this study is principals of secondary schools in the Western province, because principals are directly involved in school leadership.

1.7.2 Sample selection

White (2002:80) suggests that with any form of research such as surveys, it is usually impossible to question every member of the target population, hence the need for sampling. The sampling unit is practicing principals of secondary schools of the Western province of Kenya, while the sampling frame is principals of public secondary schools. For the purposes of this study, stratified random sampling was used to get two extremes (Saunders *et al.*, 2007: 230) of examination achievement as strata, namely high and low achieving schools. The stratification variable is student academic achievement because it easily measurable, although it was not used directly for statistical analysis in chapter five. The purpose of selecting extreme cases is to answer research questions and meet study objectives. In each of the selected schools, the principal responded to questionnaire 1 (Appendix D1), while the deputy principals responded to questionnaire 2 (Appendix D2).

Western province had about 460 secondary schools registered at the examinations council at the beginning of 2006, out of which 435 were public and 25 were private schools. From the 435 schools, 396 had done national examinations consistently for a selected period of five years (2002 to 2006). The researcher divided the 396 schools into three equal strata, namely: High Achieving Schools (HAS), Average Achieving Schools (AAS) and Low Achieving Schools (LAS). The HAS were schools that had been consistently among the top 132 schools in ranking in the province for the five years. AAS were those schools that had consistently been among the

middle 132 schools in the province for the five years. LAS were schools that had consistently been among the bottom 132 schools in the province for the five years (KNEC, 2007:1-6). For purposes of the research objectives, the researcher used schools in two strata only, namely: HAS and LAS. Simple random sampling was done in each stratum to select the required sample size as indicated in section 4.8.2.

1.7.3 Data collection techniques

All research involves the collection and analysis of data through reading, observation and measurement, asking questions or a combination of these (Blaxter *et al.*, 2001:153). The data collection techniques used were questionnaires, structured interviews, observation and document analysis, all of which are informed by the literature review in chapter four.

1.7.3.1 Questionnaire

The researcher prepared two questionnaires, one for the principals and another for the deputy principals. The first questionnaire (Appendix D1) investigated the level of ICT literacy among principals, challenges facing ICT literacy development and strategies that can enhance ICT literacy development. The second questionnaire (Appendix D2) required the deputy principals to indicate the level of school performance based on customised School Performance Excellence Criteria as explained in section 2.3.5.2.2.

1.7.3.2 Interviews

Semi-structured interviews were conducted with principals from selected high and low achieving schools to allow opportunity for probing and clarifying collected data from questionnaires.

1.7.3.3 Observation

Observation is one way to collect primary data. As Mohlokoane (2004:10) notes, it is a purposeful, systematic and selective way of watching and listening to an interaction or

phenomenon as it takes place. Observation was done in the schools during visitation hours in order to verify responses given in the questionnaires and interviews.

1.7.3.4 Document analysis

Primary and secondary literature sources were studied to gather topical information about the research topic. Documentation such as journals, newspaper articles and information available on the Internet were collected. The Kenya government policy documents included, were the Kenya National ICT Strategy in Education and Training of 2006, Kenya Education Sector Support Programme of 2006, the Sessional Paper No.1 of 2005, the Kenya Vision 2030 and the MoE Strategic Plan (2006-2011). Results analysis from the Kenya National Examinations Council between the years 2002 and 2006 inclusive were used to check the achievement of schools for the selected period of five years and to select the required sample for the study.

1.7.4 Ensuring validity and reliability

An instrument which gives trustworthy and dependable results is considered reliable (Saunders *et al.*, 2007:150). A pilot survey was used to test the reliability of the research instruments in order to confirm that they concurred with study objectives (Bell, 2005:147). Responses from the pilot study were analysed for accuracy of meaning and objectivity. An instrument which measures accurately what the researcher expects to measure is valid. A pilot survey was used to test instruments against criterion and content validity benchmarks. There was a need to test the content validity of the research instruments as this ascertains that the items produce the relevant responses from the sample (Mugenda & Mugenda, 2003: 95-98). The thesis promoter assessed the relevance of the content in the instruments developed and this advice was incorporated in the revised data collection instruments.

1.7.5 Ensuring ethical acceptability

Saunders *et al.* (2007:162) assert that research ethics is important when relating to questions about a research topic, research design, research access, data collection and analysis. In this study, a research permit was obtained from the National Council for Science and Technology.

Further permission was sought from the Provincial Director of Education (PDE) of the Western Province of Kenya. The researcher assured the selected respondents about the confidentiality of the collected information. Blumberg, Cooper and Schindler (2005:95) emphasise that consent to participate in research is not a straightforward matter; hence in this study informed consent was applied. Informed consent, according to Saunders *et al.* (2007:182-183), presupposes the participant is given full information about participation rights and use of data. The researcher also recognised objectivity as vital during data analysis to ensure that the collected data is interpreted correctly.

1.8 DEFINITION OF TERMS

Having established the general background and methodology of the study, the relevant terms are used as follows in the study:

ICTs and ICT are used interchangeably in this study to mean technologies that assist in manipulating and exchanging digitised information, hardware and software.

Hardware is used to mean computers, printers, scanners, copiers, fax machines, digital/video cameras, telephones, projectors and surveillance cameras.

Software is used to mean MS-office suite, e-mail and the Internet.

ICT literacy is used to mean a principal's access to ICT facilities, knowledge about ICT and application of ICT in school leadership functions as investigated in Appendix D1.

ICT access is the availability of ICT hardware and software in a school.

ICT knowledge is the ability to perform specified ICT tasks and frequency of use.

ICT application is used to mean principals' ability to practically use ICT in carrying out their school leadership functions.

Planned change management is the systematic attempt to redesign the school system in a way that will make ICT integration manageable to achieve educational goals.

School leadership is the ability of a principal to motivate school staff to perform tasks or take actions that help the school achieve its goals and fulfil their missions by using ICT.

Quality leadership is a principal's positive attitude towards ICT, his or her continual demonstration of willingness to acquire ICT skills through training, the establishment of ICT integration in the school system, recognition and appreciation of technological change, application of ICT skills in school operations and encouragement of school staff to train in ICT. Quality leadership improves school performance which makes quality schools.

Secondary school principals are the head teachers of secondary schools appointed in the schools by the Teachers Service Commission.

School performance is the totality of product outcomes, student-focused outcomes, workforce-focused outcomes, process-effectiveness outcomes, financial and market analysis, and leadership and social responsibility as investigated in Appendix D2.

School achievement is used to mean the students' mean scores on a 12-point scale in national examinations of the Kenya National Exams Council.

Performance improvement is the principal's attempt to integrate ICT in school operations for better school operations in terms of student academic scores, their discipline, staff motivation and financial stability.

School leadership functions are a principal's administrative roles and responsibilities as outlined by the Teachers Service Commission in Kenya. They are product outcomes, student-focused outcomes, financial analysis, work-force outcomes, process effectiveness outcomes and leadership with social responsibility as investigated in Appendix D2.

1.9 ASSUMPTIONS UNDERLYING THE STUDY

For purposes of this study, it is assumed that:

- ICT application in school leadership is one of the factors that influence school performance.
- The level of school performance is an indicator of the quality of school leadership.
- The ICT literacy of a school principal is a benchmark for quality secondary school leadership.
- Respondents were honest in responding to questionnaires and interviews.
- Recommendations of the study are useful to various stakeholders.

1.10 ORGANISATION OF THE STUDY

The thesis is divided into seven chapters, where chapter one serves as the orientation of the study and sets the background and context of the study. The policy analysis of ICT in education in Kenya is covered to show the contextual framework of the research problem. The chapter also summarises of the research problem, research aims and hypotheses, motivation for the study, research design and methods, definition of terms, and limitations and assumptions underlying the study.

Chapter two discusses change management and related theories, leadership quality and its dimensions and organisational performance. The analysis involves the concepts and their application to school leadership. Chapter three comprises of the review of related literature on ICT literacy. The chapter also covers a brief history of ICT in education, the concept and meaning of ICT and ICT literacy, challenges that face ICT literacy development and strategies that enhance ICT literacy development.

Chapter four addresses the research design and methodology. It includes the study population, sample size and sampling technique, instruments for data collection and procedures for the data collection. Three data collection instruments, namely questionnaire, interview and observation

with document analysis, were used to collect and present data for analysis and interpretation. Chapter five addresses the presentation, analysis and interpretation of data and discussion of the findings.

Chapter six consists of the summary, major research findings and conclusions of the study. It makes recommendations and suggestions for further research regarding ICT in educational leadership in Kenya. The study also suggests a roadmap to ICT integration for educational leaders on how ICT policies lead to ICT literacy development which influence leadership quality that in turn enhances school performance.

1.11 CONCLUSION

The chapter has given an introductory orientation to the current study. Due to rapid expansion of the education system, the traditional way of operating without use of ICT in school leadership reduces effectiveness and efficiency of educators. It has been shown that the Kenya government appreciates the importance of ICT integration in education. The government has therefore laid down strategies for ICT integration in secondary schools.

Modernisation of school administrative procedures by introducing ICT is necessary for contemporary institutions, because of the growth in student numbers and changes in technology. In order to realise the planned ICT policies, capacity building of the involved human resource is necessary. The investigation of ICT literacy of school principals could be the starting point for this integration and it assumed to be a step towards ICT strategy implementation in Kenya.

CHAPTER TWO

CHANGE MANAGEMENT, LEADERSHIP QUALITY AND SCHOOL PERFORMANCE

2.1 INTRODUCTION

This chapter provides literature review on change management, leadership quality and organisational performance. The section on change management discusses the meaning of change, the process of planned change, the role of school principals as change agents and approaches to change management. The section on leadership quality explains the meaning of quality, characteristics of quality leadership, quality improvement techniques and strategies for quality improvement. The last section discusses performance in terms of presentation measures for performance, performance improvement, Performance Excellence Criteria and School Performance assessment criteria.

2.2 CHANGE MANAGEMENT

2.2.1 The meaning of change

Beach and Reinhartz (2000:303) point out that change is part of life for both individuals and organisations. Whether change is planned or occurs spontaneously due to natural circumstances, there are cumulative consequences for an organisation. Stoner, Freeman & Gilbert (2001: 412) describe three types of change. One is planned change, which “is a conscious and the deliberate attempt to manage events so that the outcome is redirected by design to some predetermined end.” The second is spontaneous change, an alteration that is “the result of natural circumstances and random occurrence.” The third is evolutionary change which “refers to long-range, cumulative consequences of major and minor alterations in the organisation.” Educational institutions, like secondary schools are not immune to these types of changes and in this study, ICT literacy development among principals is planned change meant to enable ICT integration in school operations.

Mitzberg *et al.* (1998:325) claim that to effectively deal with change, one does not have to focus on change as some kind of manageable force, but one can deal with change by dealing with improving oneself. However, in order to cope with change, there is a need to change the structure, people and organisational systems, while vision should be changed with strategic positioning by redesigning programs (Mitzberg *et al.*, 1998:327; Asmal, 2003:4). In addition, Mohlokoane (2004: 34) argues that change management is possible through changing the culture or the ethos of the organisation, whether to make it more competitive or efficient under new conditions. According to Veenhof, Clermont and Sciadas (2005:5), the widespread diffusion of information and communications technologies (ICTs) has been a source of change on many fronts. Spurred by the rapid pace of this evolution, people have learned to develop new and changing skill sets to use ICTs effectively (*ibid.*:6).

2.2.2 The process of planned change

Planned change is the systematic attempt to redesign an organisation in a way that will make it manage changes in the external environment or achieve new goals (Stoner *et al.*, 2001: 412). Programs of planned change based on Lewin's ideas are directed towards removing restraining forces and then creating or strengthening driving forces that exist in organisations (Steyn, 2000:18). For instance in this study, when policies are made to implement ICT in the education sector, it is planned change. The process of change management according to Stoner *et al.* (2001:416) includes:

- i) Unfreezing. This involves making the needful change so obvious that the individual, group or organisation can readily see and accept it.
- ii) Changing. This involves adapting to new attitudes, values and behaviours. A trained change agent leads individual groups or the entire organisation through the process. During the process, the change agent will foster new values, attitudes and behaviour through internalisation.
- iii) Refreezing. This means locking new behaviour patterns into place by means of supporting or reinforcing mechanisms to become the new norm.

For the purposes of this study, unfreezing is done when the Kenya government provides ICT infrastructure in secondary schools, making the need for change in school operations obvious. Such infrastructure includes the rural electrification programme, provision of free computers to schools and establishment of digital villages in every constituency. Change takes place through the growth of ICT training opportunities in various colleges offering such courses and this is action towards managing change. Refreezing is applied when principals become ICT literate after ICT training and then integrate this literacy in administrative duties making ICT use in school operations become a new norm.

2.2.3 The leadership role in planned change

Leadership plays a visionary role in the growth of an organisation (Kaplan & Norton, 2008:20). They identify six stages for leadership effective strategy execution in planned change (*ibid.*: 21), namely:

Stage 1: The leader leads the change agenda and drives it from the top to reinforce mission, values and vision.

Stage 2: The executive leader validates the strategy map as an expression of the strategy and challenges the organisation with stretch targets.

Stage 3: Leadership drives alignments of organisation units and is essential for communicating vision, values and strategy to all employees.

Stage 4: Leadership supports the cross-organisations unit process improvements.

Stage 5: The leader's openness and skill in running the strategy management review meeting determines its effectiveness for fine-tuning the strategy throughout the year.

Stage 6: The leader arranges for well-formulated data to be collected about the performance of the existing strategy.

The ICT strategy in Kenya cannot be well implemented in schools without focusing on the technology positioning of principals as leaders. The role of leadership in organisational change is characterised by action. Leadership affects the four mechanical attributes of organisations (Holland, 2000:53):

- Vision (school vision and mission);
- Process(curriculum implementation);
- Plant, equipment and tools (ICT infrastructure);and
- Performance system (training, exam system and administrative procedure).

Unless the leadership of the organisation takes firm and positive action, the organisation's mechanical attributes will not be altered to facilitate the organisational change.

2.2.4 The role of the secondary school principal as a change agent

A change agent is a person whose role includes the responsibility of initiating and facilitating change or a professional whose major function is the advocacy of innovations into practice (Fullan & Hargreaves, 1998:103; Adam, 2005:55). Effective implementation of an innovation is dependent to a considerable degree upon the active intervention of key personnel in change agent roles; their roles are crucial because school improvement programmes require time and effort for effective change (Miles, Saxl & Lieberman 1998:158; Darling-Hammond, 2000:26; Fullan, 2000:20). Wango (2009:254) explains that there is a considerable increase in knowledge and innovations which have had an impact on education. He elaborates that education policy makers will have to combine the knowledge of individual schools with an understanding of administrative and managerial factors and skills so as to influence the process of change.

According to the regulations of the Teachers Service Commission (TSC, 2007:9-11), the roles of a secondary school principal in Kenya are outlined as:

- a) *The organisation and management of the approved school curriculum*

The ministry of education outlines that a secondary school principal is responsible for giving the school direction to offer the approved curriculum, for periodically checking students' exercise books, projects and practical work to confirm the exact situation in the classroom and also for teaching lessons. In addition, the principal convenes regular staff meetings, holds information meetings with school personnel and ensures adequate preparation of students for school tests and national examinations.

b) The management and control of school finances and stores

A principal is the school's accounting officer responsible for all revenue and expenditure plans, transactions, books of accounts and records. In addition, the principal of a school outlines all supported payments from school funds, checks regular keeping of school account books in accordance with accounting instructions for educational institutions. The principal also initiates, nurtures income generating projects and adheres to stores procurement procedures in acquiring sufficient school supplies. The principal also ensures custody of, constant reference to and familiarity with account and legal documents.

c) The management and motivation of human resources in the school

According to the new regulations of the TSC, principals are responsible for delegation of responsibilities and duties to school personnel. They also welcome and induct new teaching and non-teaching staff, as well as supervise, appraise and report on the performance of school personnel. Since teachers and non-teaching staff require in-service training for continual learning, a principal has the responsibility of creating an environment for staff training and development.

d) A secretary to the school Board of Governors (BOG) and the Parents Teachers Association (PTA)

When need arises, the principal sends out meeting notifications, co-ordinates writing of minutes for board meetings, maintains correspondence on all BOG and PTA matters. In most cases, it is expected that a principal informs the BOG on statutory and standard operating procedures in handling school matters.

e) *The management and maintenance of the school plant equipment*

A principal is expected to plan and prepare an incremental maintenance manual for all physical facilities, equipment and books. In addition, the principal ensures safety, security and cleanliness of the school.

The aforementioned responsibilities of principals in Kenya do not explain their change agent role, but are a framework for describing how a principal as a change agent can enhance ICT integration in such school leadership roles. Adam (2005: 56) explains that secondary school principals as leaders must first redefine their roles before schools can change by altering their structures and teachers can be empowered to assume leadership roles. Smith (2008:6) adds that a change agent diagnoses group problems, plans for change, implements the plans and evaluates the results. An effective change agent must understand group dynamics to reduce bureaucracy and change leadership styles to adapt to information innovations (Fullan, 2000:20).

Terry (2003:1-3) describes the role of the school principal who is a change agent as a:

- *Process helper* – who provides technical and interpersonal assistance and facilitates problem-solving, decision making, group interaction and conflict resolution in schools.
- *Resource linker* – who communicates information about resources both at the instigation of the resource supplier and in response to user request where the user can be a student, a teacher or non-teaching staff.
- *Resolution giver* – who assists in the introduction of innovations in the curriculum or instructional process.
- *Negotiator* – who develops a set of strategies or skills for facilitating the group and collaborative process (similar to process helper).
- *Nurturer* – who provides encouragement, reinforcement or emotional support (similar to process helper).
- *Teacher and learner* – who transmits information and develops receiver skills usually in a structured way by giving advice and resolutions to problems. In addition, he or she

provides materials, money, time or other resources needed by the receiver (similar to resource linker).

- *Curriculum developer* – who collects for the receiver and then provides feedback in a formative evaluation mode to aid the next step (similar to resolution giver).

In this study, the secondary school principal is such a change agent who should be ICT literate in order to manage technological changes in the education sector. According to Freidus, Grose and McNamara (2001:59) and Fullan (2000:117), change agents in educational settings have three distinct styles of working with and influencing staff and students, namely:

- Directive, in which staff and students are considered passive recipients of a principal's innovation;
- Collaborating, in which teachers share decision-making related to the innovation;
- Non-directive, in which the change assists staff and students in solving problems related to the innovation.

The change approaches, like developing skills, attitudes and perceptions about ICT among school principals, are relevant to this study. The integration of ICT literacy in school leadership is a way of managing technological change. As change agents, secondary school principals are transformational leaders who can influence the teaching and non-teaching staff in using ICT in school operations. Such transformational leaders are technological change agents who according to Bass (1985) in Johannsen (2004:3) have the following characteristics: identify themselves as change agents, are courageous individuals, believe in people, are value driven, are lifelong learners and have ability to deal with complexity.

2.2.5 Approaches to change management

There are several approaches to managing change, some of which include the problem-solving approach, the learning organisation, Fullan's theories of change management and Total Quality Management. In this study, only those which are relevant to technological change management in education are discussed namely: Total Quality Management; the Actor Network Theory, Fullan's change theory, the learning organisation approach and Kurt Lewin's force field analysis.

2.2.5.1 Total Quality Management

The idea of quality was originally developed in the 1930s and 1940s by Deming Edwards, a statistician who was best known for helping post-war Japanese business to become foremost in quality in the world (Steyn, 2000:1). Edwards supplied a simple answer to the dilemma of poor quality by finding out the needs of customers; the resultant approach was called Total Quality Management (TQM). It was in the 1990s that TQM as an industrial quality concept was introduced in educational institutions (Farrando, 2007: 1).

2.2.5.1.1 The meaning of TQM

Besterfield *et al.* (2003:2) note that TQM is both a philosophy and a set of guiding principles that represent the foundation of a continuously improving organisation. They outline TQM as:

Total – made of whole; Quality – degree of excellence a product or service provides; and Management – act, art, or manner of handling, controlling or directing.

Quality Management (QM) focuses on the continuous improvement of all processes on all levels, views no process as perfect and uses a rational measurement system (Steyn, 2000: 3). She adds that QM focuses on achieving quality with acceptance and pursuit of continuous improvement as the only useful standard of attaining quality. Quality management is the responsibility of all role players, from national and provincial levels, through regional, sub-regional, local and institutional management to educators and learners (Mohlokoane, 2004:36). The need for quality management is the single most important issue in education today (Steyn, 2000:17). According to Doss and Kamery (2005:1), many educators maintain that QM can fulfil the need for improvement by providing a structured, systematic strategy to address quality in the education sector. They also mention that quality management in education provides a structured and systematic delivery system which has led to an increase in learner performance, self-esteem, motivation and self-confidence.

Quality makes the difference between success and failure in education; changing the total quality of an organisation involves TQM which is the art of managing the whole to achieve excellence (Steyn, 2000: 2). Besterfield *et al.* (2003: 2) describe TQM as a philosophy, a continuous activity

and a set of guiding principles that represent the foundation of a continuously improving organisation. TQM is a comprehensive approach to improving competitiveness, effectiveness and flexibility through planning, organising, understanding and involving individuals at different levels (Oakland, 2003: 32). TQM is concerned with the attainment of appropriate resource mixes, curricula and assessment practices, governance mechanisms and management, as well as educator and learner performance (Steyn, 2001:3). Doss and Kamery (2005:9) state the primary philosophical tenets of TQM as follows:

- Customer focus: TQM advocates total customer satisfaction
- Process: TQM advocates reduced process variations and continuous process improvement.
- Cultural: TQM advocates an enterprise-wide corporate culture awareness of quality pursuits.
- Analytical: TQM advocates continuous improvements on all quality parameters via measurement.

Covey (2006: 264) argues that ‘total quality’ is primarily a paradigm (a way of looking at the world) concerning leadership and people. He emphasises that management must change fundamentally and transform its attitude and mind-set, before total quality can become a reality. TQM alters the values, cultures and mindsets within an organisation (Cotton, 2001:12). As a methodology, TQM involves a paradigm shift with a change of mind from the old to the new, from the past to the future, from individualism to group dynamics and from nationalism to globalism (Besterfield *et al.*, 2003:3).

One of the TQM’s basic concepts is the establishment of performance measures for the process, where quantitative data are necessary to measure the continuous improvement activity (Besterfield *et al.*, 2003: 2-3). An organisation will not begin the transformation to TQM until it is aware that the quality of products must be improved (*ibid.*: 6).

2.2.5.1.2 The role of TQM in improving leadership

TQM integrates fundamental management techniques, improving efforts and technical tools under a disciplined approach; the purpose of TQM is to provide a quality service at a minimum cost (De Feo & Barnard, 2005:213; Mitzberg *et al.*, 1998: 328). According to Besterfield *et al.* (2003:2), TQM requires six basic concepts which are considered as benefits of TQM.

- A philosophy that improves management to provide long-term continuous improvement with top-bottom organisational support. In this study, it is ICT literacy development skills which principals at the top in school management continuously improve as they perform their duties.
- A focused, systematic and structured approach to enhancing customers' satisfaction. In this study, it involves ICT integration in school operations to improve learner achievement and staff motivation.
- Process-improvement methods that reduce or eliminate problems like non-conformance costs, provide quality products to customers, increase productivity and enhance competitive position in the market. ICT integration improves curriculum implementation techniques.
- Tools and techniques for improvement-quality operating systems.
- Intrinsic motivation and improved attitudes throughout the work force.
- Enhanced communication with a proactive workforce and establishment of performance measures for the process.

The inclusion of TQM in this study highlights the competitive advantage of schools with ICT literate principals who provide quality leadership that eventually leads to improved examination outcomes.

2.2.5.2 Actor Network Theory (ANT)

Michel Callon and Bruno Latour who were French sociologists, developed ANT in the 1980s (Norbert & Schermer, 2003:2). The sociologists defined ANT to be a hybrid of modern and post-

modern constructions in which there is a link between human and non-human entities. As noted in Waryzynski (2006:2), Law (1990) explains that ANT's rich methodology embraces the interactions and explanation of change to structural, cultural, technical, physical and human variables.

2.2.5.2.1 Basic concepts of ANT

The main concepts of ANT according to Ryder (2007:4-6) are outlined as follows:

- **Actors** are all entities that are able to convert human and non-human objects to interact in an organisation. In this study for example, school principals and ICT equipment including software are actors.
- **Actor network.** If the persuasive process becomes effective, then it results in the creation of an actor network. For example, when a school principal learns ICT skills, there is interaction with equipment and software. This interaction is an actor network.
- **Translation** is the ability of leaders to keep other staff involved in a network interpreting their interest, needs, values and efforts in their language. Translation occurs through communication and interaction between members concerned. By being ICT literate, the principal as a translator plays a major role in technology integration in the school system.
- **Black boxes** are created when many elements are made to act as one and can form around issues, objects, people and structures. For example, in a school where ICT is fully integrated, the operations are networked using technology and as a result the teachers, non-teaching staff and ICT infrastructure interact as a system forming a black box.
- **Mobilisation** is the making of connections with different organisations, where the focal actor communicates with the broader network through a vision statement; strategic plan and status report. In mobilisation, successful organisations like schools have a system for everything, from acquiring new students and staff, to managing their relationships and from quality management to performance measurement (Kaplan & Norton, 2008:2). This is meant to assure the best chance of delivering results through technology integration.

2.2.5.2.2 The relationship between ANT and technological change management

A leader in a quality-oriented organisation seeks ways not merely to change but to manage and instil the change process itself (Cotton, 2001:4). A school principal as a focal actor in ANT plays a role in the process of systemic change. ANT does not typically attempt to explain why networks exist, but is more interested in the infrastructure of actor networks, how they are formed and they can fall apart. In this study, the components of ICT literacy, factors that enhance ICT literacy development and challenges facing ICT literacy development are considered. Leading technological change involves interacting and collaborating with other actors, translating their interest and needs, mobilising and channelling the knowledge, resources and power leading to successful technological change (Waryzynski, 2006:6).

ANT offers an inclusive description of technological change; hence is used in the study as an approach to managing technological change among school principals to enhance quality in education delivery and influence school performance (Cotton, 2001:13). The importance of ANT to leaders of technological change is to conceptualise the heterogeneous link of human and non-human actors in order to respond to technical challenges of their organisations in improving quality (Waryzynski, 2006:5).

2.2.5.2.3 Application of ANT in change management

A process-based approach like ANT can provide a better explanation for understanding the critical factors involved in technological change and its integration in social systems (Waryzynski (2006:3). In this study, the usefulness of ANT can be achieved using the following methodology:

1. Identify and describe the purpose, needs and benefits of the technological change (problematization).
2. Develop a list of key actors (participants) and define their interests, needs and requirements, for instance school principals showing their interest in ICT literacy and as a requirement for training.
3. Map relationships of actors because mapping of relationships is considered for ICT literacy level between principals of high and low achieving schools and the general

school performance. The structural holes in such actor networks are the disparities in ICT facilities and possible resistance to ICT integration in leadership.

4. Engage key actors, translate and inscribe their interest into visions, objectives, plans and roles. This can be through engaging education officers by translating their leadership roles, through writing strategic plans and school visions to indicate their interest in ICT integration in school leadership.
5. Enrol, mobilise, empower and coordinate actors (principals, staff and students) as translators where translators are ICT providers who train and deal with resistance to change. As a way of empowering principals, the government can initiate policies to train principals in ICT literacy. As change agents, principals can encourage other school staff to appreciate the use of technology in school operations, integrate ICT in administrative duties and understand ways of dealing with resistance to change.
6. Devise and implement strategies for improving school performance. Once a strategy is developed to change the quality of performance especially with the integration of ICT in school operations, ways of executing the formed strategy should be put in place.

The use of ANT applies in its effectiveness, efficiency and impact of technology in an organisation (Waryzinski, 2006: 9). In this study, it is shown that ICT integration in school operations can improve leadership quality and enhance school leadership consequently improving school performance.

2.2.5.3 Fullan's change management theory

Fullan's theory emphasises capacity building. He defines it as any strategy that increases the collective effectiveness of a group to reduce the performance gap among students (Fullan, 2007:7). He claims that most theories of change management fall short, because they are weak in capacity building. Elmore (2004:72) states that the more one invests in capacity building, the more one has the right to expect greater performance. He explains that in Fullan's change theory, capacity building comes first. It is then followed by judgement because that is the most motivational factor.

In order to successfully improve capacity building, there should be a way of dealing with resistance to change. In relation to this, Fullan and Hargreaves (1998: 2-3) outlines novel guidelines for organisational reform success, namely:

- i) *Respect those you want to silence*; it is important to learn from resistance as it can be instructive. Conflict and challenges can be constructive in dealing with complex problems; therefore this study accepts that principals should appreciate staff who resist technological change. Such staff are self-elected reformers who are likely to influence positive change.
- ii) *Move towards the danger in forming new alliances* since successful schools are not only collaborative internally, but also have confidence, capacity and political wisdom to reach out by constantly forming new alliances. The alliances are networks which deal with change and improving quality.
- iii) *Manage unemotionally and rationally to help* school staff see problems as issues that can be solved. In order to deal with resistance to reform, conflicting forces should be dealt with emotionally and rationally. In this way, principals are able to manage conflict and anxiety.

Fullan's change theory which emphasises capacity building in leadership is one of the justifications in this study to investigate the ICT literacy of principals. The capacity building in this case, is ICT skills development in order to deal with technological change and to integrate these skills in school operations.

2.2.5.4 The learning organisation approach

The learning organisation approach was developed by Peter Senge (1947) who was named 'a strategist of the century' after he had an impact on business operations (Smith 2009:1). According to Senge (1990: 3) in (Smith 2009: 2), the foundation of the learning organisation approach is about enhancing the capacity of all people to work towards a common goal. He adds that learning organisations are those where people continually expand their capacity to create

results they truly desire. Smith elaborates that people get new and expansive patterns of thinking and are nurtured collectively in organisations where the basic rationale is that in situations of rapid changes, only those who are flexible, adaptive and productive will excel.

According to Clark (2000: 1), a learning organisation is one that:

- Seeks to create its own future,
- Assumes learning is an ongoing and creative process for its members,
- Develops, adapts and transforms itself in response to the needs and aspirations of people, and
- Allows people at all levels, individually and collectively to continually increase their capacity to produce wanted results.

It is assumed in the learning organisation approach that the level of performance and improvement needed today requires learning (Clark, 2000:1). Learning organisations are vision-led and creative; hence they embrace change rather than react to it (*ibid.*: 2). Smith (2009: 2) reports that Senge (1990: 69-70) describes five dimensions of learning organisations namely: systems thinking, personal mastery, mental models, building shared vision and team learning. Systems thinking is the cornerstone of the learning organisation and people are agents who are able to act upon the structures and systems of which they are part. It also reinforces feedback and understanding oriented towards long term view. Personal mastery is the discipline of continually clarifying and deepening a personal vision of focusing, developing patience and seeing reality objectively (*ibid.*: 2). Mental models refer to the capacity of people to learn new skills and develop a new orientation in order to foster change in their organizations (*ibid.*: 5).

Senge (1990:70) argues that learning organisations require a new view of leadership, because leaders are designers, stewards and teachers. In this study, the principals as leaders are responsible for building schools communities where staff members continually expand their capabilities to understand complexity, clarify vision and improve shared mental models. For this reason, principals should acquire ICT skills to encourage other school staff members to integrate ICT in school operations in order to improve school performance.

2.2.5.5 Kurt Lewin's Force Field Theory

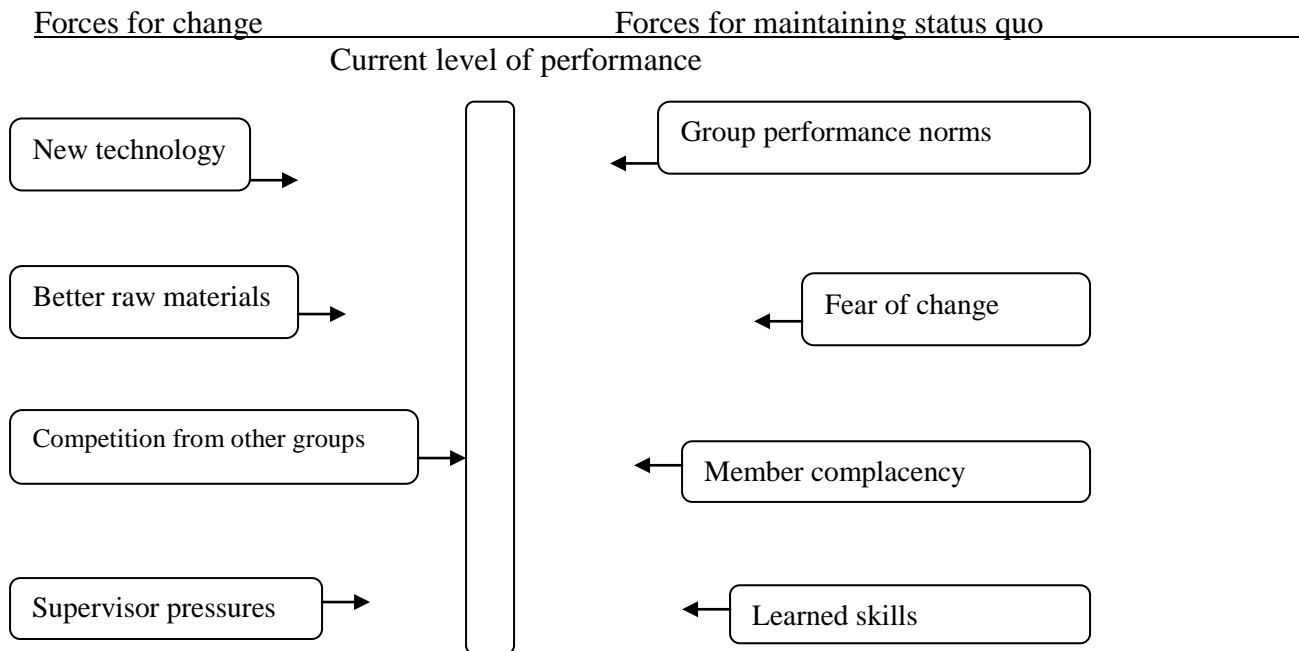
Kurt Lewin (1890-1947) was a famous charismatic German psychologist now viewed as the father of social psychology (Neill, 2004:1). His work had a profound impact on social psychology as regards experiential learning, group dynamics and action research (Smith, 2008:1). He believed that for change to take place, the total situation has to be taken into account and behaviour is determined by the totality of an individual's situation. In his field theory, a field is defined as the totality of co-existing facts, which are conceived to be mutually dependant Lewin, (1951: 240) as cited by Neill, (2004:2).

Smith (2008:2) summarises the basic tenets of Lewin's theory as:

- Behaviour is a function of the field that exists at the time it occurs
- Analysis begins with the situation as a whole from which the component parts are differentiated.
- The concrete parts in a concrete situation can be represented mathematically as
 $(B = f \{P, E\})$.
B = human behaviour
f {P, E} = the function of both the person and the environment.

This means that one's behaviour is related to both the personal characteristics and the social situation within one's environment. As mentioned in Stoner *et al.* (2001: 414), Kurt Lewin's force field theory states that behaviour is the result of equilibrium between driving and restraining forces, which work in opposite directions and act to keep an organisation in a state of equilibrium where they support the status quo. The restraining forces are those which represent the potential resistance to planned change and they include: organisational culture which is the primary force in guiding employee behaviour, self interest and employee perception of organisational goals and strategies (*ibid.*: 415). The performance that emerges is a reconciliation of the two forces. Kurt Lewin's model is summarised in figure 2.1; it is a reminder to look for multiple causes of behaviour rather than a single cause.

Figure 2.1: Kurt Lewin's force-field diagram



Note: The length of the box is equal to the amount of force

Source: Stoner *et al.*, 2001:415

The benefits of Lewin's force-field analysis are the determination of the positives and negatives of a situation; it encourages people to agree and prioritise the competing forces and identify the ways of managing the change (Besterfield *et al.*, 2003:444). Lewin's contribution on group dynamics applies to group structure and its leadership, because his model features basic skills training intended to help an individual function as a change agent (Smith, 2008:6).

The force-field analysis is a problem-solving tool for helping change to occur and identifying possible strategies for enabling the change; it makes a distinction between driving forces that make change to occur and resistance to the change (Steyn, 2000:18). The force-field analysis is discussed as Kurt Lewin's theory of change management in section 2.4.1. The main objective of managing change is to improve quality in leadership and subsequent improvement in an organisation's output (Besterfield *et al.*, 2003: 1). Since the study objective is to establish the relationship between ICT literacy of a principal and secondary school performance, Table 2.1 is an interpretation of Lewin's force field analysis.

Table 2.1: ICT literacy development (Objective)

Promoting forces	Inhibiting forces
<p>Strategies for ICT literacy development →</p> <p><i>For example</i></p> <ul style="list-style-type: none"> • Structuring of ICT policy development and implementation • ICT human capacity development • Improving the quality of programs and content for students • Reducing the cost ICT products and services • Formation of school leadership ICT literacy networks 	<p>← Challenges facing ICT literacy development.</p> <p><i>For example</i></p> <ul style="list-style-type: none"> • inadequately trained technical staff • inappropriate ICT training curricula • poor quality control • insufficient funding with high costs of ICT products and services • poorly developed infrastructure • resistance to technological change

This is applied in chapter five to report the investigation on factors and strategies that can enhance ICT literacy development among secondary school principals and challenges that face or hinder its development.

In this section, it has been indicated that Lewin’s model teaches task interdependence where the success of an organisation directly facilitates other people’s success. The field theory emphasises the integration of theory and practice, which encourages collaboration among members of an organisation to improve group performance (Smith, 2008: 3).

2.3 QUALITY AND PERFORMANCE IMPROVEMENT

2.3.1 The meaning of quality

Solms (2006:29) summarises the views of various experts by listing the following definitions of quality:

- Juran calls quality ‘fitness for purpose or use’.
- Deming says, “Quality should be aimed at the needs of the consumer, present and future.”

- Feigenbaum believes that ‘quality is the total composite product of service characteristics of marketing, engineering, manufacture and maintenance through which the product and service in use meet the needs of the customer.’
- Crosby states that quality is conformance to requirements.

According to ISO 9000:2000, quality is the degree to which a set of inherent characteristics fulfils requirements (ISO 9001, 2008: 2); De Feo and Barnard (2005: 282) define quality as those features of product and services which meet or exceed customer needs and thereby provide satisfaction. According to Besterfield *et al.* (2003: 8), quality is excellence in production of service by fulfilling or exceeding expectations, expressed as

$$Q = P/E = \text{Performance} / \text{Expectations}$$

Where Q is greater than one and the determination of P and E will be based on the perception of the organisation determining performance and the customer determining expectations. The definition of ‘quality’ can be made clearer by providing an overview of the meanings of quality illustrated by Steyn (2000:2) and Mohlokoane (2004: 35) as:

Product and service features that meet consumer needs

Higher quality enables organisations to:

- Increase customer satisfaction
- Make products saleable
- Meet competition

The major effect is on sales (learner enrolment)

Freedom of deficiencies

Higher quality enables organisations to:

- Reduce customer dissatisfaction

- Reduce error rates
- Reduce rework
- Reduce inspection
- Improve performance delivery

The major effect is on costs

Colleagues within an educational institution are customers and rely upon particular internal services of others to work effectively, where customers are people within the institution, who include the students, teachers and support staff (Steyn, 2000: 3).

2.3.2 Dimensions of quality

Besterfield *et al.* (2003: 8) identify nine dimensions of quality as outlined in Table 2.2.

Table 2.2: Dimensions of quality

Dimension	Meaning and example applicable to the study
i) Performance	Primary product characteristics. For example, the overall operations of a school regarding academic performance, sports and student discipline.
ii) Features	Secondary characteristics. For example, added ICT features
iii) Conformance	Ability to meet educational standards. For example, leadership through ICT integration according to the quality standards set by the Ministry of Education.
iv) Reliability	Consistency of performance over time. For example, consistent examination performance over a selected period.
v) Durability	Useful life. For example, a school producing useful members in society and surviving the test of time.
vi) Service	Resolution of problems. For example, solving conflict and being able to manage technological change.
vii) Response	Human-to-human interface. For example, the principal-teacher-student relationship.
viii) Aesthetics	Sensory characteristics. For example, general order due to ICT infrastructure
ix) Reputation	Past performance and track record. For example, mean score in national examinations

Source: Besterfield *et al.* (2003: 8)

The dimensions are somewhat independent; hence a product or service can be excellent in one dimension and average in another; very few products or services excel in all the dimensions (Steyn, 2000: 9). The dimensions are translated into the requirements for the development of a new product or improvement of an existing one.

Performance as a dimension of quality is the most relevant in the current study. The current study is based on the premise that school performance is proportional to its leadership when other conditions like student intelligence are kept constant. Based on these arguments, the researcher considers that when the quality of leadership is high, school performance increases. Therefore, one of the points of focus in this study is the relationship between ICT literacy of a principal and school performance, because it is assumed that ICT literacy increases the quality of leadership of a secondary school principals.

2.3.3 Characteristics of quality leadership

According to Wango (2009: 89), the combination of a national curriculum, quality assurance and national examinations is a measure of the effectiveness of school leadership. In addition, Besterfield *et al.* (2003:18-19) outline that quality leaders in organisations that manage change have the following characteristics. They:

- i) Give priority attention to internal and external customers as they continually evaluate customers' changing needs. In this study it relates to principals considering the needs of students and other staff as customers.
- ii) Empower rather than control subordinates. As regards this study, empowerment can be through encouraging students and school staff to be ICT literate.
- iii) Emphasise improvement rather than maintenance. This can be done through improving ICT skills while doing other normal school duties.
- iv) Emphasise prevention, where principals establish a balance between preventing problems and improvement.
- v) Train and coach rather than direct and supervise. When principals are ICT literate, they can indirectly train others to appreciate ICT skills.
- vi) Learn from problems and find ways of preventing more or ways of solving it. Principals can learn from slow systems and improve on them through ICT integration.
- vii) Continually try to improve communication. ICT in schools can improve communication, for example, by making use of mobile phones, e-mail and the Internet.
- viii) Continually demonstrate their commitment to quality. The ICT literacy level of principals can be a demonstration of quality.

- ix) Establish an organisation system to support the quality effort. A principal can encourage ICT integration in the school system to improve its quality.

According to this study a quality principal is a leader who gives priority to the learners, empowers school staff through use of ICT, improves communication with staff and continually demonstrates commitment to quality by being ICT literate. They also promote literacy by encouraging staff to be ICT literate and to apply it in school operations. According to Steyn (2000: 4), areas of improvement in educational institutions could also include improving educator and learner contact; improving telephone services at the office; improving communication between learners and the institution; and improving learning through monitoring of the learning process. This study concludes that improving the quality of service in school operations includes integration of ICT in school leadership functions.

In Kenya, Wango (2009: 90) outlines the measures of quality in schools as:

- i) the nature of school administration
- ii) educational standards in terms of student achievement in national exams
- iii) the nature of education offered
- iv) management of financial and physical resources
- v) school welfare like co-curricular activities, guidance and counselling with spiritual nourishment.

Based on the aforementioned measures of quality, the study considers performance level of a school as a measure of quality as investigated in questionnaire 2 (Appendix D2). The study also considers quality in terms of the level of ICT literacy; the conclusion is that quality leadership leads to quality schools.

Performance measures are used to achieve one or more of the seven objectives (Besterfield *et al.*, 2003: 167), namely to:

- i. establish baseline measures and reveal trends
- ii. determine which processes need to be improved

- iii. indicate process gains and loses
- iv. compare goals with actual performance
- v. provide information for individual and team evaluation
- vi. provide information to make informed decisions
- vii. determine overall performance of the organisation

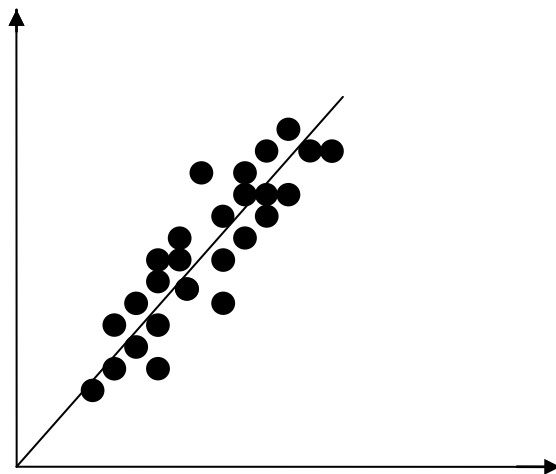
2.3.4 Performance improvement tools and techniques

There are tools and techniques that can be used to analyze problems and draw conclusions from data (Steyn, 2000:14; Besterfield *et al.*, 2003:462-510).

2.3.4.1 Scatter diagrams

A scatter diagram is used to test for a cause-effect relationship, where one variable is plotted against another. The relationship of variables can be illustrated as shown in figure 2.2.

Figure 2.2: Scatter diagram for performance improvement (Students mean score against the ICT literacy of a principal)



The strength of the relationship is determined by the tightness of a cluster, but one factor does not necessarily cause the other. Scatter diagrams could be used for instance to determine the potential relationships between the following:

- Socio-demographic factors and ICT literacy level.
- ICT access to a principal and school performance.
- ICT knowledge of a principal and school performance.
- ICT application in school operations and school performance.
- ICT literacy of a principal and school performance.

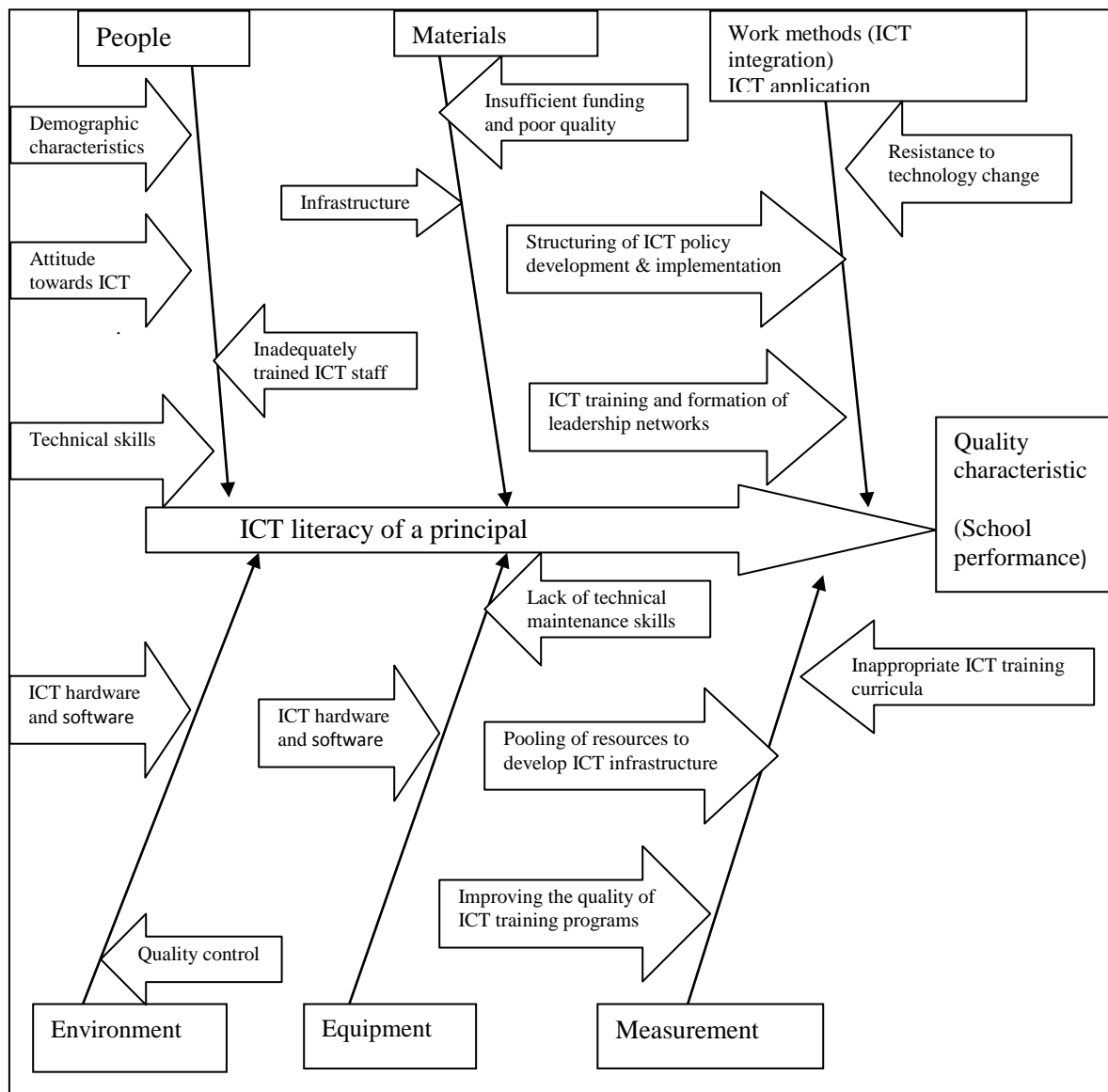
2.3.4.2 The Fishbone diagram

This also called a cause-and-effect diagram which, when structured graphically, shows the relationship of possible causes and sub-causes directly related to an identified problem (Besterfield *et al.*, 2003: 464). In such a diagram there are numerous effects and challenges, where solutions are developed to correct the causes and improve the process (*ibid.*: 466). To such challenges, the criteria for possible solutions include feasibility, resistance to change, consequences and training. The diagrams are useful for:

- Analysing actual conditions for the purpose of product or service quality improvement.
- Analysing more efficient use of resources and reduced costs.
- Eliminating conditions causing nonconformities and customer complaints
- Standardise existing and proposed operations.
- Educating and training personnel in decision making and corrective-action activities

In this study for instance, the Fishbone diagram shows various factors influencing ICT literacy among principals which eventually influence leadership quality. An illustration of the cause-effect diagram is shown in figure 2.3.

Figure 2.3: Interpretation of the Fishbone diagram for ICT integration



2.3.5 Strategies for performance improvement

The process improvement of a system involves planning and one of the best approaches is Juran's Trilogy, which has three components: planning, control and improvement (Besterfield *et al.*, 2003: 129). For this study, improvement is the most relevant component because it aims to attain levels of performance that are significantly higher than current levels. There are five basic ways to improvement:

- Reduce resources, for example, where reports are distributed to more people than necessary, wasting time and office space.
- Reduce errors, for example, ICT can be used to edit work before printing
- Meet or exceed customer expectations
- Make the performance process safer
- Make the process more satisfying by improving communication.

In addition to the basic ways of improvement, Besterfield *et al.*, (2003: 224-226) describe improvement strategies as follows:

- a) Repair, which is a short-term measure and does not make the process better than the original design. A team identifies and eliminates root causes of a problem and effect a permanent solution.
- b) Refinement, which improves processes and services on an incremental basis. It improves efficiency and effectiveness. This is a gradual change and gets little resistance from possible users although it has minimum rewards.
- c) Renovation, which results in breakthrough improvements where innovation and technological advancement are key factors.
- d) Reinvention, which is the most demanding improvement strategy. New service is developed using teams; it is good for an organisation because it maintains vitality or competitive advantage, hence prone to resistance from potential users.

The current study considers two major approaches to improving quality in education, namely International Quality Standards in Education and the Baldrige Performance Excellence Criteria.

2.3.5.1 The international quality standards in education

Farrando (2007:15) reports that in the 21st century, education is the construction of sustainable ICT integration processes based on individual needs and capacities. He adds that effective implementation of International Standards Organisation (ISO) ISO 9001 quality standards by educational institutions can play a key role in addressing this challenge. The ISO 9001:2008

defines a management system as a systematic approach to managing processes, activities, people, resources and infrastructure (ISO 9001,2008: v). Soymonds (2007:18) explains that a management system standard shows how an organisation can achieve superior performance, provided there is superior leadership and effective monitoring. Quality Management refers to activities aimed at meeting customer demands and applicable requirements, hence improving performance (ISO 9001, 2008:vi). A necessary requirement for the standard is continual improvement of the Quality Management System (QMS).

According to ISO 9001 (2008: 20), quality can be measured by considering:

- Measures of variables related to learners, teaching and support staff
- Quantitative and qualitative measurements
- Performance outcomes from Quality Management System (QMS)
- Checking trends in learner performance

The key concept for the ISO 9001 deals with organisational quality systems called quality assurance; if principles of quality assurance are applied in an organisation then a QMS is in place (Bergh, 2004: 2). He further explains that in order to measure organisational quality, the standards are in three sets:

- a) General requirements of a quality system as management responsibility, quality manual and procedures, appointment of a quality manager, availability of resources and staff.
- b) The need to maintain documented procedures on organisation processes by design, development and delivery, and implementing activities according to the procedures.
- c) Specific quality assurance mechanisms including tests and inspection, quality records and updated records.

In the process approach, ISO promotes the adoption of a process approach when developing, implementing and improving the effectiveness of QMS to enhance school performance (ISO 9001, 2008:v). The process approach is the application of a system of processes within an organisation, together with the identification and interactions of these processes. The ISO 9004

provides a wider focus on quality management, because it addresses the needs and expectations of all interested parties by systemic and continual improvement of an organisation's performance (*ibid.*, 2008:vii). According to ISO 9001 (2008:16), the development of the International Workshop Agreement (IWA 2) is one of the ISO alternatives to ISO 9001:2008 to provide confidence in the conformity of a product or service to specified requirements. As a result, the IWA 2:2007(E) is an effective QMS which provides guiding principles to quality management and in conjunction with the ISO 9001:2000, gives specific QMS principles for use in education (IWA 2, 2007:x).

IWA 2 (2007:3) outlines some strategies for encouraging leadership quality through:

- I. Communicating the QMS plan throughout the school.
- II. Strategic planning considering the aim and future goals of the school.
- III. Encouraging the identification and use of best practices.
- IV. Establishing a quality policy, ensuring all members know the vision and mission and its relation to the members' work.
- V. Establishing quality objectives to realise aims and intentions that are expressed in the quality policy to be realised in school operations.
- VI. Ensuring availability of human and material resources for achieving school objectives.
- VII. Measuring the organisation performance to monitor the fulfilment of policies.

According to Bergh (2004: 24), the appropriate application of ISO standards in education has both advantages and disadvantages.

2.3.5.1.1 Advantages of an ISO standard for education

- The promotion of high quality image with high visibility and credibility.
- A way of responding to external factors like pressure from staff and government.
- A method for developing a full quality assurance system which covers the whole organisation.
- The need to improve a number of specific activities to improve the organisation.

2.3.5.1.2 Disadvantages of an ISO standard for education

- Interpretation problems because ISO standards were initially written for the manufacturing industry.
- Insufficient relevance of certain components to the norm to schools.
- Inappropriate standardisation in use and application.
- Time consuming and costly.
- Risk of increased bureaucracy.
- Specific problems linked to particular types of education.

2.3.5.1.3 Principles of QMS in education

The principles of QMS in education according to IWA 2 (2007:3-4) include:

- i) Process approach in which a school should adopt a process when developing and implementing QMS which must be related to the goals of the school.
- ii) Customer focus which involves understanding core competence that include various enablers to ensure competitive advantage of the educational organisation. The enablers include technology, skill, expertise and school culture, which lead to learner performance improvement.
- iii) Total optimisation through systems management approach which enables each operational process to achieve its objectives from an administrative standpoint.
- iv) Visionary leadership that establishes vision, creates policy to realise vision and leads the educational organisation in responding promptly to change in the school environment.
- v) Factual approach to decision making ensures administrative decisions based on facts using a scientific approach.
- vi) Collaboration with partners, which is important to obtain optimal skill and creativity to improve learner academic achievement.

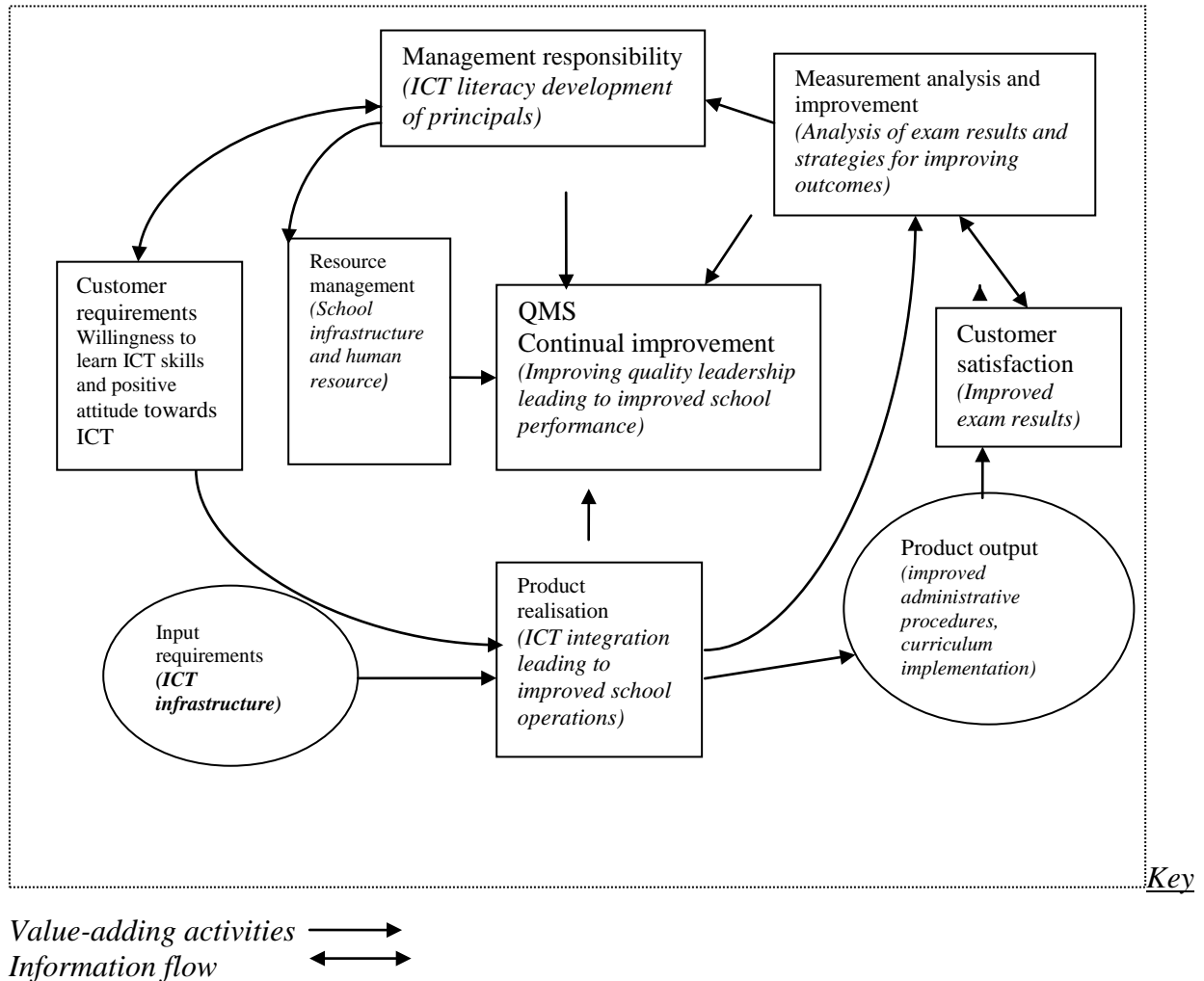
- vii) Involvement of people, which is the most effective and efficient way of an educational organisation to achieve its objectives to facilitate movement of people in schools and maximise their skill and creativity.
- viii) Continuous improvement of the educational organisation's learning process. This enables sustained growth in the external educational environment; which increases school innovation and creativity.
- ix) Creating learner value, which encourages learners to feel satisfied with the value they receive. Satisfaction measures determine the degree to which expectations are met; measurement results help schools to increase value by improving their processes for creating learner value.

These principles are represented in a QMS model and are illustrated in figure 2.4.

2.3.5.1.4 The QMS model

Figure 2.4 shows a model of a process-based approach and its interpretation to improve the quality of an organisation.

Figure 2.4: Interpretation of the Process-Based Quality Management Systems Model



Source: ISO 2008:vi



The model of ICT integration according to figure 2.4 shows that improving the quality of school leadership is continual and can lead to improved school performance.

2.3.5.1.5 The role of school leadership in implementing QMS

According to IWA 2 (2007:2), a school should define and manage the processes for the quality management system; and the processes related to the aim of the organisation should be included in the administrative duties which include: education design, curriculum development, education delivery and assessment of learning.

The school leadership should be familiar with ISO 9000 standards, the principles of continuous improvement as well as learner requirements and should be available to give advice on implementation of standards (IWA 2, 2007:5). The school leadership should use the quality policy for guiding and leading the decision-making involved in the continuous improvement of the educational processes and in curriculum implementation (ISO 9001, 2008:4). In addition, the quality policy should be documented and consistent with the professional educational standards, government rules and accreditation requirements (IWA 2, 2007:6). ICT literate principals who implement ICT strategies in education can be a step towards school leadership using continuous improvement to enhance school quality. According to Wango (2009: 88), the mission of quality assurance and standards in schools in Kenya is to establish, maintain and improve education standards. He adds that what is assessed in schools has a lot to do with school leadership, which in turn impacts on overall school performance.

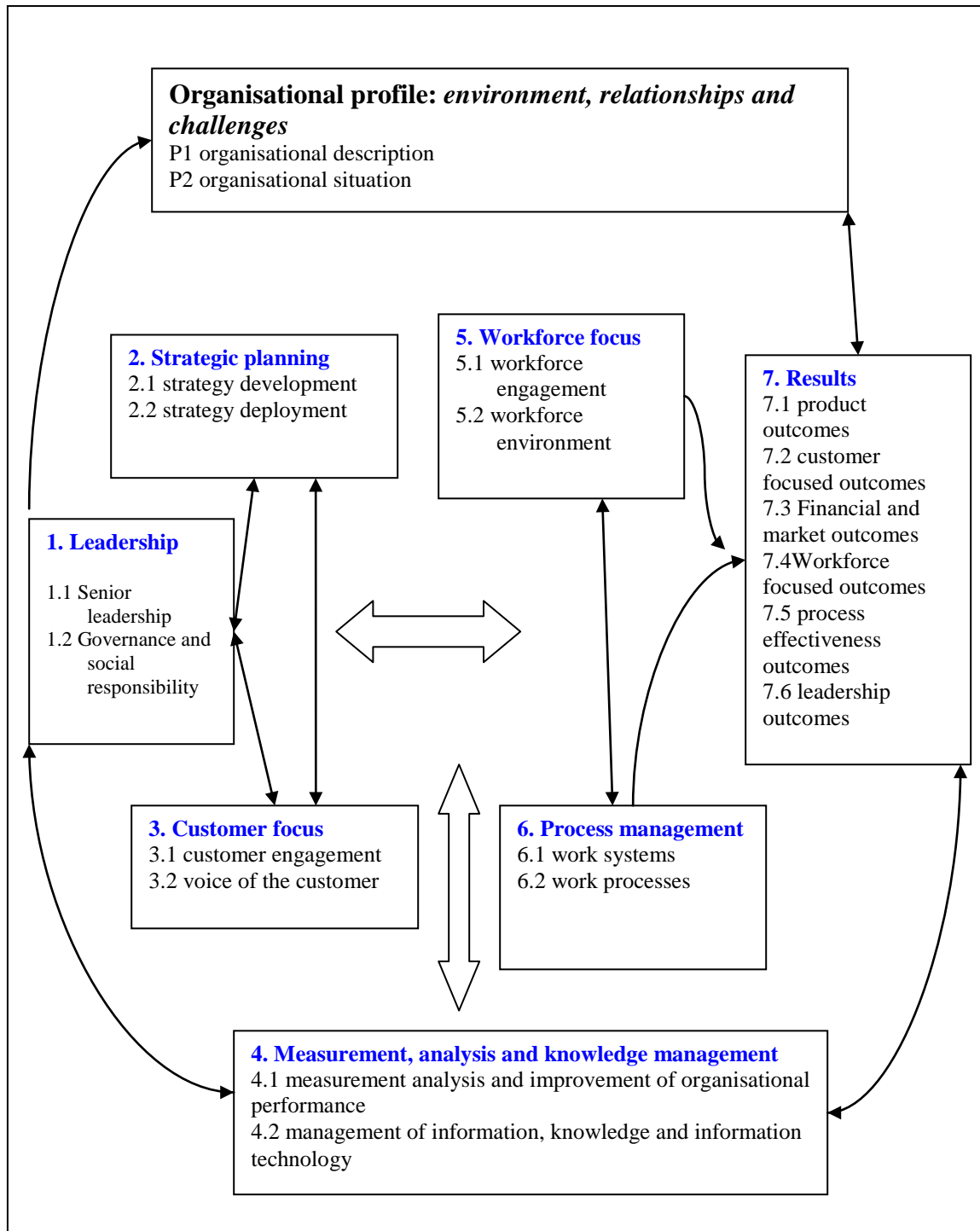
In order to improve on the educational service and QMS, school leadership should identify commitment to continuous improvement (ISO 9001, 2008:4-7) by:

- Identifying the specific ICT infrastructure, facilities, environment and equipment needed to support the teaching-learning processes. This is done by defining responsibilities and authorities to carry out bidding, purchase, receipt, storage, installation and maintenance activities. Such infrastructure includes software and hardware.
- Providing programmes for ensuring security of the school community.
- Providing human resources with information on their competence, awareness and training aligned with responsibility, authority and academic and administrative activities.
- Assessing the work environment to improve product output.
- Ensuring effective purchasing processes, evaluating purchase of educational services and compliance with regulatory requirements (*ibid.*:7).

2.3.5.2 The Performance Excellence Framework

The Performance Excellence Framework criteria lead to continuous performance improvement (Besterfield *et al.*, 2003: 192 – 194). According to Baldrige (2005: 13-26) and Solms (2006: 92), the criteria for the Performance Excellence Framework, fall into seven categories, namely: leadership, strategic planning, customer focus, measurement, analysis and knowledge management, workforce focus, process management and results. The revised 2009-2010 Baldrige Performance Excellence Framework is shown in figure 2.5.

Fig. 2.5: The Baldrige Performance Excellence Framework



Source: Baldrige Resources, 2009:1

2.3.5.2.1 Interpreting the Baldrige Performance Excellence Framework

2.3.5.2.1.1 Leadership

In visionary leadership, an organisation's senior leaders should set direction and create a customer focus, clear values and high expectations. As role models, leaders should ensure creation and achievement of performance excellence strategies. Leadership examines how senior executives guide and sustain the organisation. It also examines the organisation's governance and how the organisation addresses its ethical, legal and community responsibility.

2.3.5.2.1.2 Strategic planning

Strategic planning examines how the organisation develops strategic objectives and action plans; how the chosen strategic objectives and action plans are deployed and changed if circumstances require and how progress is measured.

2.3.5.2.1.3 Customer and market focus

Customer and market focus (in education: student, stakeholder and market focus) examines how the organisation determines requirement, expectations and preferences of customers and markets. It also examines how relationships with customers are built, determines the key factors that lead to customer acquisition, satisfaction, loyalty and retention and for organisational expansion and sustainability.

2.3.5.2.1.4 Measurement, analysis and knowledge management

Measurement, analysis and knowledge management examine how an organisation selects, gathers, analyses, manages and improves its data, information and knowledge assets. This also examines how an organisation reviews its performance.

2.3.5.2.1.5 Workforce or human resources focus

Human resources focus (in education: teachers, students and support staff) examines how an organisation's work systems and employee learning and motivation enable employees to develop and utilise their full potential in alignment with organisation's objectives, strategy and action plans.

2.3.5.2.1.6 Process management

Process management examines the key aspects of the organisation's process management, including key products, services and business processes for creating customer and organisational value with key support processes.

2.3.5.2.1.7 Business results

Business results (in education: school performance results) examine the organisation's performance and improvement in its key business areas. This will include product and service outcomes, customer satisfaction, financial and marketplace performance, human resource results, operational performance and leadership responsibility.

2.3.5.2.2 Interpreting the school Performance Excellence criteria

The Performance Excellence assessment criteria in this study are determined by using the new 2009-2010 Baldrige Framework for Performance Excellence and it shows that results of an organisation are essential (Baldrige Resources, 2009:1-10). In education results are considered the most important determinant of quality in a school. In the framework in figure 2.5, results are classified in six categories, namely: product outcomes, customer-focused outcomes, financial and market analysis, workforce-focused outcomes, process effectiveness outcomes and leadership outcomes. The totality of the six results categories is classified in this study as school performance. The assumption is that the level of school performance is enhanced by leadership quality. The categories are interpreted in the subsections that follow.

2.3.5.2.2.1 Product outcomes

Product outcomes determine the current levels and trends in key measures of performance important to students, teachers and other stakeholders. The study therefore considers the product outcomes in a school as examination results of students, which assist in comparing school performance in national examinations to other schools. In this study, it is assumed that benchmarking by investigating the ICT literacy of school principals to improve leadership quality can improve such examination results.

2.3.5.2.2.2 Student-focused outcomes

Student-focused outcomes summarise customer satisfaction, dissatisfaction and engagement by checking levels and measures of satisfaction and dissatisfaction by comparing with that of other schools. In this study, student-focused results are determined by measuring the level of student discipline, the nature of communication in the school community, the attitude towards the school and the drive towards academic work.

2.3.5.2.2.3 Workforce-focused outcomes

Workforce-focused outcomes in a school can be determined by considering capacity building and appropriate skills for the teaching and non-teaching staff. In this study, for example, workforce-focused outcomes can be determined by investigating the expertise of teachers in their subject areas, training of support staff in their work areas, access to ICT, and attitude of staff towards the school.

2.3.5.2.2.4 Process effectiveness outcomes

Process effectiveness outcomes measure the current indicators of operational performance of key work systems, for instance preparedness for disasters or emergencies. In a school system, process effectiveness can be done by investigating teachers' attendance to lessons, frequency of assessment tests, frequency of meetings to determine performance, integration of technology in curriculum implementation and organisation of study materials.

2.3.5.2.2.5 Financial and market outcomes

Financial and market analysis is determined by key measures in financial performance. In a school setting for example, the financial outcomes are checked by measuring how school expenditure runs according to the budget, checking the number of income generating activities and the frequency at which students are sent home for school fees. Market results can be determined by checking the trend in student enrolment.

2.3.5.2.2.6 Leadership and social responsibility

Leadership outcomes involve organisation of key governance and senior leadership with evidence of strategic plan accomplishments, fiscal accountability, legal compliance and social responsibility. In this study, leadership outcomes are determined by investigating the existence of a strategic plan, accessibility of the school principal to both staff and students, funding of staff for in-service training, use of appraisal procedures to reward staff, a written code of ethics for the school and ability to lead transformation.

2.3.6 Determinants of school performance in Kenya

According to Wango (2009: 108-109), the assessment of schools in Kenya for quality measures performance in terms of:

- i) academic achievement through examination results

- ii) number of students who enrol at universities and colleges
- iii) student and staff discipline
- iv) curriculum implementation through schemes of work, lesson notes and classroom instruction
- v) learner environment, for instance, gender issues, environmental conservation and general life skills.
- vi) trends in school enrolment

In this study, the Performance Excellence Framework and aforementioned determinants of performance measures are combined and customised in measuring school performance in the Western province of Kenya. The school performance level is determined using questionnaire 2 (Appendix D2) on a Likert-type scale as Strongly Disagree=1 Disagree =2, Undecided =3, Agree =4 and Strongly Agree = 5. The school performance level was then determined by converting responses to a performance index as Poor =1, Average =2 and Good= 3.

2.4 CONCLUSION

This chapter has indicated that organisational change management is essential for ICT integration. Planned change is necessary for improving school performance. As change agents, school principals need ICT literacy to enable them to integrate technology in school leadership. The QMS model can provide a framework for ICT integration in school leadership and benchmarking ICT literacy in school leadership can enhance the level of performance. The Baldrige Performance Excellence Framework provides a guideline for school performance assessment criteria for this study. The chapter that follows discusses the nature of ICT literacy and its relevance to improving school performance.

CHAPTER THREE

INFORMATION AND COMMUNICATION TECHNOLOGY (ICT)

3.1 INTRODUCTION

This chapter provides the findings of the literature review on ICT literacy from books, journals, government documents and conference papers. It reviews the meaning of ICT and the history of ICT in education. Although the purpose of this study is to ascertain the ICT literacy of secondary school principals in the Western province of Kenya, the literature review creates the context for discussion on the meaning and concept of ICT literacy, socio-demographic factors influencing ICT literacy, strategies for developing ICT literacy and challenges facing the development of ICT literacy.

3.2 INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) LITERACY

3.2.1 The meaning of ICT

Pernia (2008:11) defines ICTs as technologies used to communicate in order to create, manage and distribute information. She adds that a broad definition of ICTs includes computers, the Internet, telephone, television, radio and audio-visual equipment. She further explains that ICT is any device and application used to access, manage, integrate, evaluate, create and communicate information and knowledge. Digital technology is included in this definition as services and applications used for communication and information processing functions associated with these devices (Amara, 2006:2). According to the Education Testing Service (ETS, 2002:16-17), the International Literacy Panel regards ICT as combining Information Technology (IT) and telecommunications. The panel further explains that IT is the electronic display, processing and storage of information, but not necessarily the transmission of the information.

Onunga and Shah (2005:110) argue that digital technology reflects hardware and software products, communication tools and products with services used to transmit information. The term is meant to be as inclusive as possible to reflect the breadth of hardware, software and

infrastructure that make up ICT (Pernia, 2008:11). According to Chemwa and Mburu (2007:1), ICT hardware includes electricity infrastructure, desktop computer, laptop computer, CD drive, printer, scanner, telephone (mobile or landline) and projector. Onunga and Shah (2005:113-114) define software as detailed instructions called programmes and data that enable the hardware to perform its tasks at high speed. They further classify computer software as system and application software. They outline that system software, which manages computer operations, includes the operating system of the computer, a compiler that translates programs and utility programs such as back up. In addition, the authors mention that application software handles the needs of the end user to solve specific problems; examples include software packages that can be used in school administration and related tasks. Ferrigan (2007:2) gives examples of ICT application software as word processing, spreadsheets, databases, e-mail, the Internet and presentation software, which enhance the quality of leader-worker interactions. In this study, ICT is therefore defined as a combination of ICT infrastructure which includes hardware and application software and networks that connect them.

3.2.2 The history of ICT in education

The first computer was the ENIAC (Electronic Numeric integrator and Computer), which was completed in 1946 (Besterfield *et al.*, 2003:223). During the information age that followed, the growth in information and knowledge and the evolution of technologies that make information and knowledge growth possible has become increasingly faster (Pernia, 2008:13). Since hardware and software have developed over several years, the dates given in Table 3.1 are only a guide (Besterfield *et al.*, 2003: 224).

Table 3.1 History of Information Technology

Timeline	Machine	Application
1946-1963	Vacuum tube with input by punch cards or magnetic tape	Scientific and engineering
1964-1976	Distributed access to mainframe. Compatible models	Accounting, inventory and business transactions.
1977-1984	Mid-range computers with user-friendly interfaces	Users involved in system development.
1985-1996	Personal computers, local area networks	Desktop systems with word processors.
1997-future	Wireless technology. Internet as primary platform	E-mail, electronic commerce systems.

Source: Besterfield *et al.*, 2003: 224)

The conceptual and planning work related to the implementation of ICT in schools goes back in history to the early 1980s while the increased emphasis on the holistic incorporation of technology into educational systems began during the 1990s (Baruch & Mioduser, 2005:202 – 203). This is supported by Feldner (2003:22) who asserts that computer technology entered schools with the desktop computer in the 1980s. He adds that by 1985 market forces had been significant in the education sector; making policy formulation in the education sector to have a business footing. This is through devolution of budgetary control to schools and the impact of a business approach in schools (Coulton, 2006:3). Since then, significant national efforts have been made in many countries to plan the implementation of ICT and to allocate the required government funds. As a result, in the last decade, an increasing number of countries have been promoting as explicit national policies, the incorporation of ICT into their educational systems, installing computer networks in schools, connecting them to the Internet and training ICT-oriented teachers (Volman, Van Eck, Heemskerk & Kuiper, 2005: 41).

Special attention has been granted to the process of diffusion of innovative ICT practices in all aspects of school life, including the curriculum and administration (Baruch & Mioduser, 2005: 204). They add that in recent years major steps have been taken in many countries to supply schools with an ICT infrastructure hoping that technology will improve the quality of school

performance. In correspondence to these steps by most governments, this study is focused on investigating the role of ICT literacy in improving school leadership quality and how the leadership can influence school performance. The section that follows covers the nature of ICT literacy in the education sector.

3.3 ICT LITERACY

3.3.1 The concept of ICT literacy

ICT literacy skills comprise a 21st century form of literacy, in which research and communication of information via digital technology are as important as reading and writing were in earlier centuries (Katz, 2008: 50). Sometime in 2001, the Educational Testing Service (ETS) convened an international panel which comprised of academics, development specialists and telecommunications experts representing the governmental and private sectors to study the growing importance of existing and emerging ICT (Katz & Macklin, 2006: 51; Pernia, 2008:11). The international panel defines ICT literacy as the ability to use digital technology, communications tools and networks to access, manage, integrate, evaluate and create information in order to function in a knowledge-driven society (Kenney, 2006:1).

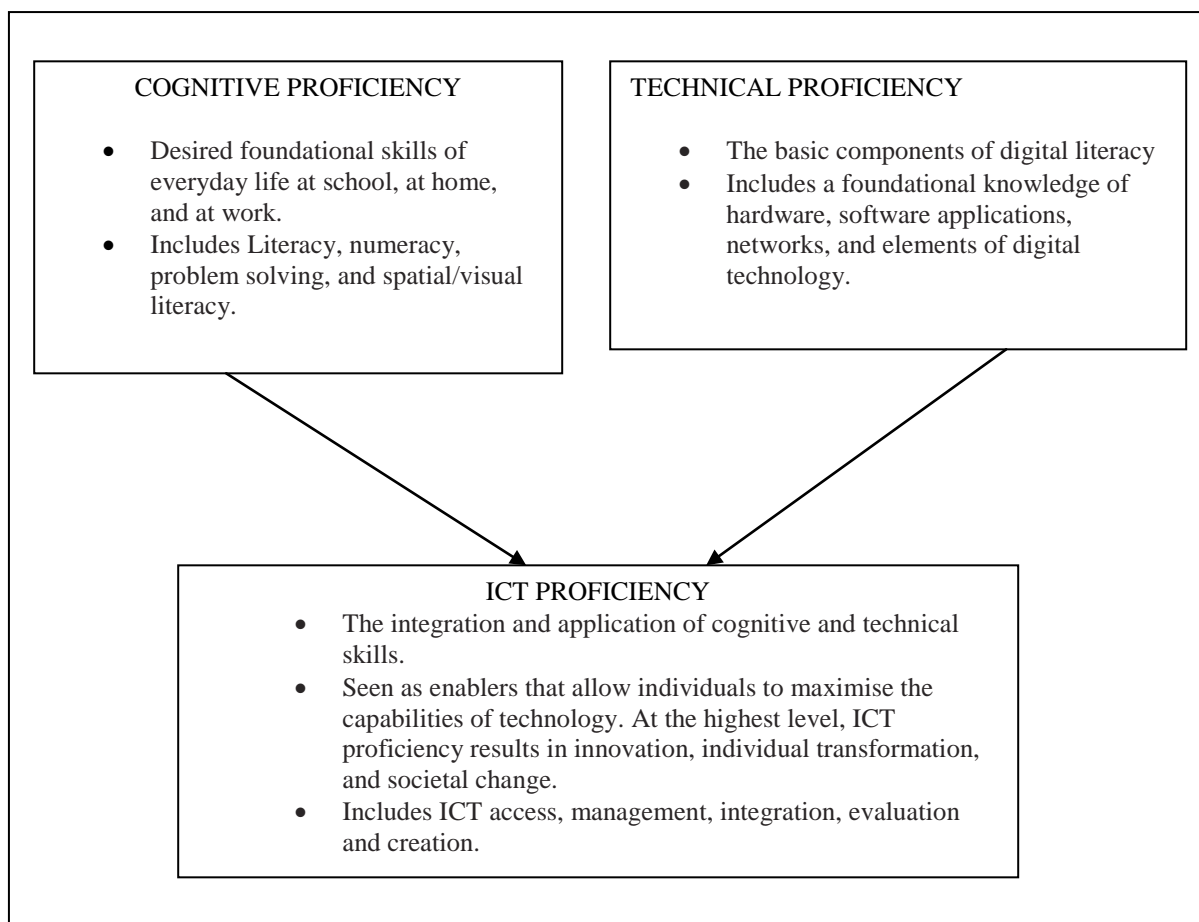
Wijaya and Sunrendro (2007:2) describe the concept of ICT literacy to consist of the terms ‘ICT’ and ‘literacy’. They further explain that ICT literacy is a bridge between technical literacy and information literacy. In technical literacy, one learns basic skills in databases, word processing and data presentation; while information literacy is access, evaluation and use of information by means of technology. This is in support of the International Literacy Panel’s statement that the concept of ICT literacy involves three proficiencies outlined in (ETS, 2002:14), namely:

- a) Cognitive proficiency, which is the desired foundational skills of everyday life at school, at home, and at work. Literacy, numeracy, problem solving and spatial/visual literacy demonstrate these proficiencies.
- b) Technical proficiency, which involves the basic components of digital literacy. It includes a foundational knowledge of hardware, software applications, networks and elements of digital technology.

- c) ICT proficiency is the integration and application of cognitive and technical skills. ICT proficiencies are seen as enablers that allow individuals to maximise the capabilities of technology. At the highest level, ICT proficiency results in innovation, individual transformation and societal change.

The relationship between these proficiencies is as presented in figure 3.1.

Figure 3.1: The relationship of ICT literacy proficiencies



Source: ETS (2002:16)



As indicated in figure 3.1, ICT proficiency includes both cognitive and technical proficiencies. While cognitive and technical proficiencies are both necessary components of ICT literacy, each represents independent domains in which the associated knowledge and skills interact to

influence ICT literacy. These cognitive skills include general literacy, such as reading and numeracy as well as critical thinking and problem solving. Without such skills, the international panel believes that true ICT literacy cannot be attained. While ICT with its immense capacity to present, access and manage information is good, there must be a balance between the need for cognitive skills, literacy and knowledge and what the technology can achieve by itself (ETS, 2002:5).

According to ETS (2002:5), the International Literacy Panel views ICT literacy as a continuum of skills, abilities and mastery of technical skills and knowledge. ICT literacy is defined as the ability to use digital technology, communications tools and networks to access, manage, integrate, evaluate and create information in order to function in a knowledge society (*ibid.*, 2002:3-13). The panel's definition reflects the notion of ICT literacy as a continuum, which allows the measurement of various aspects of literacy, from daily-life skills to the transformative benefits of ICT proficiency. This definition indicates five components of ICT literacy that represent a set of skills and knowledge presented in a sequence that suggests increasing cognitive complexity as ICT access, management, integration, evaluation and creation. Pernia (2008:12) confirms that the seven ICT proficiencies identified by ETS echo the increasing complexity of abilities including:

Define: Using ICT tools to identify and appropriately represent an information need.

Access: Knowing about and knowing how to collect and/or retrieve information in digital environments; also the ability to develop a search strategy to locate information within a database.

Manage: Organising information into existing classification schemes.

Evaluate: Reflecting to make judgments about the quality, relevance, usefulness, efficiency, authority, bias and time of the information.

Integrate: Interpreting, summarising, drawing conclusions, comparing and contrasting information from multiple digital sources.

Create: Generating new information and knowledge by adapting, applying, designing, inventing, or representing information in ICT environments.

Communicate: Conveying information and knowledge to various individuals and groups.

These proficiencies when combined make up ICT literacy and in this study, they are operationalised to mean access to ICT facilities, level of knowledge of ICT and the application of the ICT in school leadership functions. According to Murray (2005:3), ICT literacy is the access, management, integration, evaluation, creation and communication of ICT knowledge to other people. Hence the term ICT means hardware, application software and technology networks. Amara (2006:4) reports from a survey that ICT skills are not the ability to teach ICT or use it in subject teaching, but an ICT skills test ensures that one knows the way around a computer, the desktop and a variety of ICT common applications. However, there is currently no commonly-adopted definition of ICT literacy (Veenhof *et al.* (2005:5). For purposes of this study, only a few common hardware and application software were considered because they are relevant as ICT literacy prerequisites for school administrative purposes.

3.3.2 ICT literacy dimensions

There are several dimensions to ICT literacy such as that movement from one dimension to the next represents an increase or improvement in ICT-related proficiencies or competencies (Pernia, 2008:13). These are summarised in Table 3.2.

Table 3.2: ICT literacy dimensions: Conceptual labels and descriptions

Dimensions	Conceptual Label	Description
Access and knowledge	Foundational knowledge	Awareness of technologies and appreciation of their relevance
Skills	Technical skills	Use of technology for information and knowledge encompassing skills or abilities to access, retrieve, store, manage, integrate, evaluate, create and communicate information and knowledge, and participate in networks via the Internet.
Attitude	Critical assessment skills	Understanding that ICT acquisition and use impact on personal and social development, including perception of values and responsibilities, communication practices and other behaviour. Social and ethical competencies develop as a result of this critical assessment and reflection.

Source: Pernia (2008:13)

Within the scope of this research, ICT literacy differentiates between three major dimensions: one pertains to access to ICT facilities and knowledge of technology, the second to skills relevant to using the technology, and the third to attitudes accruing from critical reflection on technology use. On this basis, the study considers the dimensions grouped in three categories as investigated in questionnaire 1 (Appendix D1) namely: ICT access, ICT knowledge and ICT application in school leadership functions. For purposes of the research objectives, the study discusses the relationship of each of the categories with school performance.

3.3.2.1 ICT access

3.3.2.1.1 *The meaning of ICT access*

Pernia (2008:14) reports that the access dimension of ICT is characterised by a user's awareness of ICT and availability and the relevance of these ICT in both her/his personal and professional life. Access to digital content includes user accounts, personal file storage and communication tools such as e-mail and discussion forums (*ibid.*: 9). It is explained further that these services include network accounts, network-based file storage, access to e-mail, shared folders for learning and teaching materials. In this study, ICT access means awareness and availability in terms of acquisition of hardware and software. Awareness and acquisition state is that condition wherein the person becomes aware and conscious of the technology, analyses its significance, reflects on its value and subsequently, desires and decides on skills (*ibid.* :17). She adds that, in the case of developing countries, the levels of ICT literacy are not all applicable because the levels of ICT availability in these countries vary. The ICT facilities considered in this research are similar to those in a study done in a West England school where access to word-processing, spreadsheets, and databases, Internet/e-mail and PowerPoint among teachers was considered (Selwood *et al.*, 2003: 142). Similarly the current study considers:

Hardware

1. Electricity infrastructure
2. Computer
3. Printer
4. Scanner
5. Internet/e-mail infrastructure
7. School telephone
8. Digital/video camera
9. Fax machine
10. Copier
11. Surveillance camera

12. Projector

Software

1. Word processing
2. Spreadsheets
3. Databases
4. PowerPoint
5. Internet/e-mail

3.3.2.1.2 The relationship between ICT access and performance

The importance of access to digital/video cameras, printers, scanners, fax machines, copiers and projectors in contributing to performance in educational institutions cannot be ignored (Mahmud & Ismail, 2008:4). Selwood *et al.* (2003:63) assert that empowering school leaders with skills in ICT would allow them to access information that is otherwise not easily available. In addition, the increased access of school leadership to ICT has a direct impact on student achievement (Valle, 2007:1). Cheung and Atjonen (2006: 185) suggest that the success of ICT integration in schools depends on proactive school leaders who will make ICT access possible and ensure effective implementation in the curriculum.

3.3.2.2 ICT knowledge

3.3.2.2.1 The meaning of ICT knowledge

Knowledge in ICT includes the training one receives to use available ICT facilities (Chemwa & Mburu, 2007:1). ICT literacy requires formal or informal training in basic skills such as the use of hardware and the application software (Ferrigan, 2007:20). For instance in this study, a person is identified as computer literate if he or she has the ability to perform basic ICT operations; the frequency of their use as stated in items 7 and 8 of questionnaire 1 (Appendix D1) also apply.

On the other hand, knowledge is a feature of the interaction between the information supplied through ICT and the user of such information (Pernia, 2008:21; Amara, 2006:4). Developing

foundational knowledge should be essentially about creating awareness of ICT and its nature (Pernia, 2008:13). She outlines the key competencies that can be expected of individuals who have completed a foundational knowledge course on ICT as follows:

- Familiarity with hardware like mobile phones, computers, Internet and other ICTs
- Ability to identify ICTs.
- Appreciation of actual and potential functions of these technologies in everyday life.
- Understanding basic features and uses of ICT (for instance, mobile phones; voice calls and SMS; computers: word processing, spreadsheet, database, information storage; Internet: web browsing, e-mail and instant messaging).

In this study, the knowledge dimension is considered by investigating a principals' ability to use ICT facilities in specified leadership tasks and the frequency of use of ICT facilities. The ability to use ICT facilities involves investigating the skills dimension of principals and often results from experience with the technologies (Amara, 2006:4). For many, the abilities "to retrieve, assess, store, produce, present and exchange information, and to communicate and participate in networks via the Internet" are hallmarks of an ICT-literate individual (Pernia, 2008:14). Technical skills training ensures that an individual is proficient in the various applications of ICT, which include searching and accessing information; collecting and organising data, integrating and interpreting information from multiple sources, assessing validity and reliability of information; and generating new information (*ibid.*:15-16). She adds that such technical skills include:

- Ability to use ICT features and applications of mobile phones, cameras, video recorders and players, voice recorders, music players, multi-media services, word processing, spreadsheets, presentation software, infrared, Bluetooth, and Internet connectivity; for computers: word processing, spreadsheet, database, information storage; for Internet: web browsing, e-mail, and instant messaging.
- Ability to access and search a website for example, log on to the Internet, use search engines, and refine search using keywords.

- Ability to use Internet-based services by being able to create an account, compose e-mail, attach and download files, participate in discussion for social networking sites and create blogs.
- Ability to collect and process electronic data for immediate or later use by being able to create a database, organise, store and filter out irrelevant data.
- Ability to convert data into graphic presentation and other visual formats.
- Using ICT to support critical thinking, creativity and innovation for educational, work-related and leisure purposes. For example, one should be able to make the most of multi-media information and cross-reference information across websites.
- Frequency of use of ICT hardware and software.
- Period of experience with ICT facilities.

3.3.2.2.2 *The relationship between ICT knowledge and performance*

In Britain, BECTA (2008:3) reports that there is a significant relationship between frequency of ICT use in schools by teachers and general school performance. In Hong Kong it is a requirement that a school principal acquires ICT knowledge through formal ICT training (Cheung & Atjonen, 2006: 187). Such principals would enable technological change in their schools (*ibid.*: 3). According to Katz and Macklin (2006:53), many students in Purdue University believed that frequency use of ICT had influenced their ICT skills which eventually impacted on their academic achievement. In support of this, ICT integration in Australian schools had increased due to the ability to use and frequency of ICT use by teachers (2005: 12).

3.3.2.3 ICT application

3.3.2.3.1 *The meaning of ICT application*

Kenney (2006:1) describes ICT application as the ability to use technology as a tool to research, organise, evaluate and communicate information. Amara (2006:4), on the other hand, sees the use of computers as the extent to which teachers use ICT for teaching and it includes the use of multimedia projectors and overhead projectors for teaching and use of mobile phones. Pernia

(2008:4) notes that not surprisingly, the extent of ICT use is generally consistent with the level of economic development. She adds that ICT integration also involves actual application of ICT in administrative work and it means applying computer and Internet technology to enhance the quality of teaching and learning.

ICT foundation skills for school administrators, teachers and students should include file management, word processing, spreadsheets, e-mail and Internet skills (Selwood *et al.*, 2003: 54). The continued application of ICT increases and deepens the user's critical reading of information and knowledge that is accessed, managed, integrated, created, and communication through ICT (Pernia,2008:15). In this study, ICT integration is determined by investigating how principals apply ICT in their school leadership functions. These leadership functions are the administrative roles they play in schools as stipulated by the ministry of education in Kenya, including monitoring the organisation of the approved school curriculum, control of school finance and stores, management of human resources and correspondence with stakeholders. These are indicated in item 10 of questionnaire 1 (Appendix D1).

3.3.2.3.2 The relationship between ICT application and performance

In their report Veenhof *et al.* (2005:6-7) reveal that some recent studies have addressed relationships between ICT use and academic performance among students. The findings are mixed with studies showing positive, negative and neutral relationships between specific types of ICT use and student performance. A review of a research in Italy suggests that it is not merely the availability of ICT, but rather the quality and type of ICT application that is a key factor in performance in educational institutions (Borghans & Ter Weel, 2004:87). ICT integration had an impact on school performance and particularly student achievement in some Canadian schools (Ponte *et al.*, 2007:112).

3.3.2.3.3 Advantages of ICT application in school management

According to Wango (2009:238-239), computers integrated in school operations have advantages which include:

- i. Presentation: Work is legible and looks presentable. For example, class lists, schemes of work and classroom tests.
- ii. Easy access: This also allows more copies to be made available. For example, making report cards and newsletters.
- iii. Extended writing: documents can be easily redrafted to improve structure, expression and accuracy using the cut and paste facility.
- iv. Storage: Massive amounts of data concerning students, workers, examination results, schemes of work, photographs of school functions and letters can be easily stored on a computer.
- v. Simplicity: A simple programme can do a large amount of work like typing, editing a document, accounting, analysis of examination results and grouping students by type of class or hostel.
- vi. The Internet: This is the fastest form of communication worldwide where the school community can access information ranging from culture, history, and definition of terms.

3.3.2.3.4 Disadvantages of using ICT in school management

- i. Lack of teacher knowledge: Most teachers do not know to use computers and the workload of secretaries to do typing and editing is increased.
- ii. Expensive: Endless printing increases the cost of paper and ink to schools.
- iii. Drowning in information: The use of the Internet has encouraged the downloading of massive amounts of data and sometimes this is not used.
- iv. Big losses: In case of careless handling of digital equipment a lot of important data can be lost. For example, a broken flash disk can lose files of all school data.
- v. Lack of privacy: Important school information can leak to strangers who can access storage media like computer main memory, copier and flash drives.

3.3.3 Measuring ICT literacy

While progress has been made in properly situating ICT skills within the overall skills continuum, ICT skills have eluded measurement (ETS, 2002:6). However, Katz and Tannenbaum (2008:i-vi) document a standard-setting report to determine the recommended minimum score needed for the core assessment at a foundational level of ICT literacy skills. Previously the skills assessments test had been formed by the national Forum on Information Literacy and this served as a certification board for ICT literacy standards. Following a modified, extended method and a counterbalanced design, two independent panels converged on recommended scores corresponding to the foundational levels: 165 (on a scale of 0-300) for the core Internet skills (iSkills) assessment. In designing ETS iSkills assessment, librarians and information literacy experts collaborated to produce a measure of ICT literacy, which has skills that arise from technical environments. The reporting scale for core iSkills assessment ranges from 0 to 300, calibrated to a mean of 150 and a standard deviation of 35. The panel therefore recommended a cut score of 165. In addition, Katz (2008: vi) reports that the iSkills Assessment Test can be used to measure the ICT skills of an individual.

Ferrigan (2007:1) states that if one wishes to qualify as a teacher, one must pass the computerised Qualified Teacher Status (QTS) skills tests in numeracy, literacy and ICT. The test which takes 35 minutes, also checks skills in areas like word processing, spreadsheets, databases, e-mail and the Internet and presentation software. He also states that in order to qualify as a teacher, one must pass the Computerised Qualified Teacher Status (QTS) skills test in literacy of ICT skills. The tests check skills in hardware and software (word-processing, spreadsheets, databases, e-mail, Internet, and in presentation software).

In a research report, David (2003:33-36) acknowledges that the Internet and Computing Core Certification (IC³) is an example of an international body for standardisation of ICT literacy courses. IC³, which was launched in February 2002, helps one learn and demonstrate Internet and digital literacy through a worldwide industry standard. Complex and rigorous evaluation processes have uniquely positioned IC³ as a set of measurable and global digital literacy standards. He also claims that IC³ is the first global Internet and computing literacy measurement

and the world's only true digital literacy standard. To become IC³ certified, one must pass the following three exams, which take less than an hour per exam to complete:

- i) Computing fundamentals which include computer hardware, computer software and use of the operating system.
- ii) Key applications, which include common program functions, word-processing functions, spreadsheet functions and presentation software functions.
- iii) Networks and the Internet which include e-mail, using the Internet, the impact of computing and the Internet on society.

On the basis of the ICT measurement standards, the measure of ICT literacy of secondary school principals in this study is determined where the aforementioned skills are incorporated. In the current study, ICT literacy is considered as the access to ICT facilities, knowledge of ICT and the ability to apply ICT in school leadership functions. This measurement is done by principals responding to Appendix D1) investigating their ICT literacy. The questionnaire is on a Likert-type scale through ranking of responses, where the lowest rank means poor ICT literacy skills and the highest rank score means good ICT literacy skills. The form of investigation using a Likert-type scale is similar to one done in Spain on ICT literacy of teachers (Selwood *et al.*, 2003:160).

3.3.4 Factors influencing ICT literacy development

The report of Veenhof *et al.* (2005:4) reveals that in Canada many other factors are strongly associated with an individual's ICT use: age, gender, educational attainment and level of literacy proficiency help predict a respondent who is a "high-intensity" computer user. In this study, the ICT literacy level is assumed to be influenced by socio-demographic factors, which include gender, age, education levels, level of ICT training, period of experience in using ICT and the distance of the school from the nearest town. This section of the study evaluates some of the factors.

3.3.4.1 Gender

The introduction of ICT into the educational sector created new social stereotypes and gender inequalities (Markauskaite, 2005:445). She adds that since the invention of the computer, ICT-related activities have been viewed as a male domain. Volman and Eck (2001:614) argue that old stereotypic gender differences in attitudes and achievements that previously existed in mathematics and technological disciplines were extrapolated to the area of ICT. Several research reviews state that males are more interested in ICT than females, they are more frequent users of computers, have more positive attitudes about computers and consequently outperform females in ICT literacy (Shapka & Ferrari, 2003:321). They further admit that a number of recent studies evidenced that ICT-related differences between females and males lessen mainly in the access to ICT and basic computer skills.

Volman and Eck (2001:625) reveal that female teachers tend to be more anxious, less experienced and less confident about their ICT competencies and it is less likely that they will apply computers for various teaching and learning purposes. According to Veenhof *et al.* (2005:4), the findings for ICT use by gender are mixed. They find that in the European countries for example Italy, Norway and Switzerland, clear gender differences emerge but no such gap exists in North America. Although it is difficult to detect precisely what causes gender differences, the variation can influence the ICT literacy of an individual (Kuhlemeier & Hemker, 2007: 470). The current study investigated the influence of gender on ICT literacy level of school principals in the Western province of Kenya.

3.3.4.2 Age

In a study done in Canada it was shown that older workers have fewer ICT skills and that this may result in a deterioration of their position in the labour force (Veenhof *et al.*, 2005: 21-23). They add that a 'generation gap' with respect to exposure to computers and other ICTs may explain a reduced opportunity to learn ICT skills. They also report that young workers aged 25 and under are significantly more likely to grow up with a computer in the home than those aged 25 and above. They conclude that a significant decline in ICT use is found to occur after age 45 in several areas of the work force.

Kirsch and Lennon (2005:113) add that as a result, there are fears of a growing mismatch between the ICT skills of older workers and those skills that are in demand. A lack of skills may cause a slowdown in the introduction of ICT in jobs filled by older workers, reducing an organisation's productivity growth and competitiveness (Volman & Eck, 2001:625). They further comment that to date there has been no firm evidence of such a competitive advantage and a direct added advantage of ICT skills of older workers in the labour market.

3.3.4.3 Education level

Veenhof *et al.* (2005: 24) observe that an individual may master certain skills, for example the ability to produce tables and graphs using spreadsheet software. Since ICT skills are associated with the process of continuous learning, learners often incorporate several methods to learn necessary computer skills, either formally or informally and seldom rely on only one method of learning (Borghans & Ter Weel, 2004: 88). Formal methods include courses sponsored by one employer, while less formal methods may include help from colleagues or family, the use of manuals and books, observing others, or self-teaching through trial and error (*ibid.*: 89).

Veenhof *et al.* (2005: 7) observe that individuals with less than upper-secondary education are significantly less likely to use computers for a range of purposes and this pattern is most pronounced in Italy and Bermuda. In addition, scales that measure individuals' use of computers and the Internet and attitudes toward computers, tend to increase with the literacy proficiency of individuals (Borghans & Ter Weel, 2004:92).

At the same time, the role of formal education in building a workforce equipped with ICT skills is currently the subject of debate (Veenhof *et al.*, 2005:17). While formal education such as training at colleges and universities may be an effective means to reach the future workforce, the rapid nature of technological change and developments in the world of ICTs emphasise the need for lifelong learning (Kirsch & Lennon, 2005:93). Nonetheless, education can be an important means to develop at least basic ICT skills and the relatively recent introduction of ICT in schools may mean that as time goes by, more people are likely to use ICT (Veenhof *et al.*, 2005:18; Mioduser, Nachmias, Tubin, & Forkosh-Baruch, 2003:24). According to the National Centre on

Adult Literacy Technical Report (2005:2-3) one study in Britain found that people with more education have higher ICT skills, but suggests that more educated people tend to work with computers, making it difficult to differentiate whether education or employment has the biggest impact on ICT skill levels.

According to Veenhof *et al.* (2005:26), more effort is needed in future to measure ICT skills directly and gain insight into their development and evolution. For example, differences in ICT use and familiarity by education level in 2003 were biggest in Bermuda and Italy and slightly smaller in Canada, the United States, Norway and Switzerland. The current study investigated the influence of education level on the level of ICT literacy of a secondary school principal.

3.3.4.4 *Level of ICT training*

The confidence and competence of principals in the use of ICT are key determinants of the effective use of ICT in administrative duties (Amara 2006:2). Markauskaite (2005: 447) reveals that many school principals have low levels of confidence and competence to enable them to make effective use of ICT in school leadership. School principals not only need formal training, but also sustained and ongoing support from their colleagues to help them learn how best to integrate technology into their administrative duties (Amara, 2006:4). However, Selwood *et al.* (2003:80) add that one of the main difficulties concerning the diffusion of innovative ICT-based administrative practices in schools is finding ways to engage school administrators in using the new technologies effectively. The level of ICT training measured low among secondary school staff in schools of West England (*ibid.*: 142).

3.3.4.5 *Period of experience with ICT*

Kirsch and Lennon (2005: 114) show that there is no statistically direct relationship between the ICT skills of more experienced workers and the less experienced workers. In Spain, familiarity with computers and years of experience with ICT correlate positively with levels of institutional management (Selwood *et al.*, 2003: 155).

3.3.4.6 *Proximity from a town centre*

Town schools in Australia were more networked to ICT facilities than those in rural areas (Selwood *et al.*, 2003: 68). They also report that teachers in rural areas had less ICT competence in using ICT facilities than their counterparts in towns (*ibid.*: 71). Based on this claim, the current study investigated the influence of the distance of a school from the nearest town on the ICT literacy of school principals.

3.3.4.7 *Government policy on ICT literacy*

Policy and planning are important in identifying the aims of using ICT in education and in determining priorities in allocating resources (Waema, 2002:9). He further points out that education authorities and the centres for which they are responsible have key tasks related to enabling, implementing and monitoring the use of ICT for learning and teaching. Pernia (2008:2-3) points out that countries rated low on appreciation of ICT have ICT policies that merely recognise the strategic role of ICT for growth and development. She further notes that while the availability of computers is limited, the cost of Internet is high and the ratio of computers to population is insufficient; she cites the example of Sri Lanka and the Pacific Islands. Countries rated high in appreciation of ICT have ICT policies that go beyond measures that support ICT initiatives, for instance Australia, Malaysia and Japan. These countries have a high economic status and provide adequate ICT resources to their people.

Governments should begin to include large-scale global assessments of ICT literacy, where education experts and researchers should conduct new public policy research with the data derived from these assessments (Towers & Oliver, 2000:7). This information can help policy makers, educators and industry as they attempt to broaden people's access to and fluency with new technologies. The International Literacy Panel strongly endorses the inclusion of ICT literacy measures in large-scale assessments at both the secondary school and adult level (ETS, 2002:9). The panel emphasises that government investments, education curricula and philanthropy should all be influenced by the data derived from these assessments.

Waema (2002:9) concludes that policy priorities should include:

- developing the use of video technology in secondary schools;
- equipping teaching areas in schools and educational centres with ICT;
- increasing use of computer rooms;
- developing further the virtual learning environment (VLE) in education institutions;
- rolling out community-based ICT provision.

3.3.5 Challenges facing ICT literacy development

There are several challenges to designing and implementing effective ICT literacy strategies (Katz & Macklin, 2006: 50). In a study done in West England, staff challenges included lack of time, lack of enough school resources, poor quality and quantity of ICT training. In this study, such challenges are outlined in the sub-sections that follow.

3.3.5.1 Financial constraints

Waema (2002:6) points out that duties and taxes are levied on ICT products while value-added tax (VAT) is levied on ICT services, making both expensive. Although many governments raise revenue through taxes, the investment in ICT literacy of school leaders in Kenya is minimal. He adds that at the same time, many public tertiary institutions charge market rates for all forms of training, including ICT, thus making the training unaffordable to most people. He also observes that the Kenya government is still one of the key agencies that funds ICT human resource development, making ICT literacy training a difficult task. Of concern, is the high current cost of communication due to high telecommunication tariffs in most countries like Kenya.

Waibodhi (2002:14-17) supports these views that in public sectors of most countries, lack of funding for ICT training has led to over-reliance on external donor funding. At the secondary school level there is inadequate government funding for ICT training of education administrators like principals. He further notes that non-competitive telecommunications infrastructure, policies and regulations impede connectivity and sustainability. While there are computers in schools, ICT use is in its infancy stage due to the high cost of technology, uneven access to such facilities

and limited connectivity (Pernia, 2008:4). She adds that in China for instance, the government has been giving much attention to the introduction and integration of ICT application in the education system. However, the efforts face challenges due to financial difficulties of providing ICT facilities. Selwood *et al.* (2003: 149) feel that expenditure on ICT resources should be significant and continuous.

3.3.5.1 Lack of ICT infrastructure

The ICT options paper in Kenya indicates that one of the main challenges facing ICT literacy development is limited access and the degree of disparity in infrastructure, especially electricity and telecommunications that exists between rural and urban areas in Kenya (MoE, 2005: 12). The report continues that getting computers into schools is relatively easy; keeping them working is a greater challenge. A myriad of problems ranging from electrical spikes, to viruses, dust, heat, and normal wear and tear can bring activity in a developing country computer lab to a screeching halt. Pernia (2008:10) reports that South Korea's problems in ICT literacy development revolve around issues of ICT infrastructure maintenance and best usage of ICT facilities like selection of what should be transmitted on the information superhighway.

Many countries globally, lack adequate human capacity in ICT and this is even more critical in African countries (Waibodhi, 2002:14) and in China where there is a shortage of ICT-skilled people (Pernia (2008:7). Waema (2002:6) raises doubts about the skills of personnel in ICT literacy training in the education sector, where, for example in Kenya, schools employ poorly trained ICT staff. He further observes:

In Kenya, for example, most of the high-end ICT training takes place in public institutions, but these institutions lose staff to the private sector who offers better salaries. The consequence of the high staff turnover is over-reliance on part-time and less qualified lecturers with its attendant quality implications. Schools are more prepared to recruit staff that are already trained rather than less qualified persons who can be trained, possibly due to inadequate funds or lack of awareness on the strategic importance of well-trained manpower.

3.3.5.3 Inappropriate ICT training curricula

According to Waema (2002:6-7), curricula providing ICT training ICT to people in developing countries like Kenya face challenges such as:

- i) Most curricula are oriented towards teaching the technical aspects of the technology and ignore the social and organisational aspects of ICT. Consequently, the graduates who eventually become leaders lack organisational and management skills and are therefore inadequately prepared to deal with the complexity of analysis, design and implementation of ICT in educational organisations.
- ii) Programmes for training ICT professionals are copied from economically developed countries with little modification to reflect the realities of industrial and development goals in individual countries. These training programmes need to be adapted to the local environment to reflect, among other things, the application environment, availability of resources and capabilities of existing training institutions.
- iii) The curricula are rarely modified. In some situations, they are still geared towards producing people with specific skills that do not match the demand of school organisation or reflect changes in technology. Training curricula and programmes for ICT professionals should change in anticipation of changes in ICT. The programs should be dynamic enough to accommodate emerging concepts such as the Internet technology.

3.3.5.4 Improper quality control

Waibodhi (2002:14) observes that most programs offered by the private sector usually are skills-oriented, but sometimes the quality, curricula and effectiveness of their programs are questionable. Pernia (2008: 9) gives an example of China, stating that the country has made great progress in ICT application in education; however, there is lack or insufficient high-quality ICT products and services. In Kenya for instance, lack of standards is exemplified by disparities in the duration of similar programmes offered by different institutions. Waema (2002:5) notes:

Students at Starehe Boys Centre, for instance take two years to complete a Diploma course in computer studies because of the strict academic regime that allows for only

three weeks recess in a year and a full day's teaching, compared to polytechnics where the same programme takes three years. There are also dissimilarities in entry requirements for similar programmes. Different institutions offering the Institute for Management of Information Systems (IMIS) Diploma have different entry requirements. Despite the disparities, most of these institutions have a high pass rate. There are also no standards in certificates and diplomas awarded for ICT training programs, with institutions offering their own diplomas and certificates for programmes that vary in content and duration.

3.3.5.5 Negative attitude towards ICT

Markauskaite (2005:447) notes that the intensity of ICT appreciation and use is directly influenced by individuals' attitudes. Reflecting a higher level of ICT literacy than the knowledge or skills dimensions, the attitude dimension represents the product and process of a person's critical assessment of the use of ICT for information and knowledge (Pernia, 2008:14). In order to consider the attitude dimension towards ICT, opinion on, interest in, the challenges and strategies of ICT literacy development should be considered, (Selwood *et al.*, 2003:79). Waibodhi (2002:14) argues that administrators may sometimes show resistance to technological change. In this study, this attitude dimension is considered by investigating principals' attitude towards ICT as a challenge they face in an attempt to be ICT literate.

3.3.5.6 Lack of interest in ICT

De Feo and Barnard (2005:282) agree that lack of interest may be due factors such as:

- Bureaucracy that includes organisational rules and red tape in applications of technology in administrative duties.
- Organisational mindsets which are the diverse value systems and conflicting beliefs about changes in technology.
- Organisational structure that involves rigid boundaries between stakeholders' functions and disciplines where there are no budgetary allocations for ICT development.

- Lack of required competencies in ICT and capabilities like project management of an ICT literacy program.
- Lack of adequate resources and rewards for being ICT literate.

3.3.5.7 Lack of enough technical support and maintenance

The level and quality of technical support is very important in maintaining the confidence of educators in the reliability of access to equipment and software (Towers & Oliver, 2000:7). They also observe that the level of ICT literacy of an individual is consequently affected because it is assumed that the availability of qualified technical staff impacts on ICT appreciation of administrators of educational institutions.

This section of the study has discussed possible challenges that face ICT literacy development in Kenya and other countries. The next section considers various strategies that can enhance ICT literacy development.

3.3.6 Strategies for ICT literacy development

Katz and Macklin (2006:50) are positive that educators who accept the challenges of learning ICT literacy skills must be prepared to find strategies to develop ICT skills and create an active environment to enhance ICT literacy development in the education sector. Governments worldwide recognise the role of ICT in national development (Waema 2002:4). The need to develop strategies depends on the nature of challenges faced and such strategies are explained in the sub-sections that follow.

3.3.6.1 ICT human capacity development

ICT human capacity development is an important strategy in enhancing ICT use in educational leadership and efforts to expand capacity for ICT education (Waibodhi, 2002:15). He adds that the abundance of ICT professionals in Africa may, with the right policy instruments, attract foreign investment for the industry as it has done in several Asian countries. This means that there will be a huge demand for ICT manpower in the coming years. There have been attempts of

human capacity-building in ICT in education with the support of NGOs and the private sector in Nepal and Philippines where education administrators receive ICT training (Pernia, 2008:7). In addition, in such countries 20% of the teachers and personnel for secondary schools have been trained for ICT literacy through a tele-education project. Developing countries like Kenya should be positioned to take a significant share of this global market in developing ICT literacy of educational leaders through capacity building (Waema, 2002:5). Waema suggests that ICT human capacity development can be done through expanding ICT skills in existing institutions without compromising quality.

Developing a policy on ICT literacy for practicing secondary school principals is essential; Hawkins (2002:40) emphasises that linking ICT and education efforts to broader education reforms is the key. He recognises that governments should make ICT literacy training compulsory for all people involved in school leadership to enable them exploit and develop new technologies that meet national development requirements. Waibodhi (2002:15) reveals that in Kenya, the Institute of Computer Science at the University of Nairobi has developed modular certificate and advanced certificate courses in computing studies. One of the target audiences for these courses is employees such as secondary school principals who need ICT literacy skills. They can take courses in ICT training colleges accredited by the university. These academic courses were developed to meet the following needs:

- Provide information technology literacy skills to a cross-section of target audience
- Standardise computing education at certificate level
- Open up ICT technology education to a wider cross-section of Kenyans

Waema (2002:6) outlines that ICT programmes and content should be characterised by:

- Appropriate mix of staff complement. This is largely due to the growing multi-disciplinary nature of ICT where staff should teach relevant content like school Management Information Systems. The social application aspect of ICT should receive more emphasis than the technical aspect.

- Dynamic curricula and programmes. Training curricula and programmes for ICT professionals should change in anticipation of changes in technology.
- Adequate supporting resources and facilities. There is a need to have adequate human capital with facilities like computers and literature, to improve the quality of ICT literacy training of educators.

In Mongolia, for example, the government offers retraining for its public servants using ICT in word processing, computer programming, desktop publishing and graphic design (Pernia, 2008:7). While computer literacy represents a start to ICT integration, the integration of computers and the Internet into broader school operations is essential. She also reports that in Malaysia, school principals and support staff receive ICT training and ICT training for women is free through the federal Ministry of Women and Family Development. In addition, Malaysian web surfers are increasingly turning to the net for information.

In developing human capacity, Pernia (2008:18) suggests the conducting of research studies to determine individual characteristics, such as: age and educational levels; needs, motivation, and uses for ICT; level of ICT competency; community characteristics and job opportunities that are available. She concludes that such research will ensure a match among learner needs, available training opportunities in formal, non-formal and informal education, training contexts and availability of work.

3.3.6.2 Structuring of ICT policy development and implementation

It is important for governments to set up national entities that champion the development and implementation of ICT policies and strategies (Hawkins, 2002:38). The establishment of an ICT literacy policy should be based on political consensus, a very important asset in ensuring continuity beyond five-year political plans (Waema, 2002:4). He also points out that in such a strategy there are three groups that should work in unison: all stakeholders; a small working unit of technical people to monitor the strategy and a linking mechanism with government information strategies.

Pernia (2008:10) reveals that in 2000 a survey showed that the Republic of South Korea appeared to have developed the best ICT potential and infrastructure in the world as a result of supportive government policies. The country has been successful in constructing a database for education, promoting e-learning, building a cyber education community and developing software to enhance ICT literacy development. Waema (2002:3) suggests that for Kenya a National Information and Communication Technology Council (NICTC) could be the apex body for providing broad guidelines and directives for human resource development in ICT. The body should be constituted under the office of the president. He also envisages that various experts, ministries, universities, industries, professional organisations, training institutes, business sectors and other relevant agencies are represented in the council. He finally reveals that in Kenya a cabinet paper has been prepared to set up a NICTC.

While encouraging ICT literacy in the education sector, Waema (2002:5-6) suggests that collaboration with government policies would enable:

- a) Preparing a vision statement that will energise the people, creating faith in them that ICT vitally aids personal and national growth.
- b) Formulating ICT policy and master plan and keeping these policies and strategies updated to enable developing countries to emerge as ICT giants in the 21st century.
- c) Developing an appropriate management programme and advising on the strategy's long-term sustainable implementation and resources.
- d) Developing a national capacity-building approach covering legal matters and institutional development, human resources development and community awareness.
- e) Incorporating a legal framework that is flexible and can easily adapt to change and negotiating with telecommunications operators and venture capital.

Hawkins (2002:40) notes that as wireless technologies continue to develop and become more ubiquitous, governments need to evaluate their spectrum allocation and licensing policies to ensure satellite connectivity options. This would allow for a broad range of choices for the connection of underserved areas of a given country. As confirmed by Waema (2002:5), many ministries of education around the world have made the commitment to computerise schools; few have developed coherent strategies to fully integrate the use of computers as tools in administrative duties.

Pernia (2008:11-12) suggests that the government policy should therefore focus on forming the next generation of educational leaders and training the practicing ones. She suggests that the education sector component of the national ICT policy and strategy should evolve in tandem with changes in education, technology and society. In addition, she feels that school leaders should be adequately ICT literate to integrate the new approaches into their administrative duties. The literacy program should be launched as a national campaign once the infrastructure is established. She advocates a ICT literacy drive where a large number of ICT trainers and teachers are needed. She concludes that training of school leaders in ICT should be made a government policy.

In the Philippines, modernisation of the Education Department has been launched to introduce modern technology in school management especially in public schools in underserved provinces (Pernia, 2005:4-7). Non-governmental organisations and the private sector give their support for the government thrust in improving ICT use in education. The organisations provide funding for acquiring computers, installing Internet connections and hands-on training in basic ICT literacy. The ICT literacy policy in Malaysia is supportive in promoting its use in education. In the country 75% to 90% of all schools have access to the Internet; a number of schools have their own websites; online portals for students and teachers have been established and all teachers are required by the government to take basic information courses.

3.3.6.3 Improving the quality of training programmes and their content

There is a need for the regulation of standards for quality training in which stakeholders look for methods to regulate the quality of training institutions (Hawkins, 2002:41). It is important that the process of developing and implementing standards be a continuous one, as both the technology and the functions it facilitates are constantly changing (Waema, 2002:4). He further recommends that professionals should develop standards in ICT literacy levels and qualifications of trainers for the various courses.

Pernia (2008:19) suggests in a framework for ICT literacy that stakeholders in government and the private sector particularly telecommunications companies and the business sector, may be invited to:

1. Provide insights, trends and data regarding prospects for ICT developments present and projected skills needed.
2. Develop fundamental knowledge competencies about technologies, hardware, software applications, and other elements of digital technology; deepen technical competencies; and stimulate critical thinking for responsible and ethical use of ICT.

3.3.6.4 Reducing the cost of ICT products and services

Waibodhi (2002:16) feels that reducing the cost of ICT products and services can be an effective ICT literacy development strategy. This can be done by encouraging private sector participation such as bank loans with low interest rates for the education sector and zero rating duties and taxes for ICT products and services in education. He also suggests that governments need to come up with incentives, such as tax holidays for those providing ICT services and zero-rating importation of teaching equipment and materials. This will enable the private sector to invest more in ICT literacy development (MoE, 2006:13).

Governments need to form strategic partnerships if they are to succeed in cost-sharing in ICT literacy development (Waema, 2002:5-7). For instance, some of the resources can be found by getting the community involved through an education tax. Reducing telecommunication tariffs is a precondition for the integrated use of new technologies in schools. Such technologies include the availability of adequate and suitable ICT infrastructure, like multimedia computers, peripheral equipment, software and telecommunication connections. Provision of low cost personal computers, low cost Internet connection and telephone lines are the basic requirements for such technology. In the Kenya National ICT Strategy (MoE, 2006a: 6-8) it is suggested that improvements in ICT infrastructure and resources to support learning and teaching have increased the potential of ICT for learning and teaching. Rapid development of effective infrastructure should be upgraded to switch-based distribution arrangements capable of delivering data and applications to the desktop in rural networks. A wide range of ICT equipment including programmable roaming devices, digital still and video cameras, laptop computers would allow greater flexibility in deployment of resources and wireless networks.

3.3.6.5 Pooling of resources to develop ICT infrastructure

Pernia (2008: 20) suggests that various sectors should be involved in lifelong learning as the framework for promoting ICT literacy. She notes that such sectors include the education ministry, public and private training institutions, telecommunications industry representatives, ICT service providers and the business community. She further suggests that the pooling of resources for ICT literacy development from the mentioned sectors can help to define the continuum of ICT literacy competencies, skills and abilities needed by citizens to cross the digital divide; she also suggests an ICT steering group to set create opportunities for optimal learning using data provided by the research and assessment activities for continued planning and action related to ICT literacy training.

As a way of expanding ICT infrastructure, Hawkins (2002:42-45) reports:

The most effective technology for connecting schools in developing countries is wireless. With the availability of high technology, it has been possible to offer distance education via Intranet and Internet. While getting schools wired to the Internet is the first step, a whole host of other factors need to be considered, ranging from teacher ICT literacy training to sustainability. Each district can be linked with central Very Small Aperture Terminal (VSAT). Using an Intranet and metropolitan area network system, computers may be used as televisions for tele-teaching, tele-learning and demonstration of different educational packages. The telecommunications infrastructure is so poor in many African countries, for instance, that fixed line dial-up connectivity may not be a viable solution. Developing country schools are now bypassing their local fixed line infrastructure and establishing wireless Internet access. The World Links program is now experimenting with wireless satellite or VSAT technology in rural areas in a wireless connectivity pilot to enhance human capacity development. Because reliable fixed line connectivity is still mostly limited to only urban areas in developing countries, wireless options can be attractive to rural and semi-urban communities.

To ensure sustainability of education training programmes for example, private telecoms may provide financial resources as part of their corporate social responsibility.

3.3.6.6 Formation of leadership networks

Pernia (2008: 8) reports that in the Republic of South Korea, teachers have shown initiative by creating study groups meeting for lectures and seminars in order to develop ICT educational materials. Vocational training in ICT for these groups is offered online. Wilding and Blackford (2006:3-4) add that with a range of expertise, experience and educational view points, such an initiative forms a network. They describe networks to be groups of relatively isolated schools linked to a close knit professional team; they demonstrate the impact of collaboration of school leadership on student learning and achievement as well as the professional growth and morale of staff. They work in partnership to benefit each other and the entire education system. Kenney (2006:2) suggests that an ICT literacy assessment test administered to a network of school leadership can assist school personnel in comparing their level of ICT skills and proficiency. It is also an effective way to use individual and government resources for ICT literacy in educational leadership.

3.3.7 The role of ICT literacy benchmarking in improving performance

Besterfield *et al.*, (2003: 207) describe benchmarking as the systematic search for best practices, innovative ideas and highly effective operating procedures. It is the process of borrowing ideas and adapting them to gain competitive advantage and a tool for continuous improvement and popular element for quality standards (Grant, 2001:11; Besterfield *et al.*, (2003: 209). They claim that benchmarking measures performance against that of best-in-class organisations; determines how the in-class achieves performance levels and uses the information as a basis for adaptive creativity and breakthrough performance.

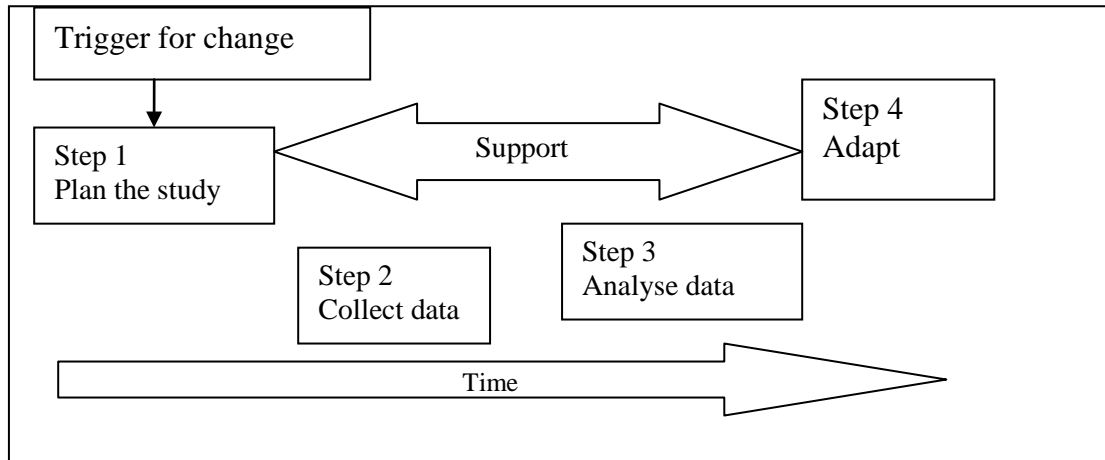
Besterfield *et al.* (2003: 210) add that performance improvement also involves use of technology, hence preparing managers for ICT literacy is benchmarking for leadership quality. The two key elements of benchmarking are:

- a) Measuring performance, which requires measuring units called metrics and are expressed numerically. The numbers achieved by the best in-class benchmark are the target. An organisation seeking improvement then plots its own performance against the target, and

- b) Managers' understanding of why their performance differs from other's; this helps managers organise their own improvement efforts. Benchmarking is about setting goals and objectives by improving processes.

The main steps in benchmarking are shown in the illustration in fig. 3.2.

Figure 3.2: Steps in benchmarking



Source: Grant (2001:12)

The illustration is one of the justifications for this study to investigate ICT literacy of school principals because it is assumed that ICT literacy development is a response to technological change. The literacy then improves school leadership quality through ICT integration and quality leadership enhances school performance. The first rule of any technology used in an organisation is that automation applied to an efficient operation will improve the efficiency (Besterfield *et al.*, 2003: 233). Wango (2009: 21) explains that principals should be accountable for students' results by understanding how technological change and transition affects organisations.

ICT literacy provides a benchmark for measuring leadership quality and it plays an essential role in the following quality functions (Besterfield *et al.*, 2003: 224-226):

- a) Data collection for inventory control, purchasing, design and production control. In a school setting, sources of data can be examination results and writing of inspection reports.

- b) Data analysis, reduction and reporting where data can be analysed at intervals or cumulatively.
- c) Statistical analysis which uses established software for data analysis. For instance, using Excel to present data that can measure organisational quality performance.
- d) Automated process control; in an educational organisation, computers can be used to monitor the learning process.
- e) Automated test and inspection. Computer-controlled test and inspection systems offer improved test quality, lower operating costs, better report preparation, improved accuracy and automated calibration.
- f) System design adaptive systems permit a system to learn from data patterns and repetitive situations. Data flow is monitored to detect, characterise and record events that describe the actions to be taken in similar situations.

3.4 CONCLUSION

This chapter has covered the meaning and concept of ICT, dimensions of ICT literacy, factors enhancing and limiting the development of ICT literacy. ICTs include digital hardware and software. ICT literacy should progress in terms of access, knowledge, application of assessment skills along with the corresponding ICT key competencies. The basic outline and sequence for ICT literacy training indicates that ICT exists in three dimensions, namely ICT access, knowledge and integration where one needs to be proficient in all three to be considered ICT literate. Strategies can be developed to counter challenges faced in ICT literacy development. The chapter that follows considers the research design and methods for this study.

CHAPTER FOUR

RESEARCH DESIGN AND METHODS

4.1 INTRODUCTION

This chapter examines the research design employed in the study. In order to focus the discussion, the research questions and the emerging hypotheses are restated. First, a justification for the research design chosen and a description of the research setting is provided. Next, the ethical measures, the data collection methods including the population, sampling techniques, verification strategies and the data collection instruments used are discussed. Finally, the data analysis procedures are discussed.

4.2 RESEARCH QUESTIONS RESTATED

The main research question of the study is: What is the extent of ICT literacy among practicing secondary school principals of Kenya? Out of this main research question, the following sub-questions emerge:

- i. What is the level of ICT literacy among secondary school principals in the Western province of Kenya?
- ii. What socio-demographic factors influence ICT literacy among secondary school principals in the Western province of Kenya?
- iii. Is there a significant relationship between the level of ICT literacy of a principal and school performance?
- iv. What is the role of ICT literacy in improving secondary school performance?
- v. Can features of ICT integration in school leadership be combined in a model for purposes of improving secondary school performance?

4.3 RESEARCH AIMS AND OBJECTIVES RESTATED

Emanating from the stated problem, the following research aims are addressed to ascertain the ICT literacy levels of principals. In order to establish the potential of integrating technology in secondary school leadership for improving school performance, the specific objectives are to:

- i) Investigate socio-demographic factors influencing the ICT literacy level of a secondary school principal.
- ii) Investigate how ICT access to a principal relates to school performance.
- iii) Investigate how ICT knowledge of a principal relates to school performance.
- iv) Investigate how ICT application in school leadership functions relates to school performance.
- v) Investigate how challenges facing the development of ICT literacy among principals relate to school performance.
- vi) Provide guidelines on strategies for ICT literacy development among secondary school principals of the Western province of Kenya.

4.4 THE NULL HYPOTHESES

In order to test the statistical relationship between ICT literacy of a principal and school performance, the following null hypotheses were stated:

- H_{01} : There is no statistically significant relationship between the ICT access of a principal and school performance.
- H_{02} : There is no statistically significant relationship between the ICT knowledge of a principal and school performance.
- H_{03} : There is no statistically significant relationship between ICT application in school leadership functions and school performance.
- H_{04} : There is no statistically significant relationship between challenges facing the development of ICT literacy among principals and school performance.

4.5 RESEARCH DESIGN AND METHODS

The research process becomes purposeful, meaningful and systematic if it is carried out within the realms of a definable mode of investigation, which researchers call design (Chikuya, 2007:87). He adds that the research design becomes the researcher's plan of action that provides the researcher with a framework of operation that steers the process through stages that are research-worthy. Borg and Gall (1989) and Cohen and Manion (2000) among others describe various research designs that a researcher can employ. These designs they name case studies, historical designs, experimental designs and survey designs. Though the list is not exhaustive, it however shows that research designs are varied. The survey design was chosen to carry out the current study on ICT literacy of secondary principals in Western province of Kenya.

Apart from the named research designs, there are basically three approaches to research, namely quantitative, qualitative and mixed mode research approaches. Quantitative and qualitative approaches are often portrayed as polar opposites (Creswell, 2003:4). The researcher used both the quantitative and qualitative research approaches in the current study. The two were used to complement each other and are discussed separately in the sections that follow.

4.5.1 Quantitative research

Monyatsi (2002:160) notes that one of the main distinguishing characteristics between the quantitative and the qualitative approach to research is the relationship between cause and effect. In the quantitative approach, statistical data analysis can be used to show such relationships, but the information rich qualitative research approach provides explanatory data from the interview and observation schedules. McMillan and Schumacher (2001: 32) also point out that apart from being the most commonly used method in educational research, a descriptive survey is quantitative and is often preferred because it is objective in data collection, quantifies variables and describes phenomena using numbers to characterise them. Saunders *et al.* (2007: 358) assert that concepts, variables and hypotheses are chosen before the study begins and remain fixed throughout the study in a static design. McMillan and Schumacher (2001:9-10) explain that quantitative methodology uses a deductive form of logic where theories and hypotheses are tested

for cause and effect. They further note that the approach uses predetermined hypotheses in order to develop generalisations that contribute to the theory and enable one to predict, explain and understand some situations.

The quantitative approach generates numbers, which are analysed statistically, making comparisons and correlations possible (Descombe, 2000:174). According to Gay and Airasian (2000:25-26), the main aim of descriptive research in quantitative approaches is the exploration and clarification of phenomena where accurate information is lacking.

The current study describes the extent of ICT literacy among secondary school principals and employs descriptive research as a quantitative design to measure the correlation between ICT literacy levels of principals and secondary school performance. Secondary school performance is the dependent variable and the ICT literacy of a principal is the independent variable. The researcher used KCSE examination results from KNEC for the years 2002 to 2006 to obtain the school means and to use the mean scores for stratification. However, moderator variables such as gender, age, academic level, ICT training level, period of experience with ICT and the distance of a school from the nearest town are analysed as socio-demographic data. For this quantitative research, the study employed two samples, the pilot sample for the development of instruments and the main sample for substantive inquiry.

4.5.2 Qualitative research

The purpose of qualitative research is to shed light on a particular social phenomenon in its natural setting (Saunders *et al.*, 2007: 109). In addition, Henning *et al.* (2004:5) explain that the assumption underlying qualitative research is that knowledge is socially constructed; qualitative approaches are typically used to investigate behaviour as it occurs naturally in a non-contrived situation, with no manipulation of conditions. This means that the data consists of words in the form of rich verbal descriptions rather than numbers (McMillan & Schumacher, 2001:14-16). They further explain that qualitative research assures multiple realities and is more concerned with understanding social phenomena than quantitative research. According to Gay and Airasian (2000:21), qualitative research does not seek to establish generalisations that are universal and context free, but believes actions are strongly influenced by the context within which they occur.

The qualitative approach employs inductive logic where categories emerge from informants rather than being identified *a priori* by the researcher (*ibid.*: 24). Such an approach is said to produce rich content bound information leading to patterns or theories that help explain the situation under study.

The research problem of the present investigation was examined in context to address the challenges facing ICT literacy development and strategies that enhance ICT literacy development among secondary school principals. The researcher investigated strategies for enhancing ICT literacy development by asking principals to fill in one open-ended item (13) in the questionnaire (Appendix D1). In order to verify data gathered through the questionnaires, the researcher used interview and observation schedules to obtain qualitative data. The attitude of principals towards ICT literacy was investigated using the interview schedule (Appendix D3) and actual existence of ICT facilities was verified using the observation schedule (Appendix D4).

4.5.3 Mixed mode research approach

Using only a quantitative or a qualitative approach in a research, falls short of what is used in the social and human sciences today; hence the need to use the mixed mode research approach (Tashakkori & Teddlie, 2003:5). For this reason, the present study employs both quantitative and qualitative approaches as a mixed mode research approach. Proponents of mixed mode research adhere to the compatibility thesis (Johnson & Christensen, 2004:1) as they explain that quantitative and qualitative research methods are compatible and they can both be used in a single research study. They also believe that adopting a mixed methods approach is pragmatic since the researchers are not committed to any system of philosophy and reality. This study therefore employs a mixed mode research approach with a concurrent strategy of inquiry. According to Cresswell (2003:16), the concurrent strategy enables the researcher to investigate different issues at the same time. In this study the researcher investigates socio-demographic factors influencing ICT literacy, the ICT literacy levels of principals, a school's performance level and at the same time investigates the relationship between ICT literacy and school performance.

4.5.3.1 Characteristics of a mixed mode research approach

Adam (2005:72-73) summarises characteristics of a mixed mode research approach, namely assumptions about the world, context sensitivity, multi-method strategies, goals and the researcher's role. These characteristics are discussed in the sections that follow.

4.5.3.1.1 *Assumptions about the world*

Cresswell (2003:18) describes the mixed mode research approach as one in which the researcher tends to base knowledge claims on pragmatic grounds, for instance consequence-oriented, problem-centred and pluralistic grounds. Pragmatism is not committed to any system of philosophy and reality as truth is what works at the time (*ibid.*: 19). He outlines that strategies to inquiry in a mixed method study may be sequential where one idea follows another, concurrent where ideas occur simultaneously or transformational where one idea leads into another.

4.5.3.1.2 *Context sensitivity*

In a mixed mode research approach, the researcher establishes both context-bound and context-free generalisations (Tashakkori & Teddlie, 2003:12). The possibility of combining qualitative and quantitative approaches capitalises on the belief that human behaviour and actions are strongly influenced by the setting in which they occur because it forms the framework within which subjects interpret their thoughts, feelings and actions. In this study, the level of ICT literacy of a principal may be determined by the environment in which a principal operates or the attitude of a principal towards ICT.

4.5.3.1.3 *Multi-method strategies*

According to Johnson and Christensen (2004:1), the proponents of a mixed mode research typically adhere to the compatibility thesis: quantitative, qualitative and descriptive research approaches are compatible and they can all be used in a single research study. Therefore, in a mixed mode research design, both predetermined and emerging methods provide opportunities

for open-and closed-ended questions and multiple forms of data drawing on all possibilities of statistical and textual analysis (Cresswell, 2003:17). The researcher uses the strength of additional methods to overcome the weakness of another method (Johnson & Christensen, 2004:4). Stronger evidence for a conclusion is provided through convergence and corroboration of findings. In this study, the researcher uses quantitative methods to find statistical relationships and qualitative methods to probe challenges, strategies and opinions of principals about ICT literacy.

4.5.3.1.4 Goals

The goal of the mixed mode research approach is to capture the best of both quantitative and qualitative methods (Adam, 2005:73). In addition, Johnson and Christensen (2004:4) explain that when using this approach, the researcher collects diverse types of data which provide the best understanding for the research problem. They add that in such a case, the researcher first explores generally to learn about what variables to study and thereafter studies variables with a large sample of individuals. In the current study the researcher identified variables that defined ICT literacy and school performance in order to answer the main research question. The variables were then incorporated in questionnaires and a survey was done in a large population of schools.

4.5.3.1.5 Researcher's role

In mixed mode research, the researcher collects both quantitative and qualitative data and develops a rationale for mixing these (Tashakkori & Teddlie, 2003:9). In addition, the procedures of such a study and the data obtained are integrated at different stages of the inquiry. This made the choice of a mixed method of inquiry suitable for this study.

4.5.3.2 Advantages of a mixed mode research approach

Cresswell (1994:175) as cited by Monyatsi (2002:163) advances five advantages of combining research approaches in a single study, namely:

- It helps to integrate results.

- It is complimentary, because overlapping and different facts of a phenomenon may emerge.
- It is developmental because the quantitative method is used sequentially to help inform on the qualitative method.
- It helps contradictions and fresh perspectives to emerge.
- Mixed methods add scope and breadth to a study.

4.6 ETHICAL MEASURES

Saunders *et al.* (2007:180) explain that researchers must try to minimise risk to participants and society while attempting to maximise the quality of information they produce. Therefore ethical measures were observed throughout the investigation. Educational researchers need to be sensitive to ethical principles because of their research topic, face-to-face interactive data collection, and emergent design and reciprocity with participants (Adam, 2005:79). Some pertinent ethical issues are briefly explained in the sections that follow.

4.6.1 Informed consent as dialogue

A letter of information providing details of the study and the appropriate consent letter was distributed to potential participants and an explanation given for their being sampled. The potential participants were then given a verbal explanation of study objectives.

4.6.2 Voluntary participation

Since participants were fully informed of the purpose of the present investigation in advance, each participant gave his or her permission to be observed, interviewed or to fill in the questionnaire. Following the clarification, participants were given the option to discontinue participation in the process for whatever reason. The researcher and the research assistants confirmed the willingness of principals to participate during the visits to the schools.

4.6.3 Confidentiality

Personal data should be secured or concealed and made public behind a shield of anonymity (Christians, 2000:139). Secondary school principals and their deputies who took part in this investigation were given assurance of full confidentiality and anonymity. Other than identifying factors for principals such as gender, age, education level or ICT training level, no other personal identifiable information was divulged or specific schools identified by name. Each school principal was assigned a code number (e.g. principal 1 or principal 2).

4.6.4 Researcher's competence and relationship with participants

According to Maseko (2002: 93), researchers are ethically obliged to possess a high level of competence and skill in undertaking a study. The researcher in the present investigation has been a secondary school teacher for twelve years, acted as deputy principal for three years and has completed substantial graduate level study in research methodology. On that basis the researcher maintained a healthy relationship with each participant and shared a high degree of trust throughout the investigation.

4.7 RESEARCH SETTING

The research was done in the Western province of Kenya (Appendix C). The Ministry of Information and Communications (MIC, 2007:1-3) reports that the province covers an area of about 8,361sq kilometres and has approximately four million inhabitants. It is one of the eight provinces of Kenya with eight districts, namely Bungoma, Busia, Butere-Mumias, Kakamega, Lugari, Mt. Elgon, Teso and Vihiga. The province has a tropical climate and enjoys heavy rainfall most of the year; hence the dominant economic activity is farming. There were many secondary schools approximately 500 as at the beginning of the year 2007 to cater for the high population density. However, despite the favourable climatic conditions, there is a poor road network and all schools are basically rural. The management of schools is under the Ministry of Education which is headed by a cabinet minister. At provincial level, the Provincial Director of Education oversees the administration of all schools which use the 8-4-4 education system. Secondary schools in the province are headed by a principal who is answerable to the District

Education Officer. Working in school administration directly under the principal, is the deputy principal, who also controls the Heads of Departments in the schools.

4.8 RESEARCH METHODS

4.8.1 Population

A study population is the totality of persons, events, organisations, units or other sampling units which concern the research problem (Mohlokoane, 2004:8). In support of this statement, Monyatsi (2002:176) explains that a population in research is a discrete group of units of analysis such as organisations or schools. This is why schools as educational units are used to select the sample for the study rather than using all educational institutions. The target population for this study was all secondary school principals in the Western province of Kenya.

Pernia (2008:7) recognises that the features of ICT are biased towards those who are already literate in a more traditional sense (have reading and writing skills) and are numerate (can understand and use numbers). As such, she strongly recommends that general literacy should be addressed alongside ICT literacy. Secondary school principals, being literate, are therefore a suitable group for this study investigating ICT literacy level. Deputy principals were included in the questionnaire on school leadership performance because they are directly involved in monitoring process effectiveness in curriculum implementation, student discipline and operations of school workers and they are directly answerable to the school principal.

4.8.2 Sampling

Chikuya (2007:91) defines a sample as a unit that provides a practical and efficient means to collect data since it serves as a model of the population under study. According to Saunders *et al.* (2007:206), sampling provides a valid alternative to a whole population because surveying an entire population may lead to budget constraints, time constraints and delay results analysis. The sampling frame in this study was all principals of public secondary schools in the Western province of Kenya.

Sampling methods can be classified into probability and non-probability sampling (Panneerselvam, 2008: 192). He further explains that in a quantitative inquiry, the main sampling strategy is probability which depends on the selection of random samples that are representative of the larger population. This study used probability sampling where each unit of the population has a likelihood of being selected as a unit of the sample. Probability sampling is free from biases and five methods can be applied, namely simple random, systematic, stratified, cluster and multi-stage sampling (*ibid.*:194). The researcher used two of the methods, stratified sampling and simple random sampling, which are discussed briefly in the sub-sections that follow.

4.8.2.1 Stratified random sampling

Saunders *et al.* (2007:221) explain stratified sampling as a modification of random sampling in which the population is divided into relevant and significant strata, based on several attributes. Dividing the population into a series of relevant strata means that the sample is likely to be representative because it is ensured that each of the strata is represented proportionally to the sample.

The process of stratification involves:

- Choosing the stratification variable. In this study, the variable is student achievement through examination performance in national examinations.
- Dividing the sampling frame into discrete strata (HAS, AAS and LAS).
- Numbering each of the cases in each stratum with a unique number.
- Selecting the sample using simple random sampling.

The study employed the stratified random sampling procedure because of the heterogeneous nature of the target population including the secondary school principals of the Western province of Kenya. In addition, stratification enabled the researcher to assert some control over the selection of the sample or factors in the way they existed in the wider population that made generalisation of results possible (Descombe, 2000:12).

Examination results from the Kenya National Examinations Council (KNEC) were a standard measure of school achievement level in order to determine the sample population for this study. Western province had about 460 secondary schools registered at the examinations council at the beginning of 2006, out of which 435 were public and 25 were private schools. From the 435 schools, 396 had consistently written national examinations for a selected period of five years (2002 to 2006). The researcher divided the 396 schools into three equal strata, namely: High Achieving Schools (HAS), Average Achieving Schools (AAS) and Low Achieving Schools (LAS). Proportional stratified sampling involves selecting an equal number of units per strata (Panneerselvam, 2008: 195); hence the study obtained 132 schools per stratum. There were 132 HAS that had consistently been among the top in ranking according to 12.0 score scale in the province for the selected five years. AAS were those schools that had consistently been among the middle 132 schools in the province for the five years. LAS were schools that had consistently been among the bottom 132 schools in ranking in the province for the five years (KNEC, 2007:1-6). For purposes of the research objectives, the researcher used schools in two strata only, namely: HAS and LAS. Simple random sampling was done in each stratum to select the required sample size.

4.8.2.2 Simple random sampling

Saunders *et al.* (2007:206) state that probability sampling is often associated with surveys. Mugenda and Mugenda (2003: 50) explain that simple random sampling involves giving subjects in the population random numbers, then picking the numbers at random. In this study, simple random sampling as a probability method was done in each stratum (HAS and LAS) to select the required sample size. The researcher initially made a list of 132 schools per stratum and picked numbers written on pieces of paper.

4.8.2.3 Deciding on a suitable sample size

Generalisations about populations from data collected using any probability samples are based on statistical probability (Saunders *et al.*, 2007:210; Panneerselvam, 2008:192). In the current study, the probability samples are those that had been randomly selected from the target population in

the two strata and the likelihood of selecting a school was the same for any school. The larger the sample size, the lower the likely error in drawing generalisation about the population (*ibid.*: 211). Mugenda and Mugenda (2003: 52) outline that the choice of a sample size is dependent on:

- The confidence one needs to have in the data, implying the level of certainty that the characteristics of data collected will represent the characteristics of the total population.
- The margin of error that one can tolerate, which is the accuracy one requires for any estimates made from a sample.
- The types of analysis to be undertaken and in particular the number of categories into which one wishes to sub-divide the data.
- The size of the total population from which a sample is being drawn.

The larger the absolute size of a sample, the more closely its distribution will be to the normal distribution (Saunders *et al.*, 2007:211). This relationship is called the central limit theorem; which occurs even if the population from which the sample is drawn is not normally distributed. Statistical inference according to Saunders *et al.* (2007:212), is the process of coming up with conclusions about a population on the basis of data describing the sample. It allows one to calculate how probable it is to obtain the given results by chance. Researchers normally work to a 95% level of certainty; hence it means the margin of error describes the precision of population estimates. Panneerselvam (2008: 14) advises that if there are no estimates available of the proportion in the target population assumed to have characteristics of interest, at least 50% of the target population is recommended. In this study, allowing the margin of error, at least 110 schools from each stratum were selected. This was a total of 220 schools being 95% of the target population of the 264 schools. From each of the schools the principal and the deputy principal were asked to fill in questionnaires 1 and 2 respectively. Purposeful sampling was done for the principals to be interviewed as Mugenda and Mugenda (2003: 53) explain that it is a technique that allows a researcher to use cases that have the required information with respect to objectives of the study.

4.8.3 Data collection techniques

This section is a summary of the description of the instruments and scales used for data collection for this study. Gay and Airasian (2000:9) concur with Cohen and Manion (1995:242) that the choice of research instruments depends on the nature of the research questions. The instruments used in this study include questionnaires, interviews and observations; they are discussed in the sections that follow.

4.8.3.1 The questionnaire

Orodho (2004: 39) notes that in education and social sciences research, the most commonly used instruments are questionnaires, interview schedules and observation forms. Thus, questionnaires were used to collect important information about the population. Questionnaires were preferred for this study because they generate quantifiable data ready for statistical analysis (Mugenda, 2008:285). Questionnaires allow each one of the respondents to read and answer identical questions, thereby ensuring consistency of the demands. (Saunders *et al.*, 2007: 357). They add that questionnaires also generate standardised data, which makes the processing of responses easier. Standardised data also help to increase the validity and reliability of the results (Panneerselvam, 2008: 93).

The current study focuses on ICT literacy levels of secondary school principals with regard to their relationship with school performance. The first questionnaire (Appendix D1) was developed in order to collect the necessary data on the moderator variables, the access to ICT facilities, ICT knowledge, ICT application, challenges facing ICT literacy development and strategies for ICT literacy development among secondary principals of Western Province of Kenya. The second questionnaire (Appendix D2) investigated the performance level of schools by requesting the deputy principals to fill in the thirty items. The questionnaires enabled the researcher to reach a large population scattered over an extensive geographical area of schools in the Western province of Kenya. The responses required in this study varied in each question. Data was collected during visits to the schools as principals filled in the questionnaire 1 and deputy principals filled in questionnaire 2. Participants were also allowed to ask questions to clarify research items and were requested to answer every item in the questionnaire as truthfully as possible. In situations

where respondents did not have enough time, the researchers left the questionnaire with a self-addressed envelope for mailing.

4.8.3.2 Semi-structured interviews

The essence of the qualitative interview is to capture the perspectives of the respondents through verbal interaction between the interviewer and the interviewee (Mugenda & Mugenda, 2003: 90; Saunders *et al.*, 2007: 394). Panneerselvam (2008: 18) points out that when planning an interview schedule, the researcher has to decide which questions to ask. He distinguishes between five categories of questions, namely experience or behaviour questions, opinion or value questions, feelings questions, knowledge questions and demographic questions. Monyatsi (2002: 172) notes that a major advantage of the interview is its adaptability, where a skilful interviewer can follow up ideas, probe responses and investigate motives and feelings that a questionnaire cannot do. Mugenda and Mugenda (2003:91) add that in semi-structured interviews, some interview questions are asked together with open-ended ones in the questionnaire.

In the current study, 40 selected principals were interviewed once during visits to schools using the interview schedule (Appendix D3) to allow opportunity for probing and clarifying collected data from the questionnaires. The responses were recorded as notes when the respondents talked; in an attempt to avoid problems caused by note taking in the course of the interview, the interviewer used short-hand notes. However, permission was first sought from the principals before the notes were taken and they were assured that the recorded information would only be used for purposes of the study at hand.

4.8.3.3 Observation

Data gathering often includes unobtrusive observation of people's behaviour to obtain information about phenomena of interest (Johnson & Christensen, 2004:147). Observational data is attractive because it is gained directly from "life situations" (Cohen *et al.*, 2000:305). They add that observation is important as a means of verifying what people say about themselves and their actions. Researchers should be able to understand the context of programmes, be open-ended and inductive, see things that might otherwise be missed, discover things that participants might not

talk freely about in interview situations and access personal knowledge (Hackley, 2003:85). The researcher is said to be the data collection instrument in qualitative observation because it is the researcher who must decide what is important and which data should be recorded (Johnson & Christensen, 2000:149). According to Pole and Lampard (2002:71) observation is a matter of collecting information about the nature of the physical and social world as it unfolds before us directly via the senses rather than indirectly via the accounts of others. In this study, observation was done using the observation schedule during visits (Appendix D4). Field notes were taken during the visits to the schools in order to ascertain information asked for in the questionnaire.

4.8.3.4 Document analysis

Although the analysis of documents was not the focus of this study, the Kenya government policy documents on ICT in education were checked by the researcher to ascertain the rationale for the current study. Such documents included the Kenya Education Sector Support Programme (KESSP), the Ministry of Education (MoE) strategic plan (2006-2011), the Sessional Paper No. 1 of 2005, National ICT policy of 2006 and the Kenya Vision 2030 (2006-2030). In order to confirm school achievement, results analysis of the Western province from KNEC (2007:1-6) were used to confirm actual means for a selected period between years 2002-2006. These documents acted as information sources and were used as a means of triangulating data collected from questionnaires and observations and also to justify research aims.

4.8.4 The pilot sample

An important stage of the research instruments design was the piloting phase. Mugenda and Mugenda (2003:80) state,

All data gathering instruments should be piloted to test how long it takes recipients to complete them; to check that all questions and other instruments are clear; and to enable one to remove any items which do not yield usable data.

In pilot study of the current study, ten schools were randomly selected from the target population, five from HAS and five from LAS. Principals and their deputies who did not participate in the

main study of 220 schools were the respondents. They were requested to respond to the draft questionnaire and were then interviewed and observed the same day during a visit to the school. The respondents had similar characteristics to those used in the main study. The pilot sample enabled validation of the instrument by identifying possible ambiguities in both content and language in preparation for the data collection of the main sample. It also helped the researcher to form an idea of the time required to complete the questionnaire and to anticipate any problems likely to be encountered during the main data collection. Respondents were also asked to give written comments on the instruments (McMillan & Schumacher, 2001:243; Mertens, 1998:315). After analysis of the pilot responses to the questionnaire, interviews and observation, the instruments were reproduced for administration to the main sample using a procedure to be described in the section that follows.

4.8.5 Data collection procedure

A research permit for conducting research was obtained from the National Council for Science and Technology (Appendix A1). Further permission was sought from the Provincial Director of Education (PDE) of the Western Province of Kenya (Appendix A2). Saunders *et al.* (2007: 95) emphasise that consent to participate in research is not a straightforward matter; hence in this study informed consent was applied. The individual respondents were informed in a letter about their option to or not to participate (Appendix B). In addition, the rationale for their being sampled was explained. The purpose of the study was explained to the respondents before completion of the questionnaire commenced, namely to investigate the ICT literacy levels of secondary school principals and assess its relationship with school performance.

Since the population was spread over a large area, the researcher collected data with the help of ten research assistants who travelled to each of the schools and collected data from about 20 schools each. Although the exercise was costly in terms of travel, it enabled the researcher to collect a lot of data using the two questionnaires, interviews and observation in the schools. The researcher requested the principals to fill in questionnaire 1 (Appendix D1) and the deputy principals filled in questionnaire 2 (Appendix D2). Whenever time allowed, interviews which took about ten minutes each, were done with the selected principals the same day, but if it did not work out, the interviews were arranged for a different day as agreed by the principals.

Observation was done in the schools as the principals and their deputies filled in the questionnaires. The exercise took about four months to complete.

4.9 VALIDITY AND RELIABILITY

4.9.1 Validity

Mugenda and Mugenda (2003: 90) contend that a major concern in research is the validity of the procedures and conclusions. According to Gay & Airasian (2000:42), validity is that quality of a data gathering instrument or procedure that enables it to measure what it is supposed to measure. The idea of validity rests on the extent to which research data and the methods for obtaining data are deemed accurate, honest and on target (Descombe, 2000:241). Validity addresses the question of whether one is measuring suitable indicators of the concept, accuracy of the results and the extent to which an instrument measures what it was meant to measure (Dambudzo, 2005:79).

4.9.1.1 Validity in quantitative research

In quantitative research design, validity rests on the data collection and analysis techniques (McMillan & Schumacher, 2001:407). There are various types of validity, *inter alia* face, content and criterion-related validity (Mugenda & Mugenda, 2003: 80). The current study focused mainly on face and content validity as briefly explained in the sections that follow.

4.9.1.1.1 Face validity

Face validity is less systematic than content validity as it checks if a questionnaire makes sense (Saunders *et al.*, 2007: 386). In the current study, the researcher gave the instruments to an expert to check their face validity. The expert checked on the face value, if the first questionnaire tested ICT access, ICT knowledge and ICT application as major components of ICT literacy. The second questionnaire was similarly checked whether it measured the level of school performance.

4.9.1.1.2 *Content validity*

Content validity is the extent to which the measurement device like a questionnaire provides adequate coverage of the investigative questions (Saunders *et al.*, 2007: 366). Mugenda and Mugenda (2003: 100) define validity as a measure of the degree to which data collected using a particular instrument represents content of a particular concept. Content validity involves confidence that items comprising the measuring instrument are representative of the field which they intend to serve (Crowe, 2004:123). In this study, the adequacy with which an instrument covers the appropriate content (ICT literacy and school performance) determines the content validity. This is complied to by reviewing tasks in the measuring instruments to ensure that they are representative of ICT literacy levels of principals.

In order to determine content validity, the researcher specified the domain of variables under investigation. In the first questionnaire (Appendix D1) the researcher included items on ICT access, ICT knowledge, ICT application in school leadership functions and challenges facing ICT literacy development. The questionnaire also involved possible strategies for enhancing ICT literacy development. In addition to the five socio-demographic variables, the questions addressed the aims, research questions and hypotheses of the study as a way of ensuring content validity. The first part consisted of five items with socio-demographic details; the second part of the questionnaire consisted of three questions which aimed at measuring the access to ICT facilities of principals. The third part of the questionnaire consisted of three items which measured the level of ICT knowledge among principals. The fourth part of the questionnaire consisted of four items which measured ICT application in school leadership functions. The fifth part consisted of two open-ended items which measured the challenges that face the development of ICT literacy. The last part of the questionnaire consisted of one item concerning strategies that can enhance development of ICT literacy among principals.

In the second questionnaire (Appendix D2) the researcher investigated the school performance index; it consisted of thirty items. The items measured performance excellence in terms of product outcomes, customer-focused outcomes, financial and market outcomes, workforce-focused outcomes, process effectiveness outcomes and leadership and social responsibility. In

order to enhance content validity, the researcher subjected the instruments to the scrutiny of the thesis promoter. The instruments were also pre-tested in a pilot study.

4.9.1.2 Validity in qualitative research

In order to verify validity of qualitative data, there are approaches to verification and standards of quality. The verification of validity relies on Guba's model of trustworthiness (De Vos et al, 1998: 349). This model is based on the identification of four aspects, namely: truth value, applicability, consistency and neutrality. Truth value considers whether the researcher has established confidence in the findings of informants and the context within which the study was undertaken. Applicability refers to the degree with which findings can be applied to other contents and settings. Consistency alludes to reproducibility of findings if the inquiry was replicated with the same subjects, while neutrality is freedom from bias in research procedures and results (Krefting, 1990: 217) cited by Adam (2005:83).

Guba's model for trustworthiness addresses ways for warding off biases in the results of qualitative analysis (Mohlokoane: 2004:91). In this study however, the model was used to develop strategies that would introduce standards of quality in the qualitative and partly quantitative analysis. The five strategies are identified in UNISA (2003:19) and are as explained:

- a) *Credibility (truth value)* demonstrates that the research was conducted in such a way that the phenomenon was accurately described. In order to ensure credibility in this study, the researcher used prolonged field study where in all the schools visited, time was taken to gather data as required. Field notes were kept during data collection and used for data analysis.
- b) *Transferability* demonstrates the applicability of the findings to another context. Transferability was applicable in the current study by selecting a sample by random sampling and then using the findings to generalise for the whole population.
- c) *Comparability* which is the degree to which the research design is adequately described so that researchers may use the study to extend the findings to other studies. In the study, the research findings from Western province were compared to other findings from similar research elsewhere as indicated in chapter five.

- d) *Dependability* refers to whether the findings would be consistent if the inquiry were replicated with the same subjects or similar context. Questionnaires were developed using literature review and a pilot test was conducted before dissemination of the research instruments. The researcher provided valuable input with respect to the instrument's design.
- e) *Conformability (neutrality)* focuses on whether the results are a function solely of the informants and not of the biases and motivations of the researchers. This was done by the thesis promoter checking the work, triangulation of the research instruments and note taking throughout the investigation.

4.9.2 Reliability

Saunders *et al.* (2007:367) point out that two researchers studying a single setting may come up with different data and produce different findings. Both studies can be reliable, but the reliability of one or both studies would be questioned if they yield incompatible results. Reliability therefore addresses the question: "Will two researchers independently studying the same setting or subject come up with same findings?" Reliability is essential to the effectiveness of any data gathering procedure. In support of this, Gay and Airasian (2000:114) note that reliability is the degree of consistency that the instrument or procedure demonstrates.

A concern for reliability was important in the current study because reliability is a necessary condition for validity and consequently without reliability there can be no valid results (McMillan & Schumacher, 2001:232). An instrument such as a questionnaire is said to be reliable to the extent that independent administrators of it or a comparable instrument, consistently yield similar results (Saunders *et al.*, 2007: 367). Thus, the more reliable the instruments, the more consistent and dependable the results will be. While several procedures exist for establishing reliability such as test re-test and split-half methods; the split-half method is the most commonly used in educational research (McMillan & Schumacher, 2001: 230). In the current study, the split half technique was used to obtain X and Y scores. X distribution took odd-positioned items, whereas Y distribution took even-positioned items. Pearson product moment correlation (r) was used to calculate the reliability coefficient. The coefficient obtained was then converted into an appropriate correlation for the entire test using the Spearman and Brown prophecy formula. The

reliability coefficient of 0.5 and above is accepted as a good measure of reliability (Saunders *et al.*, 2007: 368). Computation using the above formula yielded a reliability coefficient of 0.7, which was judged a good measure of reliability.

The researcher attempted to increase reliability by having a large number of items for analysis. In addition, the researcher collected data from a heterogeneous group in terms of school achievement. The high and low achieving schools formed a sample for this study, an arrangement which intended to increase the reliability of the research findings. The more heterogeneous a group is on the trait being measured or the greatest range of scores, the higher the reliability (McMillan & Schumacher, 2001:230). The measuring instrument was only administered once for practical reasons; hence the test re-test method of determining reliability was not employed.

4.10 DATA ANALYSIS

Data analysis was done for each of the questionnaires. The analysis was done for quantitative data using descriptive and inferential statistics. However, responses from open-ended items, those from the interviews with school principals and the observation schedule were analysed qualitatively.

4.10.1 Response rate

For any samples, according to Saunders *et al.* (2007:212), 100% response rate is unlikely and the sample needs to be larger to ensure sufficient responses for the required margin of error. There is a need to obtain as high a response rate as possible to ensure that the sample is representative (*ibid.*:215). In this study, non-response was due to some respondents not willing to participate because of lack of time, some questionnaires were not returned as agreed by respondents and some of the questionnaires were not completely filled in. Such questionnaires were not considered for data analysis. Out of the questionnaires distributed in the main sample of 210 schools, the following was the distribution of questionnaires returned:

Questionnaire 1

- 188 (89.4%) were completely filled in
- 15 (7.1%) were not completely filled in
- 7 (3.5%) were not returned

Questionnaire 2

- 191(90.9%) were completely filled in
- 6 (2.9%) were not completely filled in
- 13 (6.2%) were not returned

The response rates indicate that there was uneven distribution of completely filled in questionnaires 1 and 2. Since the study investigated the relationship between ICT literacy of principals and school performance, the researcher picked an equivalent number of filled-in questionnaires (188) in each category to be used for data analysis.

4.10.2 Quantitative data analysis

Responses from all the open-ended and closed-ended questions were analysed to facilitate coding, processing and entry into the computer in preparation for analysis. The data-processing exercise started with the coding of all the responses obtained to facilitate easy analysis using the Statistical Package for Social Sciences (SPSS v.13.5). A master codebook was designed to ensure that all the questionnaires were coded uniformly.

Questionnaire 1 (Appendix D1) had 54 items in total for quantitative analysis; this analysis was firstly done for socio-demographic factors influencing the ICT literacy of principals which partly described the nature of respondents. The next analyses were the levels of ICT access, ICT knowledge, ICT application and challenges facing ICT literacy development which were determined by measuring the items on a Likert-type scale. In order to determine the levels of ICT literacy of principals, the researcher quantified the levels by calculating an index on a scale of 1, 2 or 3. The levels of these variables were determined as follows:

- ICT access level 1- low, 2- high
- ICT knowledge level 1- low, 2-moderate, 3- high
- ICT application in school leadership functions level 1- low, 2-moderate, 3- high
- Challenges facing ICT literacy development level 1- low, 2-moderate, 3- high

Questionnaire 2 set out determine the level of school performance and contained 30 items for analysis. The researcher quantified the levels by calculating an index on a scale 1, 2 or 3. The level of school performance was analysed as an index as follows: 1 – poor, 2 – average, 3 – good. The index was used in data analysis (see chapter 5).

The Chi-square (χ^2) test, Spearman Correlation and descriptive statistics were used to analyse the data. Chi-square test is a statistical technique used to compare the differences between categorical frequencies when data is categorical and drawn from a population with uniform distribution in which all alternative responses are equally likely (Panneerselvam, 2008: 295; Saunders *et al.*, 2007: 444). The Chi-square test was used because the data the researcher collected was of the type one-variable-many-levels and was basically in categorical frequencies. It was used to analyse socio-demographic factors influencing ICT literacy of principals and to determine the statistical differences among the variables. Apart from the Chi-square test, the researcher also used percentage scores for comparing the response to variables under study based on the Likert-type scale scoring.

In order to show the relationship between ICT access, ICT knowledge, ICT application and ICT challenges as the independent variables and leadership quality as the dependent variable, correlations were done. Spearman's correlations analysed strengths of cross-tabulated significant relationships (Saunders *et al.*, 2007: 451). All data was analysed at a level of 95% or $\alpha = 0.05$ and degree of freedom depending on the particular case as was determined. The value $\alpha = 0.05$ has been chosen because the sample size is adopted from calculated figures based on 0.95 level of confidence. The results of the descriptive statistics and correlations are presented in chapter five.

4.10.3 Qualitative data analysis

In this study a mixed-method approach was used: data gathered from open-ended items in the questionnaire, observation, interviews and documents supplement each other as part of the data analysis process. Pole and Lampard (2002: 190) mention that during data collection, processual data analysis occurs because the researcher is continuously engaged with the data as it is collected. They further explain that processual analysis is important in informing data collection and in shaping the direction of a research project. For purposes of preliminary data analysis, the researcher read through the field notes. Summative data analysis was conducted using data analysis methods cited by Adam (2005: 96). The steps used were as follows:

- 1) All the data (observation field notes and open-ended questionnaire documents) were reviewed first in a general manner to obtain a sense of the data and emerging themes. Data was coded for analysis according to the method of qualitative data analysis. This procedure enables a thorough and systematic search for chunks of information.
- 2) Analysis was conducted to identify similarities, differences and contributions of this study to previous research.
- 3) This provided structure to the gathered data and allowed for triangulation between the various research instruments used. Therefore, qualitative data consisted of all responses to the questionnaire and field notes from the interview and observation schedules.

Detailed descriptive field notes were kept for planned and incidental observations. The notes were written in real time in a form of personal shorthand attempting to capture the essence of the situation observed.

4.11 CONCLUSION

This chapter presented a detailed description of the research design of the study. The research hypotheses and questions which guide the study were restated. The chapter focused on the theoretical purpose and justification of the methodology chosen, ethical considerations, informal and formal data gathering techniques and an explanation of the data analysis method used. Both quantitative and qualitative research approaches were indicated. Issues of sampling, validity and

reliability were described and explained with focus on content and face validity. The data analysis methods for both quantitative and qualitative data for the study were explained.

The next chapter considers the composite results obtained from the profiles received for all secondary principals participating in this study.

CHAPTER FIVE

RESEARCH FINDINGS: ANALYSIS AND DISCUSSION

5.1 INTRODUCTION

This chapter presents, analyses and discusses the research findings from the survey questionnaires, observation and interviews of this study. The first section deals with chapter introduction. The second section deals with socio-demographic data and background information of the respondents as per items 1 to 6 of questionnaire 1 (Appendix D1). These data are also used to simultaneously report the socio-demographic factors influencing ICT literacy among principals, hence answering the research objective (i) in section 4.3: to investigate the socio-demographic factors influencing ICT literacy among secondary school principals in the Western province of Kenya.

The third section is organised according to the research objectives which were to investigate the relationship between school performance and i) ICT access ii) ICT knowledge iii) ICT application in school leadership functions iv) challenges facing ICT literacy development (see section 4.3). The section deals with the analyses and discussion of data from items 7 to 13 of the survey questionnaire 1 (Appendix D1). The closed-ended items were analysed quantitatively, while open-ended items, responses from interviews, and observation schedules were analysed qualitatively. The fourth section presents a summary of the chapter.

In this study not all questionnaires were completely filled in because a number of respondents were not willing to participate, some due to lack of time, and some questionnaires were not returned as agreed by respondents. Such questionnaires were not considered for data analysis. Out of the sampled 220 schools, 10 schools were used for the pilot study and 210 schools were used in the main sample of the study. The researcher picked on an equivalent number of completely filled in questionnaires (188) in each category of questionnaires (1 and 2) to be used for data analysis as explained in section 4.10.1. Questionnaire 1 was meant to investigate the level of ICT literacy of a principal and questionnaire 2 was meant to investigate the level of school performance. The intention was to find the correlation between the ICT literacy level of a

principal and school performance, in relation to research question iii) Is there a relationship between the level of ICT literacy of a principal and school performance? (See section 4.2).

5.2 SOCIO-DEMOGRAPHIC FACTORS INFLUENCING ICT LITERACY AMONG PRINCIPALS

Alampay (2003:1) asserts from a survey that factors that influence ICT skills of adults include gender, age, education, location and income. In this section demographic data is the biographic and background information of the respondents, which is presented and analysed in order to show their distribution. In this study the demographic characteristics of the respondents include gender, age, education levels, level of ICT training, years of experience in using ICT and the distance of the school from the nearest town. This information is important to the study because it helps the reader to understand some issues that may be important in the analysis. The data is presented in both tabular and text form. In addition, Pearson Chi-square is calculated for each of the factors to show the statistical difference in distribution and Cramer's V is given to show the level of association between the variables. In order to determine the levels of ICT literacy of principals, the researcher quantified the levels by calculating an index on a scale of 1, 2 or 3. The levels of these variables were determined as follows:

- ICT access level 1 – low, 2 – high
- ICT knowledge level 1 – low, 2 – moderate, 3 – high
- ICT application in school leadership functions level 1 – low, 2 – moderate, 3 – high
- Challenges facing ICT literacy development level 1 – low, 2 – moderate, 3 – high

The overall ICT literacy levels were determined by combining the levels of ICT access, knowledge, application in leadership functions and challenges; then converting these levels to an index 1= low, 2 = moderate, 3 = high.

5.2.1 The distribution of respondents by gender

The distribution of respondents by gender is indicated in Table 5.1.

Table 5.1: Distribution of respondents by gender

Gender	ICT Literacy level			Total
	Low	Moderate	High	
Male	0 (.0%)	84 (44.7%)	16 (8.5%)	100 (53.2%)
Female	32 (17.0%)	49 (26.1%)	7 (3.7%)	88 (46.8%)
Total	32 (17.0%)	133 (70.7%)	23 (12.2%)	188 (100.0%)
$X^2 = 44.146, df = 2, p = .000$				$Cramer's V = 0.152, p = .312$

Data in Table 5.1 shows the distribution of respondents as 100 (53.2%) male and 88 (46.8%) female secondary school principals. The fact that there were more male principals in the sample is not by design, but it means that there are more male than female principals in the Western province of Kenya. The distribution shows a statistically significant difference ($p < .05$) between male and female principals in terms of their ICT literacy levels. However, Markauskaite (2005: 445) reports that in recent studies in Australia, ICT-related differences between male and females lessened mainly in the access to ICT and basic computer literacy. Cramer's V shows a weak, but acceptable association between the gender of a principal and the ICT literacy level. It can be concluded that gender is a factor influencing ICT literacy among principals in the Western province.

5.2.2 The distribution of respondents by age

The distribution of respondents by age is indicated in Table 5.2.

Table 5.2: Distribution of respondents by age

Age	ICT Literacy level			Total
	Low	Moderate	High	
30 and below	0 (0%)	0 (0%)	0 (0%)	0 (.0%)
31 to 40	10 (5.3%)	28 (14.9%)	8 (4.3%)	46 (24.5%)
41 to 50	22 (11.7%)	76 (40.4%)	15 (8.0%)	113 (60.1%)
Above 50	0 (0%)	29 (15.4%)	0 (0%)	29 (15.4%)
Total	32 (17.0%)	133 (70.7%)	23 (12.2%)	188 (100.0%)
$X^2 = 14.920, df = 4, p = .005$				$Cramer's V = .243, p = .002$

Data in Table 5.2 shows that none of the principals was 30 and below (0.0%), 46 (24.5 %) were 31 to 40, 113 (60.1%) were 41 to 50, while 29 (15.4%) were above 50. The Pearson Chi-square indicates that there is a statistically significant difference ($p < .05$) among principals of various ages in terms of their ICT literacy levels. Cramer's V indicates a moderate association between the age and ICT literacy level of a principal. This scenario where the majority of principals are middle-aged implies that there is potential for enhancing ICT literacy among the young principals who can appreciate technological change in the Western province of Kenya. It can be concluded that age is a factor influencing ICT literacy among principals in the Western province. This conclusion concurs with a study that a generation gap with respect to exposure to computers and other ICTs may explain the different attitudes to learning ICT skills among adults (Veenhof *et al.*, 2005:22).

5.2.3 The distribution of respondents by education level

The distribution of respondents by education level is shown in Table 5.3.

Table 5.3: Distribution of respondents by education level

Education level	ICT Literacy level			Total
	Low	Moderate	High	
Diploma	10 (5.3%)	23 (12.2%)	0 (0%)	33 (17.6%)
Bachelors degree	21 (11.2%)	98 (52.1%)	19 (10.1%)	138 (73.4%)
Masters degree	1 (0.5%)	12 (6.4%)	4 (2.1%)	17 (9.0%)
Total	32 (17.0%)	133(70.7%)	23 (12.2%)	188 (100.0%)
$X^2 = 11.005, df= 4, p= .027$				$Cramer's V = .296 p= .001$

Data in Table 5.3 shows that 33 (17.6%) were Diploma holders, 138 (73.4%) had a Bachelors degree and 17 (9%) had a Masters degree. The Pearson Chi-square indicates that there is a statistically significant difference ($p < .05$) among principals of various educational levels in terms of their ICT literacy levels. This implies that majority of the principals are university graduates who can appreciate technological change. This idea is supported by Veenhof *et al.* (2005:7) who also find that there is a positive relationship between an individual's educational level and ICT skills. In support of this, Alampay (2003:1) reports from a survey that in most European countries, the level of education was the most significant factor in determining ICT

literacy. Cramer's V indicates that there is a moderately strong association between the education level and the ICT literacy level of a principal. It can be concluded that education level is a factor influencing ICT literacy among principals in the Western province. It can also be argued that implementing an ICT literacy development program can be workable in the Western province, because the principals have a high level of education.

5.2.4 Distribution of respondents by level of ICT training

The distribution of respondents by level of ICT training is shown in Table 5.4.

Table 5.4: Distribution of respondents by level of ICT training

Level of ICT training	ICT Literacy level			Total
	Low	Moderate	High	
No training	19 (10.1%)	51 (27.1%)	3 (1.6%)	73 (38.8%)
Informal training	10 (5.3%)	66 (35.1%)	6 (3.3%)	82 (43.6%)
Formal training with Certificate	3 (1.7%)	16 (8.5%)	14 (7.4%)	33 (17.6%)
Total	32 (17.0%)	133 (70.7%)	23 (12.2%)	188 (100.0%)
$X^2 = 12.120, df= 4, p= .049$		$Cramer's V= .204, p=.016$		

Data in Table 5.4 indicates that the majority 73 (38.8 %) of principals had no training, 82 (43.6%) were informally trained and 33 (17.6%) were formally trained to certificate level in ICT. The Pearson Chi-square indicates that there is a statistically significant difference ($p < .05$) among principals of various levels of ICT training in terms of their ICT literacy levels. Cramer's V shows a statistically moderate association between the level of ICT training and literacy of a principal. It can be concluded that the level of ICT training influences ICT skills among principals in the Western province. The conclusion concurs with the finding of Towers and Oliver (2000: 7) that the level of ICT training of individuals in an organisation influences the application of ICT skills in their operations.

5.2.5 Distribution of respondents by period of experience with ICT

The distribution of respondents by years of experience with ICT use is shown in Table 5.5.

Table 5.5: Distribution of respondents by period of experience with ICT use

Period of experience	ICT Literacy level			Total
	Low	Moderate	High	
Never	20 (10.6%)	38 (20.2%)	0 (.0%)	58 (30.9%)
Less than 1 year	4 (2.1%)	17 (9.0%)	4 (2.1%)	25 (13.3%)
1 to 5 years	8 (4.3%)	37 (19.3%)	10 (5.3%)	55 (29.3%)
More than 5 years	0 (0%)	41 (21.8%)	9 (4.3%)	50 (26.6%)
Total	32 (17.0%)	133 (70.7%)	23 (12.2%)	188 (100.0%)
$X^2 = 13.015, df= 4, p= .057$			$Cramer's V= .192, p= .214$	

Data in Table 5.5 indicates that 73 (38.8%) of the principals never had experience in ICT use, 62 (33.0%) had experience of less than a year, 43 (22.9%) had experience of 1 to 5 years and 10 (5.3%) had experience of more than 5 years. This implies that implementing an ICT literacy development program in the Western province should be considered because several principals have no experience with ICT. The Pearson Chi-square indicates that there is no statistically significant difference ($p > .05$) among principals of various years of experience with ICT in terms of their ICT literacy levels. Cramer's V shows a statistically weak association between the period of experience with ICT use and literacy of a principal. It can be concluded that the period of experience with ICT use is a not a statistically significant factor influencing ICT literacy among principals in the Western province. Veenhof *et al.* (2005: 8) reports that the years of experience of a worker with ICTs sometimes determines effectiveness of ICT use in organisational operations.

5.2.6 Distribution of respondents by distance of the school from the nearest town

The distribution of respondents by distance of the school from the nearest town is shown in Table 5.6.

Table 5.6: Distribution of respondents by distance of the school from the nearest town

Distance of the school from the nearest town	ICT Literacy level			Total
	Low	Moderate	High	
More than 10 kilometres	22 (11.7%)	49 (26.1%)	7 (3.7%)	78 (41.5%)
5 to 10 kilometres	10 (5.3%)	39 (20.7%)	8 (4.3%)	57 (30.3%)
Less than 5 kilometres	0 (.0%)	45 (23.9%)	8 (4.3%)	53 (28.2%)
Total	32 (17.0%)	133(70.7%)	23 (12.2%)	188 (100.0%)
$\chi^2 = 18.183, df= 4, p= .001$ $Cramer's V= .487, p= .000$				

Data in Table 5.6 indicates that 78 (41.5%) were rural schools (more than 10 km away from town), 57 (30.3%) were a few kilometres away from towns (5 to 10 km) and 53 (28.2%) of the schools are located in towns (less than 5 km). The Pearson Chi-square indicates that there is a statistically significant difference ($p < .05$) among principals in schools of various distances from the nearest town in terms of their ICT literacy levels. The data implies that most schools are rural; hence strategies for an ICT literacy development program for principals in the Western province should consider technology for rural areas. Cramer's V shows a statistically very strong association between the distance of a school from the nearest town and ICT literacy of a principal. It can be concluded that the distance of a school from the nearest town is a factor influencing ICT literacy among principals in the Western province. The conclusion supports Alampay (2003: 3) who claims that the distance of an education institution from a town centre influences the nature of its ICT infrastructure.

This section has provided an overview of the population distribution the researcher dealt with. Such data is important during the data analysis to show how socio-demographic factors may influence the ICT literacy skills of secondary school principals in the Western province of Kenya. The next section deals with the analyses based on the research aims and objectives of the study as stated in section 4.3.

5.3 DATA ANALYSIS ACCORDING TO RESEARCH OBJECTIVES

5.3.1 Introduction

This section focuses on the findings of the study in relation to the research objectives which aim to answer the main research question: What is the extent of ICT literacy among secondary school principals in the Western province of Kenya? As indicated in section 4.10, data analysis was done using descriptive and inferential statistics to analyse the quantitative data. The analysis for some challenges and strategies for ICT literacy development among secondary school principals of the Western province of Kenya was done qualitatively as the items in questionnaire 1 (Appendix D1) were open-ended. The researcher summarised the challenges and strategies as per the responses from the survey questionnaire and the views of principals about ICT literacy from the interview schedule (Appendix D3). The section that follows shows the analyses organised according to the study objectives.

The section is divided into six subsections in which the responses in tabular form answer the first research question: what is the level of ICT literacy among secondary school principals of the Western Province of Kenya? In addition, data in the tables, also answer the third research question: what is the relationship between the ICT literacy level of a principal and school performance? In each table a calculation of Spearman's rho correlation co-efficient is provided to show the degree of the relationship between the specified aspect of ICT literacy and school performance. The aspects of ICT literacy included ICT access, knowledge and application.

The discussions that follow each correlation coefficient answer the fourth research question: What is the role of ICT literacy in improving school performance? Each of the subsections concludes with hypothesis testing (see section 4.4). The results of hypothesis testing are presented using bar graphs and Spearman's correlation co-efficient (rho). The correlation co-efficient was used in order to show the degree of the statistical relationship between the level of ICT literacy of a principal and the level of school performance. In the study ICT literacy was determined in terms of ICT access, ICT knowledge and ICT application in school leadership functions as indicated in questionnaire 1 (Appendix D1). At the same time, the level of school performance was equated to the school performance index, which was determined as the totality

of the six performance measures namely: product outcomes, student-focused outcomes, financial and market outcomes, workforce-focused outcomes, process effectiveness outcomes and leadership outcomes as indicated in questionnaire 2 (Appendix D2). The interpretation of the data analysis is structured according to research aims as indicated in section 4.3.

5.3.2 The relationship between ICT access of a principal and school performance

This section discusses the ICT access of a principal and school performance in the Western province of Kenya in relation to the theoretical findings of this study. The objective is to establish the relationship between the ICT access of a principal and school performance. In this study ICT access means the availability of ICT hardware and software to secondary school principals as indicated in section 3.3.2.1. The ICT hardware includes electricity infrastructure, computer, Internet/e-mail infrastructure, school telephone, digital/video camera, printer, scanner, fax machine, copier, surveillance camera and projector. The ICT software includes word processing, spreadsheets, databases, e-mail/Internet and PowerPoint.

The study also investigated the level of school performance determined in terms of product outcomes, student-focused outcomes, financial and market outcomes, workforce-focused outcomes, process effectiveness outcomes and leadership outcomes as discussed in section 4.10.2. The level of school performance was determined by converting the responses to a school performance index which was then correlated with each aspect of ICT access. The data for the conversion was obtained from questionnaire 2 (Appendix D2) which had 30 items and the researcher quantified the levels of school performance as an index as follows: 1 – poor, 2 – average, 3 – good. This conversion was done using SPSS. From this information it is assumed that a principal's access to ICT facilities enhances leadership quality, which can influence school performance.

The data for this research objective was obtained from item 7 of the survey questionnaire 1 (Appendix D1) and item 1 of the observation schedule (Appendix D4). The study required secondary school principals to respond to item 7 in questionnaire 1 to show their access to hardware and software by indicating No = 1 or Yes = 2. Deputy principals responded to all items of questionnaire 2 (Appendix D2) by indicating Strongly Disagree = 1, Disagree = 2, Undecided

= 3, Agree = 4 and Strongly Agree = 5. In order to show the variation in their responses, the data was summarised in terms of frequencies of the responses for access to ICT hardware and software and presented in tabular form (Tables 5.7(a) to 5.7(k) and Tables 5.8(a) to 5.8 (d)). The level of school performance was equivalent to the school performance index which was determined by converting responses from questionnaire 2 (Appendix D2) to a scale: Poor = 1, Average = 2, Good = 3. Data obtained for ICT access are discussed in the subsections that follow and are recorded as frequencies (N) and percentage (%).

5.3.2.1 Access to ICT hardware

The current study investigated the relationship between access to each ICT hardware item mentioned and school performance as indicated in the subsections that follow.

5.3.2.1.1 Access to electricity infrastructure

This study investigates whether there is a relationship between electricity infrastructure access of a principal in school and the level of school performance. The distribution of responses is summarised in Table 5.7 (a).

Table 5.7(a): Relationship between access to electricity infrastructure and school performance

ICT hardware	Response	Frequency	School performance index			Total
			Poor	Average	Good	
Electricity infrastructure	No	N	47	15	7	69
		%	25.0%	8.0%	3.7%	36.7%
	Yes	N	32	31	56	119
		%	17.0%	16.5%	29.8%	63.3%
Total		N	79	46	63	188
		%	42.0%	24.5%	33.5%	100.0%
		Spearman's correlation co-efficient (r= .436, p = .000)				

Data in Table 5.7 (a) indicates that 119 (63.3%) of principals had access to electricity infrastructure, while 69 (36.7%) did not. Data from the observation schedule (Appendix D4) indicated that most rural schools had recently acquired electricity infrastructure through the Kenya rural electrification programme. There was a statistically significant strong positive

relationship ($p < .05$) between access to electricity and school performance and the effect size ($r = .436$) was big. This implies that a principal's access electricity infrastructure in a school plays a role in influencing school performance.

5.3.2.1.2 Access to computer

This study investigated the relationship between a principal's access to a computer and the level of school performance. The distribution of responses is summarised in Table 5.7 (b).

Table 5.7(b): Relationship between access to a computer and school performance

ICT hardware	Response	Frequency	School performance index			Total
			Poor	Average	Good	
Computer	No	N	48	18	18	84
		%	25.5%	9.6%	9.6%	44.7%
	Yes	N	31	28	45	104
		%	16.5%	14.9%	23.9%	55.3%
Total		N	79	46	63	188
		%	42.0%	24.5%	33.5%	100.0%
		Spearman's correlation co-efficient ($r = .428, p = .000$)				

Data in Table 5.7 (b) indicates that good performance in a school varied with the principal's access to a computer. There were 104 (55.3%) principals who had access to a computer, while 84 (44.7%) did not. However, from the observation schedule it was noted that in five of the poorly performing schools, the computers were not yet in use as schools had only recently obtained electricity through the rural electrification program. It was also noted from the observation schedule that in two of the poorly performing schools, there was no electricity, but the schools used diesel generators as a source of energy for their computers and in one other school there were solar panels used as a source of energy. Data from the observation schedule also showed that some principals in well performing schools had computers in their offices and most of those in poorly performing schools did not. There was a statistically significant strong positive relationship ($p < .05$) between a principal's access to a computer and school performance and the effect size ($r = .428$) was big. This implies that a principal's access to a computer plays a role in influencing school performance.

5.3.2.1.3 Access to Internet/e-mail infrastructure

This study investigated the relationship between a principal's access to Internet/e-mail in school and overall school performance. The distribution of responses is summarised in Table 5.7 (c).

Table 5.7(c): Relationship between access to Internet/e-mail infrastructure and school performance

ICT hardware	Response	Frequency	School performance index			Total
			Poor	Average	Good	
Internet/ e-mail infrastructure	No	N	2	11	17	30
		%	1.1%	5.9%	9.0%	16.0%
	Yes	N	77	35	46	158
		%	41.0%	18.6%	24.5%	84.0%
Total		N	79	46	63	188
		%	42.0%	24.5%	33.5%	100.0%
		Spearman's correlation co-efficient (r= .298, p= .000)				

Data in Table 5.7 (c) indicates that 158 (84.0%) of principals had access to Internet/e-mail infrastructure in their schools, while 30 (16.0%) did not. From the observation schedule, only five schools had Internet/e-mail connection from a landline, about eighty three used wireless networks on computers and the rest used their mobile phones to access the Internet. From the interview schedule, one principal said, *whenever there is need for serious information from the Internet, I usually go to cyber cafes in town.* Some of the principals attributed the lack of Internet/e-mail access in schools to the newness of the mode of technology in educational institutions. There was a statistically significant very weak positive relationship ($p < .05$) between a principal's access to Internet/e-mail infrastructure and school performance and the effect size ($r = .298$) was moderate. The proportions of the numbers in Table 5.7 (c) imply that access to Internet/e-mail infrastructure is not closely associated with school performance; hence Internet/e-mail access to a principal can play a minimal role in influencing school performance. Contrary to these findings, Mahmud and Ismail (2008:5) argue that access to Internet facilities, ICT equipment and multimedia facilities play an important role and influence the integration of ICT in general organisational operations.

5.3.2.1.4 Access to the school telephone

This study investigated whether there is a relationship between a principal’s access to the school telephone and school performance. The distribution of responses is summarised in Table 5.7 (d).

Table 5.7(d): Relationship between access to the school telephone and school performance

ICT hardware	Response	Frequency	School performance index			Total
			Poor	Average	Good	
School telephone	No	N	47	12	4	63
		%	25.0%	6.4%	2.1%	33.5%
	Yes	N	32	34	59	125
		%	17.0%	18.1%	31.4%	66.5%
Total		N	79	46	63	188
		%	42.0%	24.5%	33.5%	100.0%
		Spearman’s correlation co-efficient ($r = .192, p = .471$)				

Data in Table 5.7 (d) indicates that the majority of schools 125 (66.5%) had school telephones, while 63 (33.5%) had no school telephones. The proportion indicates that most schools with a high school performance index had a school telephone, but 47 of the poorly performing schools did not have a school telephone. The observation schedule shows that the principals in schools without telephones used their mobile phones to communicate on most school matters. In ten of the average performing schools, there were old landlines which were not operational. It was however notable that in all the 188 (100%) schools, there was a phone which either belonged to the school or to the principal. There was a statistically non-significant very weak positive relationship ($p > .05$) between access to a school telephone and school performance and the effect size ($r = .192$) was small. This implies that a principal’s access to a telephone plays a very small role in influencing school performance, because school performance does not vary to a large extent with telephone access to a principal.

5.3.2.1.5 Access to Digital/Video camera

The current study investigated the relationship between a principal’s access to the digital/video camera and school performance. The distribution of responses is summarised in Table 5.7 (e).

Table 5.7(e): Relationship between access to a digital/video camera and school performance

ICT hardware	Response	Frequency	School performance index			Total
			Poor	Average	Good	
Digital/video camera	No	N	79	45	48	172
		%	42.0%	23.9%	25.5%	91.5%
	Yes	N	0	1	15	16
		%	0%	0.5%	8.0%	8.5%
Total		N	79	46	63	188
		%	42.0%	24.5%	33.5%	100.0%
Spearman's correlation co-efficient ($r = .356, p = .000$)						

Data in Table 5.7 (e) shows that only 16 (8.5%) had access to digital/video cameras in their schools while the rest 172 (91.5%) had none. There was a statistically significant weak positive relationship ($p < .05$) between a principal's access to a digital/video camera and school performance and the effect size ($r = .356$) was moderate. This implies that the access to the cameras is positively associated with school performance, but a principal's access plays a role in influencing school performance to a small extent. Mahmud and Ismail (2008: 4) assert that teachers need to be exposed to the latest updates in ICT such as access to digital cameras for multimedia-based teaching and learning in order to improve on their ICT literacy.

5.3.2.1.6 Access to a printer

This study investigated the relationship between a principal's access to a printer and school performance. The distribution of responses is summarised in Table 5.7 (f).

Table 5.7(f): Relationship between access to a printer and school performance

ICT hardware	Response	Frequency	School performance index			Total
			Poor	Average	Good	
Printer	No	N	40	25	3	68
		%	21.3	13.3	1.6	36.2
	Yes	N	39	21	60	120
		%	20.7	11.2	31.9	63.8
Total		N	79	46	63	188
		%	42.0%	24.5%	33.5%	100.0%
Spearman's correlation co-efficient ($r = .436, p = .000$)						

Data in Table 5.7 (f) indicates that most principals 120 (63.8%) had access to printers in their schools, while 68 (36.2%) had none. It was noted from the observation schedule that printers were available in schools which had computers and electricity and were almost in equivalent proportions. The frequencies indicate that well performing schools had more printers compared to the poorly performing schools. There was a statistically significant strong positive relationship ($p < .05$) between a principal's access to a printer and school performance, where the effect size ($r = .436$) was big. This implies that access to a printer plays a big role in influencing school performance, because printing documents like receipts, examinations and school reports enhances effectiveness in school operations.

5.3.2.1.7 Access to a scanner

This study investigated whether there is a relationship between a principal's access to a scanner and school performance. The distribution of responses is summarised in Table 5.7 (g).

Table 5.7(g): Relationship between access to a scanner and school performance

ICT hardware	Response	Frequency	School performance index			Total
			Poor	Average	Good	
Scanner	No	N	73	27	47	147
		%	38.8%	14.4%	25.0%	78.2%
	Yes	N	6	19	16	41
		%	3.2%	10.1%	8.5%	21.8%
Total		N	79	46	63	188
		%	42.0%	24.5%	33.5%	100.0%
		Spearman's correlation co-efficient ($r = .210$, $p = .004$)				

Data in Table 5.7 (g) shows that majority of principals did not have scanners and only 41 (21.8%) had scanners in their schools. From the observation schedule only thirty five principals had working scanners, while six had access to scanners which were not operational. There is a statistically significant weak positive relationship ($p < .05$) between a principal's access to a scanner and school performance, where the effect size ($r = .210$) was moderate. This implies that a principal's access to a scanner plays a small role in influencing school performance.

5.3.2.1.8 Access to a fax machine

This study investigated whether there is a relationship between a principal's access to a fax machine and school performance. The distribution of responses is summarised in Table 5.7 (h).

Table 5.7(h): Relationship between access to a fax machine and school performance

ICT hardware	Response	Frequency	School performance index			Total
			Poor	Average	Good	
Fax machine	No	N	75	45	51	171
		%	39.9%	23.9%	27.1%	91.0%
	Yes	N	4	1	12	17
		%	2.1%	0.5%	6.4%	9.0%
Total		N	79	46	63	188
		%	42.0%	24.5%	33.5%	100.0%
		Spearman's correlation co-efficient (r= .197, p= .007)				

Data in Table 5.7 (h) shows that most principals 171 (91.0%) did not have a fax machine in their schools and only 17 (9.0%) had. The data shows that the proportions varied with school performance. There was a statistically significant very weak positive relationship ($p < .05$) between a principal's access to a fax machine and school performance, where and the effect size ($r = .197$) was small. This implies that access to a fax machine plays a very small role in influencing school performance.

5.3.2.1.9 Access to a copier

This study investigated whether there is a relationship between a principal's access to a copier and school performance. The distribution of responses is summarised in Table 5.7 (i).

Table 5.7(i): Relationship between access to a copier and school performance

ICT hardware	Response	Frequency	School performance index			Total
			Poor	Average	Good	
Copier	No	N	65	30	21	116
		%	34.6%	16.0%	11.2%	61.7%
	Yes	N	14	16	42	72
		%	7.4%	8.5%	22.3%	38.3%
Total		N	79	46	63	188
		%	42.0%	24.5%	33.5%	100.0%
		Spearman's correlation co-efficient (r= .429, p= .000)				

Data in Table 5.7 (i) indicates only a few principals 72 (38.3%) had access to a copier while majority 116 (61.7%) did not. However, there was a high number 42 (38.3%) of principals in good performing schools compared to 14(7.4%) of the principals in poorly performing schools who had access to a copier. There was a statistically significant strong positive relationship ($p < .05$) between a principal's access to a copier and school performance, where the effect size ($r = .429$) was big. This implies that a principal's access to a copier plays a major role in influencing school performance.

5.3.2.1.10 Access to a surveillance camera

This study investigated whether there is a relationship between a principal's access to the surveillance camera and school performance. The distribution of responses is summarised in Table 5.7 (j).

Table 5.7(j): Relationship between access to a surveillance camera and school performance

ICT hardware	Response	Frequency	School performance index			Total
			Poor	Average	Good	
Surveillance camera	No	N	79	46	63	188
		%	42.0%	24.5%	33.5%	100.0%
Total		N	79	46	63	188
		%	42.0%	24.5%	33.5%	100.0%
		Spearman's correlation co-efficient was not found				

Data in Table 5.7 (j) indicates that none of the 188 (100%) principals had access to a surveillance camera in school. The observation schedule indicated that the schools employed security officers who communicate with the principal using a telephone installed at the gate or using mobile phones. This being the case, Spearman’s correlation could not be calculated because the value for the responses is a constant.

5.3.2.1.11 Access to a projector

This study investigated whether there is a relationship between a principal’s access to a projector and school performance. The distribution of responses is summarised in Table 5.7 (k).

Table 5.7(k): Relationship between access to a projector and school performance

ICT hardware	Response	Frequency	School performance index			Total
			Poor	Average	Good	
Projector	No	N	74	38	48	160
		%	39.4%	20.2%	25.5%	85.1%
	Yes	N	5	8	15	28
		%	2.7%	4.3%	8.0%	14.9%
Total		N	79	46	63	188
		%	42.0%	24.5%	33.5%	100.0%
		Spearman’s correlation co-efficient (r= .215, p= .003)				

Data in Table 5.7 (k) indicates that only 28 (14.9%) of school principals had access to a projector, but the rest 160 (85.1%) did not. In the observation schedule it was notable that there were more projectors in well than in poorly performing schools. There was a statistically significant weak positive relationship ($p < .05$) between a principal’s access to a projector and school performance, where the effect size ($r = .215$) was moderate. This implies that the access of a projector to principal played a role in influencing school performance, but to a small extent.

5.3.2.2 Access to ICT software among principals

The current study investigated whether there is a relationship between a principal’s access to ICT software and school performance. The software considered were word processing, spreadsheets, databases and PowerPoint.

5.3.2.2.1 Access to word processing

This study investigated whether there is a relationship between a principal's access to word-processing and school performance. The distribution of responses is summarised in Table 5.8 (a).

Table 5.8 (a): Relationship between access to word processing and school performance

ICT hardware	Response	Frequency	School performance index			Total
			Poor	Average	Good	
Word processing	No	N	53	19	7	79
		%	28.2%	10.1%	3.7%	42.0%
	Yes	N	26	27	56	109
		%	13.8%	14.4%	29.8%	58.0%
Total	N		79	46	63	188
	%		42.0%	24.5%	33.5%	100.0%
	Spearman's correlation co-efficient (r= .488, p= .000)					

Data in Table 5.8 (a) indicates that majority of principals 109 (58.0%) had access to word processing, while 79 (42.0%) did not. The observation schedule shows that most schools which had computers also had word processing installed. However, the values indicate that principals in poorly performing schools had less access 26(13.8%) than those in schools with good performance 56 (29.8%). There was a statistically significant strong positive relationship ($p < .05$) between a principal's access to word processing and school performance, where the effect size ($r = .488$) was very big. This implies that a principal's access to word processing plays a significant role in influencing school performance.

5.3.2.2.2 Access to spreadsheets

This study investigated whether there is a relationship between a principal's access to spreadsheets and school performance. The distribution of responses is summarised in Table 5.8 (b).

Table 5.8 (b): Relationship between access to spreadsheets and school performance

ICT hardware	Response	Frequency	School performance index			Total
			Poor	Average	Good	
Spreadsheets	No	N	66	20	13	99
		%	35.1%	10.6%	6.9%	52.7%
	Yes	N	13	26	50	89
		%	6.9%	13.8%	26.6%	47.3%
Total		N	79	46	63	188
		%	42.0%	24.5%	33.5%	100.0%
		Spearman's correlation co-efficient (r= .551, p= .000)				

Data in Table 5.8 (b) indicates that less than half of the principals 89 (47.3%) had access to spreadsheets, while a slightly higher number 99 (52.7%) of principals had no access to spreadsheets. However, the proportion of access to spreadsheets varied with school performance index where 50 (26.6%) principals in good performance schools had access to spreadsheets compared to only 13 (6.9%) in poor performance schools. There was a statistically significant very strong positive relationship ($p < .05$) between a principal's access to spreadsheets and school performance. The effect size ($r = .551$) was very big and this implies that a principal's access to spreadsheets plays a major role in influencing school performance.

5.3.2.2.3 Access to databases

This study investigated whether there is a relationship between a principal's access to databases and school performance. The distribution of responses is summarised in Table 5.8 (c).

Table 5.8 (c): Relationship between access to databases and school performance

ICT hardware	Response	Frequency	School performance index			Total
			Poor	Average	Good	
Databases	No	N	54	22	10	86
		%	28.7%	11.7%	5.3%	45.7%
	Yes	N	25	24	53	102
		%	13.3%	12.8%	28.2%	54.3%
Total		N	79	46	63	188
		%	42.0%	24.5%	33.5%	100.0%
		Spearman's correlation co-efficient (r= .451, p= .000)				

Data in Table 5.8 (c) indicates that most principals 102 (54.3%) had access to databases, while 86 (45.7%) did not. However, the proportion varied with school performance and there was a statistically significant strong positive relationship ($p < .05$) between a principal's access to databases and school performance. The effect size ($r = .451$) was big and this implies that a principal's access to databases plays a big role in influencing school performance.

5.3.2.2.4 Access to PowerPoint

This study investigated whether there is a relationship between a principal's access to PowerPoint and school performance. The distribution of responses is summarised in Table 5.8 (d).

Table 5.8 (d): Relationship between access to PowerPoint and school performance

ICT hardware	Response	Frequency	School performance index			Total
			Poor	Average	Good	
PowerPoint	No	N	67	22	15	104
		%	35.6%	11.7%	8.0%	55.3%
	Yes	N	12	24	48	84
		%	6.4%	12.8%	25.5%	44.7%
Total		N	79	46	63	188
		%	42.0%	24.5%	33.5%	100.0%
		Spearman's correlation co-efficient (r= .123, p= .004)				

Data in Table 5.8 (d) indicates that a few principals 84 (44.7%) had access to PowerPoint, while 104 (55.3%) did not and the proportion varied according to school performance index. There was a statistically significant very weak positive relationship ($p < .05$) between a principal's access to

PowerPoint and school performance. The effect size ($r = .123$) was very small and this implies that a principal's access to PowerPoint plays a very small role in influencing school performance.

5.3.2.3 Testing Hypothesis 1

Hypothesis 1: There is no statistically significant relationship between ICT access of a principal and school performance.

The overall ICT access to a principal was determined by combining the responses for the access to ICT hardware and software. The values of the responses for ICT access were converted to an index: Low = 1, High = 2 in order to determine the level of ICT access. The level of school performance was equivalent to the school performance index which was determined by converting responses from questionnaire 2 (Appendix D2) to a scale: Poor = 1, Average = 2, Good = 3. The conversion was done using the Statistical Package for Social Sciences (SPSS). In order to test the statistical relationship between ICT access of a principal and school performance, the null hypothesis 1 was tested. The statistical relationship between a principal's ICT access and school performance was shown using a bar graph as indicated in Chart 5.1.

Chart 5.1: Relationship between ICT access of a principal and school performance

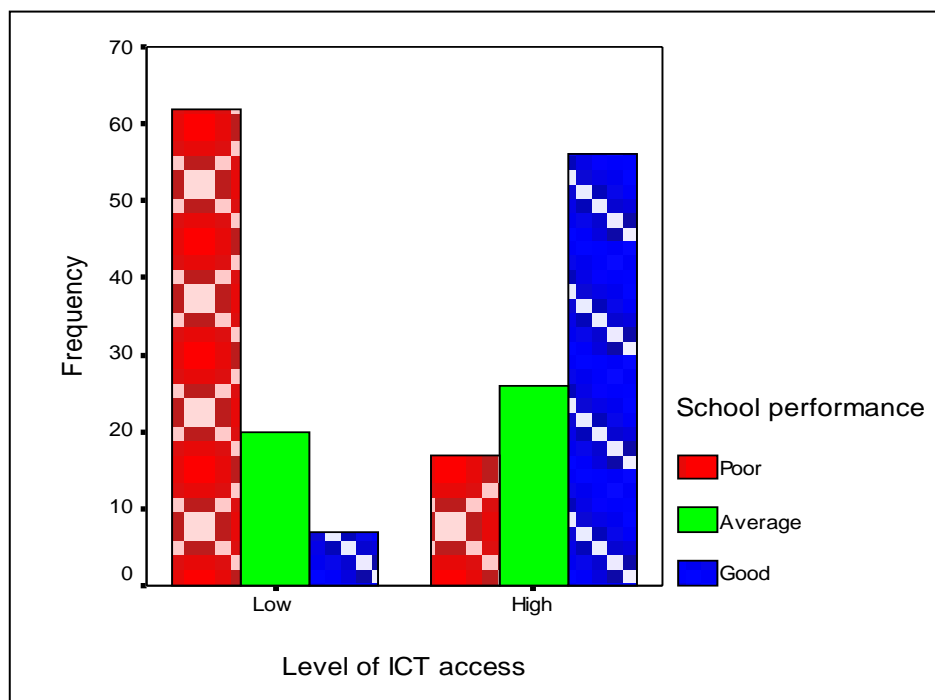


Chart 5.1 indicates that when the level of ICT access was very low, the performance index was poor, when the ICT access was very high; the performance index was also high. Responses from item 3 of the interview schedule (Appendix D3) indicated that some principals viewed access to ICT to indirectly influence school performance. For example, one male principal from a highly achieving school declares that.....*when I am accessible to ICT in school it means the school community is also accessible, hence anybody competent can use the available facilities to improve on school operations.* However, another female interviewee differs that..... *my lack of access to ICT in this school has not had an effect on leadership quality, therefore has not influenced school performance. It is the ability of my learners and their social-economic background that influences our level of school performance.*

The data was further tested to investigate the degree of the statistical relationship between the level of ICT access and school performance. This was done using Spearman's rho correlation coefficient at 0.05 significance level and it yielded $r = .584$, $p = .000$. There was a statistically significant strong positive relationship between ICT access of a principal and school performance in the Western province of Kenya. Since the significance level is low ($p < .05$), the null hypothesis that there is no statistically significant relationship between ICT access to a principal and school performance is therefore rejected. This concurs with a study done in South England that the high levels of ICT access to school staff were proportional to institutional performance (Selwood *et al.*, 2003: 142).

5.3.3 The relationship between ICT knowledge of a principal and school performance

This section discusses the ICT knowledge of a principal and school performance in the Western province in relation to the theoretical findings of this study. The objective is to establish the relationship between ICT knowledge of a principal and school performance. In this study, ICT knowledge meant the ability of a principal to perform specified ICT tasks and frequency of use of the ICT tasks, namely ability to start and shut down a computer, send and receive an e-mail, word processing, spreadsheets, databases and PowerPoint (see section 3.3.2.2).

The data for this research objective was obtained through items 8 and 9 of the survey questionnaire 1 (Appendix D1) and all items of questionnaire 2 (Appendix D2). It is assumed that

a principal's knowledge of ICT facilities positively influences school performance in terms of product outcomes, student-focused outcomes, financial and market outcomes, workforce-focused outcomes, process effectiveness outcomes and leadership outcomes. Data obtained for ICT knowledge are discussed in the subsections that follow and recorded as frequencies (N) and percentage (%).

5.3.3.1 Ability of a principal to perform specified ICT tasks

The principals responded to item 8 in questionnaire 1 by indicating Strongly Disagree = 1 Disagree = 2, Undecided = 3, Agree = 4 and Strongly Agree = 5 to show their agreement with the given statements. In order to show the variation in their responses, the data was summarised in tabular form and explained in the sub-sections that follow.

5.3.3.1.1 Ability to start and shut down a computer

This study investigated the relationship between the ability of a principal to start and shut down a computer and school performance. The distribution of responses is recorded in Table 5.9 (a).

Table 5.9 (a): Relationship between ability to start and shut down a computer and school performance

Ability to use ICT	Response	Frequency	School performance index			Total
			Poor	Average	Good	
Start and shut down a computer	Strongly Disagree	N	38	15	11	64
		%	20.2%	8.0%	5.9%	34.0%
	Disagree	N	4	0	6	10
		%	2.1%	.0%	3.2%	5.3%
	Undecided	N	18	6	17	41
		%	9.6%	3.2%	9.0%	21.8%
	Agree	N	11	11	4	26
		%	5.9%	5.9%	2.1%	13.8%
	Strongly Agree	N	8	14	25	47
		%	4.3%	7.4%	13.3%	25.0%
	Total	N	79	46	63	188
		%	42.0%	24.5%	33.5%	100.0%
Spearman's correlation co-efficient (r= .306, p= .000)						

Data in Table 5.9(a) indicates that 47 (25.0%) strongly agreed, 26 (13.3%) agreed, a reasonable number 41 (21.8%) were undecided and 74 (39.3%) disagreed that they could start or shut down a computer. From the interview schedule item 2, a female principal from a highly achieving school mentioned...*the most important ICT skill for me is to know how to use a computer from its basics. This will enable me learn the computer packages easily.* A male principal from a poorly achieving school laments.... *how can I know the most important ICT skill when I do not own any computer at home and in school.* It was interesting to note one principal from a highly achieving school comment that...*he was not interested in knowing the most important ICT skills, because after all, the school had been doing well even without him knowing any ICT skills.*

The proportions show that school performance varied with ability to start and shut down a computer and there was a statistically significant weak positive relationship ($p < .05$) between the ability of a principal to start and shut down a computer and school performance. The effect size ($r = .306$) was moderate and this implies that the ability of a principal to start and shut down a computer plays a role in school performance, but to a small extent. Valle (2007:2) mentions that technologically updated school leadership is the most influential to student learning, because such leaders understand how to balance growth through change and are technologically knowledgeable.

5.3.3.1.2 Ability to use Internet/e-mail

This study investigated the relationship between the ability of a principal to use the Internet/e-mail and school performance. The distribution of responses is indicated in Table 5.9 (b).

Table 5.9(b): Relationship between ability to use Internet/e-mail and school performance

Ability to use ICT	Response	Frequency	School performance index			Total	
			Poor	Average	Good		
Send and receive an e-mail	Strongly Disagree	N	25	21	21	67	
		%	13.3%	11.2%	11.2%	35.6%	
	Disagree	N	28	1	10	39	
		%	14.9%	.5%	5.3%	20.7%	
	Undecided	N	25	11	13	49	
		%	13.3%	5.9%	6.9%	26.1%	
	Agree	N	1	9	15	25	
		%	.5%	4.8%	8.0%	13.3%	
	Strongly Agree	N	0	4	4	8	
		%	.0%	2.1%	2.1%	4.3%	
	Total		N	79	46	63	188
			%	42.0%	24.5%	33.5%	100.0%
Spearman's correlation co-efficient (r= .157, p= .031)							

Data in Table 5.9 (b) indicates that a small number 8 (4.3%) strongly agreed, 25 (13.3%) agreed, 49 (26.1%) were undecided, 39 (20.7%) disagreed and 67 (35.6%) strongly disagreed. The frequencies show that there is small difference in the ability of a principal to receive and send an e-mail in the poorly, average and well performing schools. Responses from item 2 of the interview schedule (Appendix D3) indicated that despite most principals being accessible to Internet/e-mail facilities, only a few were keen on using them. They attributed this to lack of skills to use the Internet and e-mail. From the interview schedule, most principals felt that it was necessary to learn how to send and receive an e-mail. For instance one principal felt that ... *I wish the government would introduce compulsory courses for learning e-mail and Internet skills as the most important ICT skills for principals.*

The distribution of responses indicated that there was a statistically significant very weak positive relationship ($p < .05$) between the ability of a principal to use Internet/e-mail and school performance. The effect size ($r = .157$) was very small and this implies that the ability of a principal to use Internet/e-mail is plays a negligible role in influencing school performance. Contrary to these findings, Ponte *et al.* (2002:112) report in their survey that the development of digital mediums and new technology implies that it is important that school principals acquire new forms of digital literacy like Internet use to function well in the teaching profession.

5.3.3.1.3 Ability to use word processing

This study investigated the relationship between the ability of a principal to use word processing and school performance. The distribution of responses is indicated in Table 5.9(c)

Table 5.9(c): Relationship between ability to use word processing and school performance

Ability to use ICT	Response	Frequency	School performance index			Total
			Poor	Average	Good	
Word processing	Strongly Disagree	N	36	16	11	63
		%	19.1%	8.5%	5.9%	33.5%
	Disagree	N	6	0	9	15
		%	3.2%	0%	4.8%	8.0%
	Undecided	N	18	6	17	41
		%	9.6%	3.2%	9.0%	21.8%
	Agree	N	13	13	7	33
		%	6.9%	6.9%	3.7%	17.6%
	Strongly Agree	N	6	11	19	36
		%	3.2%	5.9%	10.1%	19.1%
	Total	N	79	46	63	188
		%	42.0%	24.5%	33.5%	100.0%
Spearman's correlation co-efficient ($r = .457, p = .000$)						

Data in Table 5.9 (c) indicates that 36 (19.1%) strongly agreed, 33 (17.6%) agreed, 41 (21.8%) were undecided, 15 (8.0%) disagreed and 63 (33.5%) strongly disagreed. The proportions imply that a larger number of principals (26 – 13.8 %) in schools with good performance than in poorly performing schools (19 – 10.1%) have the ability to use word processing. Responses from the interview schedule (Appendix D3) show that majority of principals suggested that word processing was the most important ICT skill, because it can help one to typing and keep documents confidential. There was a statistically significant strong positive relationship ($p < .05$) between the ability of a principal to use word processing and school performance. The effect size ($r = .457$) was big and this implies that the ability of a principal to use word processing is associated with good performance; hence it plays a big role in influencing school performance.

5.3.3.1.4 Ability to use spreadsheets

This study investigated the relationship between the ability of a principal to use spreadsheets and school performance. The distribution of responses is indicated in Table 5.9(d)

Table 5.9 (d): Relationship between ability to use spreadsheets and school performance

Ability to use ICT	Response	Frequency	School performance index			Total	
			Poor	Average	Good		
Spreadsheets	Strongly Disagree	N	33	15	8	56	
		%	17.6%	8.0%	4.3%	29.8%	
	Disagree	N	9	0	9	18	
		%	4.8%	.0%	4.8%	9.6%	
	Undecided	N	23	13	12	48	
		%	12.2%	6.9%	6.4%	25.5%	
	Agree	N	12	9	10	31	
		%	6.4%	4.8%	5.3%	16.5%	
	Strongly Agree	N	2	9	24	35	
		%	1.1%	4.8%	12.8%	18.6%	
	Total		N	79	46	63	188
			%	42.0%	24.5%	33.5%	100.0%
		Spearman's correlation co-efficient (r= .373, p= .000)					

Data in Table 5.9 (d) indicates that 35 (18.6%) strongly agreed, 31 (16.5%) agreed, 48 (25.5%) were undecided, 18(9.65%) disagreed and 56 (29.8%) strongly disagreed. The proportions imply that a relatively large number 34 (18.1 %) principals in schools with good performance have the ability to use spreadsheets compared to 14 (7.5%) principals in poor performance schools. A female principal from a badly performing school regretted not having spreadsheets like Excel because it would assist greatly in managing school finance. The majority of those interviewed felt that using spreadsheets should be among those ICT skills considered most important. However, it was noted that in several schools spreadsheets were accessible, but were used by the secretaries, accountants and computer technicians in the schools, but not by the principals. There was a statistically significant weak positive relationship ($p < .05$) between the ability of a principal to use spreadsheets and school performance. The effect size ($r = .373$) was moderate and this implies that the ability of a principal to use spreadsheets plays a role in influencing school performance, but to a small extent.

5.3.3.1.5 Ability to use databases

This study investigated the relationship between the ability of a principal to use databases and school performance. The distribution of responses is recorded in Table 5.9(e).

Table 5.9(e): Relationship between ability use databases and school performance

Ability to use ICT	Response	Frequency	School performance index			Total	
			Poor	Average	Good		
Databases	Strongly Disagree	N	13	11	15	39	
		%	6.9%	5.9%	8.0%	20.7%	
	Disagree	N	37	14	14	65	
		%	19.7%	7.4%	7.4%	34.6%	
	Undecided	N	26	18	22	66	
		%	13.8%	9.6%	11.7%	35.1%	
	Agree	N	3	1	11	15	
		%	1.6%	0.5%	5.9%	8.0%	
	Strongly Agree	N	0	2	1	3	
		%	.0%	1.1%	.5%	1.6%	
	Total		N	79	46	63	188
			%	42.0%	24.5%	33.5%	100.0%
		Spearman's correlation co-efficient (r= .113, p= .123)					

Data in Table 5.9 (e) indicates that 3 (1.6%) strongly agreed, 15 (8.0%) agreed, 66 (35.1%) were undecided, 65 (34.6%) disagreed and 39 (20.7%) strongly disagreed that they could use databases. There were interesting responses from item 2 of the interview schedule (Appendix D3). A principal from a low achieving school was amused at the idea, saying *...how can I rate the importance of something I have no idea about? I don't know what databases are and not interested in knowing them.* Another one from a similar school was hopeful that he knows how to use databases because he had seen in a neighbouring school where the timetable and learners reports were easily made using databases. A principal from a highly achieving school argued, *I have ensured that databases are updated in my school, but not interested in learning them because such skills are for computer technicians and secretaries.* There was a statistically non-significant very weak positive relationship ($p > .05$) between the ability of a principal to use databases and school performance. The effect size ($r = .113$) was very small and this implies that the ability of a principal to use databases plays a no role in influencing school performance.

5.3.3.1.6 Ability to use PowerPoint

This study investigated the relationship between the ability of a principal to use PowerPoint and school performance. The distribution of responses is recorded in Table 5.9 (f).

Table 5.9(f): Relationship between ability to use PowerPoint and school performance

Ability to use ICT	Response	Frequency	School performance index			Total
			Poor	Average	Good	
PowerPoint	Strongly Disagree	N	32	17	14	63
		%	17.0%	9.0%	7.4%	33.5%
	Disagree	N	20	16	17	53
		%	10.6%	8.5%	9.0%	28.2%
	Undecided	N	22	9	13	44
		%	11.7%	4.8%	6.9%	23.4%
	Agree	N	4	2	15	21
		%	2.1%	1.1%	8.0%	11.2%
	Strongly Agree	N	1	2	4	7
		%	.5%	1.1%	2.1%	3.7%
	Total	N	79	46	63	188
		%	42.0%	24.5%	33.5%	100.0%
Spearman's correlation co-efficient (r= .215, p= .003)						

Data in Table 5.9 (f) indicates that 7 (3.7%) strongly agreed, 21 (11.2%) agreed, 44 (23.4%) were undecided, 53 (28.2%) disagreed and 63 (33.5%) strongly disagreed that principals had the ability to use PowerPoint. From the interview responses, some principals felt that PowerPoint should be available in schools and learnt by teachers to assist in curriculum implementation. There was a statistically significant very weak positive relationship ($p < .05$) between the ability of a principal to use PowerPoint and school performance. The effect size ($r = .215$) was small and this implies that the ability of a principal to use PowerPoint plays a role in enhancing school performance, but to a very small extent.

5.3.3.2 Frequency of ICT use

For this variable, the principals responded to item 9 in questionnaire 1 by indicating Never = 1, Rarely = 2, Occasionally = 3 and Frequently = 4 to show their frequency of use of the specified ICT tasks.

5.3.3.2.1 Frequency of starting and shutting down a computer

The study investigated the relationship between a principal's frequency of starting and shutting down a computer and school performance. The distribution of responses is recorded in Table 5.10 (a).

Table 5.10 (a): Relationship between frequency of starting and shutting down a computer and school performance

Frequency of ICT use	Response	Frequency	School performance index			Total
			Poor	Average	Good	
Desktop computer	Never	N	52	19	22	93
		%	27.7%	10.1%	11.7%	49.5%
	Rarely	N	4	0	6	10
		%	2.1%	0%	3.2%	5.3%
	Occasionally	N	10	1	9	20
		%	5.3%	0.5%	4.8%	10.6%
	Frequently	N	13	26	26	65
		%	6.9%	13.8%	13.8%	34.6%
Total		N	79	46	63	188
		%	42.0%	24.5%	33.5%	100.0%
		Spearman's correlation co-efficient (r= .280, p= .000)				

Data in Table 5.10 (a) indicates that 65 (34.6%) principals frequently started and shut down a computer, 20 (10.6%) occasionally did, 10 (5.3%) rarely did and the majority 93 (49.5%) never started and shut down a computer. The proportions show that principals in good performance schools used computers more frequently than those in poor performance schools. There was a statistically significant weak positive relationship ($p < .05$) between a principal's frequency of starting and shutting down a computer and school performance. The effect size ($r = .280$) was small and this implies that the frequency of starting and shutting down a computer plays a role in influencing school performance, but to a small extent.

5.3.3.2.2 Frequency of Internet/e-mail use

The study investigated the relationship between a principal's frequency of Internet/e-mail use and school performance. The distribution of responses is recorded in Table 5.10 (b).

Table 5.10 (b): Relationship between frequency of Internet/e-mail use and school performance

Frequency of ICT use	Response	Frequency	School performance index			Total	
			Poor	Average	Good		
Internet/e-mail	Never	N	77	35	46	158	
		%	41.0%	18.6%	24.5%	84.0%	
	Rarely	N	1	2	2	5	
		%	0.5%	1.1%	1.1%	2.7%	
	Occasionally	N	1	5	11	17	
		%	0.5%	2.7%	5.9%	9.0%	
	Frequently	N	0	4	4	8	
		%	0%	2.1%	2.1%	4.3%	
	Total		N	79	46	63	188
			%	42.0%	24.5%	33.5%	100.0%
			Spearman's correlation co-efficient (r= .162, p= .000)				

Data in Table 5.10 (b) indicates the principals' responses as 8 (4.3%) frequently, 17 (9.0%) occasionally, 5 (2.7%) rarely and 158 (84.0%) never used the Internet/e-mail in school. There was a statistically significant weak positive relationship ($p < .05$) between a principal's frequency of Internet/e-mail use and school performance. The effect size ($r = .162$) was very small and this implies that a principal's frequency of Internet/e-mail use plays a small role in influencing school performance. Similarly, a study done in Australia confirmed that there was a strong correlation between frequency of teachers' Internet and learner performance (Katz & Macklin, 2008: 53). They conclude that teachers believed that the frequent interaction with the Internet improved their ICT literacy skills.

5.3.3.2.3 Frequency of word processing use

The study investigated the relationship between a principal's frequency of word processing use and school performance. The distribution of responses is recorded in Table 5.10 (c).

Table 5.10 (c): Relationship between frequency of word processing use and school performance

Frequency of ICT use	Response	Frequency	School performance index			Total
			Poor	Average	Good	
Word processing	Never	N	54	21	9	84
		%	28.7%	11.2%	4.8%	44.7%
	Occasionally	N	14	12	29	55
		%	7.4%	6.4%	15.4%	29.3%
	Frequently	N	11	13	25	49
		%	5.9%	6.9%	13.3%	26.1%
Total		N	79	46	63	188
		%	42.0%	24.5%	33.5%	100.0%
		Spearman's correlation co-efficient (r= .505, p= .000)				

Data in Table 5.10 (c) shows principals' responses that 49 (26.1%) frequently used word processing, 55 (29.3%) occasionally used, none rarely used and 84 (44.7%) never used word processing. There was a statistically significant very strong positive relationship between a principal's frequency of word processing use and school performance. The effect size (r= .505) was very big and this implies that a principal's frequency of word processing use is associated with good school performance and plays a role in influencing it to a large extent.

5.3.3.2.4 Frequency of spreadsheets use

The study investigated the relationship between a principal's frequency of spreadsheets use and school performance. The distribution of responses is recorded in Table 5.10 (d).

Table 5.10(d): Relationship between frequency of spreadsheets use and school performance

Frequency of using ICT	Response	Frequency	School performance index			Total	
			Poor	Average	Good		
Spreadsheets	Never	N	54	21	9	84	
		%	28.7%	11.2%	4.8%	44.7%	
	Rarely	N	9	5	6	20	
		%	4.8%	2.7%	3.2%	10.6%	
	Occasionally	N	11	12	24	47	
		%	5.9%	6.4%	12.8%	25.0%	
	Frequently	N	5	8	24	37	
		%	2.7%	4.3%	12.8%	19.7%	
	Total		N	79	46	63	188
			%	42.0%	24.5%	33.5%	100.0%
			Spearman's correlation co-efficient (r= .434, p= .000)				

Data in Table 5.10 (d) shows that 37 (19.7%) frequently used spreadsheets, 47(25.0%) occasionally used, 20 (10.6%) rarely used and 84 (44.7%) never used spreadsheets. There was a statistically significant strong positive relationship between a principal's frequency of spreadsheets use and school performance. The effect size ($r = .434$) was big and this implies that the frequency of use of spreadsheets by a principal is associated with good performance; hence it plays a role in influencing school performance.

5.3.3.2.5 Frequency of databases use

This study investigated the relationship between a principal's frequency of databases use and school performance. The distribution of responses is recorded in Table 5.10 (e).

Table 5.10 (e): Relationship between frequency of databases use and school performance

Frequency of using ICT	Response	Frequency	School performance index			Total
			Poor	Average	Good	
Databases	Never	N	54	22	10	86
		%	28.7%	11.7%	5.3%	45.7%
	Rarely	N	18	11	38	67
		%	9.6%	5.9%	20.2%	35.6%
	Occasionally	N	6	4	0	10
		%	3.2%	2.1%	0%	5.3%
	Frequently	N	1	9	15	25
		%	0.5%	4.8%	8.0%	13.3%
Total		N	79	46	63	188
		%	42.0%	24.5%	33.5%	100.0%
		Spearman's correlation co-efficient (r= .143, p= .101)				

Data in the Table 5.10 (e) shows that 25 (13.3%) frequently used, 10 (5.3%) occasionally used, 67 (35.6%) rarely used and 86 (45.7%) never used databases. The proportions of the frequencies vary according to the school performance index and there was a statistically non-significant weak positive relationship ($p > .05$) between a principal's frequency of databases use and school performance. The effect size ($r = .143$) was very small and this implies that the frequency of databases use by a principal plays a minimal role in influencing school performance.

5.3.3.2.6 Frequency of PowerPoint use

The study investigated the relationship between a principal's frequency of PowerPoint use and school performance. The distribution of responses is recorded in Table 5.10 (f).

Table 5.10(f): Relationship between frequency of PowerPoint use and school performance

Frequency of using ICT	Response	Frequency	School performance index			Total
			Poor	Average	Good	
PowerPoint	Never	N	67	22	15	104
		%	35.6%	11.7%	8.0%	55.3%
	Rarely	N	11	16	20	47
		%	5.9%	8.5%	10.6%	25.0%
	Occasionally	N	0	4	15	19
		%	0%	2.1%	8.0%	10.1%
	Frequently	N	1	4	13	18
		%	0.5%	2.1%	6.9%	9.6%
Total		N	79	46	63	188
		%	42.0%	24.5%	33.5%	100.0%
		Spearman's correlation co-efficient ($r = .166, p = .215$)				

Data in Table 5.10 (f) shows that 18 (9.6%) frequently, 19 (10.1%) occasionally, 47 (25.0%) rarely and 104 (55.3%) never used PowerPoint. The proportions of the frequencies vary according to the school performance index and there was a statistically non-significant very weak positive relationship ($p > .05$) between the frequency of PowerPoint use by a principal and school performance. The effect size ($r = .166$) was very small and this implies that the frequency of ICT use by a principal does not play a role in influencing school performance.

5.3.3.3 Testing hypothesis 2

Hypothesis 2: There is no statistically significant relationship between the ICT knowledge of a principal and school performance.

The overall ICT knowledge of a principal was determined by combining responses for the ability of a principal to perform specified ICT tasks and frequency of their use. The values of the responses for ICT knowledge were converted to an index: Low = 1, Moderate = 2 and High = 3 in order to determine the level of ICT knowledge. The level of school performance was equivalent to the school performance index which was determined by converting responses from questionnaire 2 (Appendix D2) to a scale: Poor = 1, Average = 2, Good = 3. The conversion was done using the Statistical Package for Social Sciences (SPSS). In order to determine the statistical

relationship between ICT knowledge of a principal and school performance, the null hypothesis 2 was tested. The statistical relationship between a principal's ICT knowledge and school performance was shown using a bar graph as indicated in Chart 5.2.

Chart 5.2: Relationship between ICT knowledge of a principal and school performance

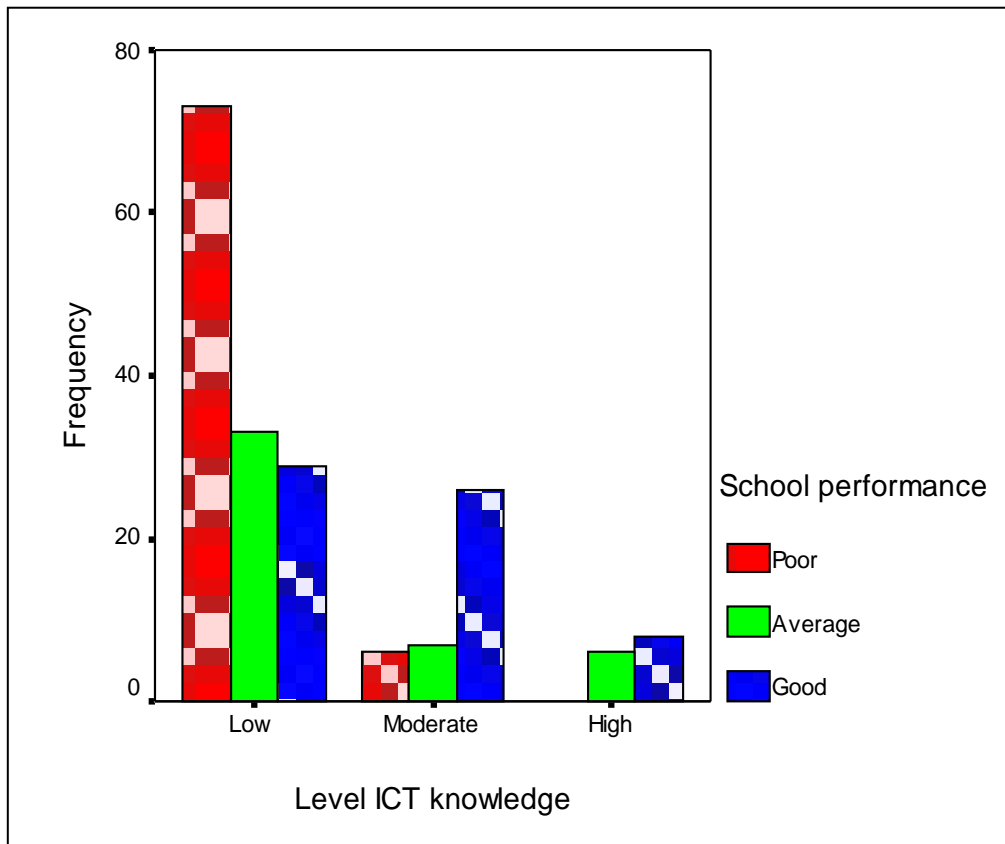


Chart 5.2 shows that when the level of ICT knowledge of a principal was low, the performance index of a school was poor, and when the level was moderate, the performance was index high. Responses from item 3 of the interview schedule (Appendix D3) indicated that some principals viewed their ICT knowledge to indirectly influence school performance. For instance, a principal from a highly achieving school claims that *...being knowledgeable has assisted me have a positive attitude towards ICT and made me encourage the entire school staff in using ICT. My ICT knowledge can therefore influence school performance.* However, it is notable from Chart 5.2 that a high level of ICT knowledge was not directly proportional to the school performance index because the bars do not show a regular pattern. The data was further tested to investigate the degree of the statistical relationship using Spearman's rho correlation co-efficient which

yielded $r = .442$, $p = .000$. This means that there was a statistically significant strong positive relationship between the ICT knowledge of a principal and school performance in the Western province. Since the $p < .05$, the null hypothesis that there is no statistically significant relationship between ICT knowledge of a principal and school performance is therefore rejected. The effect size ($r = .442$) was big and this implies that the level of ICT knowledge of a principal is associated with good leadership performance; hence it plays a big role in influencing school performance. In support of this, BECTA (2008.3) reports that a study done in Britain shows that there was a significant positive relationship between frequency of ICT use in schools and student performance.

5.3.4 The relationship between ICT application in leadership functions and school performance

This section discusses ICT application in school leadership functions and school performance in relation to the theoretical findings of this study. The objective is to establish the relationship between ICT application in school leadership functions and school performance. The data for this research objective was obtained through item 11 of the survey questionnaire 1 (Appendix D1) where principals indicated Strongly Disagree = 1, Disagree = 2, Undecided = 3, Agree = 4 and Strongly Agree = 5 to show their level of agreement with the given statements. In this study, ICT application in school leadership functions meant a principal's application of ICT in administrative functions, including organisation of the approved school curriculum, control of school finance and stores, management of human resources, correspondence with stakeholders and management of the school physical facilities as indicated in section 3.3.2.3. It was assumed that a principal's ICT application in school leadership functions positively influences school performance in terms of product outcomes, student-focused outcomes, financial and market outcomes, workforce-focused outcomes, process effectiveness outcomes and leadership outcomes. Data obtained for ICT knowledge are discussed in the subsections that follow and recorded as frequencies (N) and percentage (%).

5.3.4.1 Organisation of the approved school curriculum

In the current study, the organisation of the approved school curriculum meant monitoring the school timetable, teachers' schemes of work, learners' progress reports and learning sessions.

5.3.4.1.1 Application of ICT in monitoring the school timetable

The study investigated the relationship between a principal's application of ICT in monitoring the school timetable and school performance. The distribution of responses is recorded in Table 5.11 (a).

Table 5.11 (a): Relationship between application of ICT in monitoring the timetable and school performance

ICT in leadership functions	Response	Frequency	School performance index			Total	
			Poor	Average	Good		
School timetable	Strongly Disagree	N	45	29	31	105	
		%	23.9%	15.4%	16.5%	55.9%	
	Disagree	N	18	11	20	49	
		%	9.6%	5.9%	10.6%	26.1%	
	Undecided	N	6	2	1	9	
		%	3.2%	1.1%	.5%	4.8%	
	Agree	N	5	3	8	16	
		%	2.7%	1.6%	4.3%	8.5%	
	Strongly Agree	N	3	1	5	9	
		%	1.6%	0.5%	2.7%	4.8%	
	Total		N	79	46	63	188
			%	42.0%	24.5%	33.5%	100.0%
		Spearman's correlation co-efficient ($r = .045$, $p = .541$)					

Data in Table 5.11 (a) indicates principals' responses showing that 9 (4.8%) strongly agreed, 16 (8.5%) agreed, 9 (4.8%) were undecided, 49 (26.1%) disagreed and 105 (55.9%) strongly disagreed that they applied ICT in monitoring the school timetable. There was a statistically non-significant very weak positive relationship ($p > .05$) between the application of ICT in monitoring the school timetable by a principal and school performance, where the effect size ($r = .045$) was

moderate. This implies that a principal's application of ICT in monitoring the school timetable is not closely associated with good performance; hence plays no role in influencing school performance.

5.3.4.1.2 Application of ICT in monitoring teachers schemes of work

The study investigated the relationship between the application of ICT in monitoring teachers' schemes of work and school performance. The distribution of responses is recorded in Table 5.11(b).

Table 5.11 (b): Relationship between application of ICT in monitoring teachers schemes of work and school performance

ICT in leadership functions	Response	Frequency	School performance index			Total
			Poor	Average	Good	
Schemes of work	Strongly Disagree	N	25	12	2	39
		%	13.3%	6.4%	1.1%	20.7%
	Disagree	N	28	18	15	61
		%	14.9%	9.6%	8.0%	32.4%
	Undecided	N	10	0	1	11
		%	5.3%	0%	0.5%	5.9%
	Agree	N	16	11	35	62
		%	8.5%	5.9%	18.6%	33.0%
	Strongly Agree	N	0	5	10	15
		%	0.0%	2.7%	5.3%	8.0%
Total	N	79	46	63	188	
	%	42.0%	24.5%	33.5%	100.0%	
	Spearman's correlation co-efficient (r= .434, p= .000)					

Data in Table 5.11(b) indicates principals' responses showing that 15 (8.0%) strongly agreed, 62 (33.0%) agreed, 11(5.9%) were undecided, 61(32.4%) disagreed and 39 (20.7%) strongly disagreed that they applied ICT in monitoring schemes of work. There was a statistically significant strong positive relationship ($p < .05$) between a principal's application of ICT in monitoring teachers' schemes of work and school performance. The effect size ($r = .434$) was very big and this implies that application of ICT in monitoring teachers' schemes of work is closely associated with good performance; hence it plays a role in influencing school performance.

5.3.4.1.3 Application of ICT in monitoring learners' progress reports

The study investigated the relationship between a principal's application of ICT in monitoring learners' progress reports and school performance. The distribution of responses is recorded in Table 5.11 (c).

Table 5.11 (c): Relationship between ICT application in monitoring learners' progress reports and school performance

ICT in leadership functions	Response	Frequency	School performance index			Total	
			Poor	Average	Good		
Learners' progress reports	Strongly Disagree	N	30	14	4	48	
		%	16.0%	7.4%	2.1%	25.5%	
	Disagree	N	38	11	4	53	
		%	20.2%	5.9%	2.1%	28.2%	
	Undecided	N	4	0	6	10	
		%	2.1%	0%	3.2%	5.3%	
	Agree	N	6	8	28	42	
		%	3.2%	4.3%	14.9%	22.3%	
	Strongly Agree	N	1	13	21	35	
		%	0.5%	6.9%	11.2%	18.6%	
	Total	N		79	46	63	188
		%		42.0%	24.5%	33.5%	100.0%
Spearman's correlation co-efficient (r= .568, p= .000)							

Data in Table 5.11(c) shows principals' responses indicating that 35 (18.6%) strongly agreed, 42 (22.3%) agreed, 10 (5.3%) were undecided, 53 (28.2%) disagreed and 48 (25.5%) strongly disagreed they applied ICT in monitoring learners' progress reports. There was a statistically significant very strong positive relationship ($p < .05$) between application of ICT in monitoring learners progress reports by a principal and school performance. The effect size ($r = .568$) was very big and this implies that a principal's application of ICT in monitoring learners' progress reports is closely associated with good performance; hence plays a significant role in influencing school performance.

5.3.4.1.4 Application of ICT in monitoring learning sessions

The study investigated the relationship between the application of ICT in monitoring learning sessions by a principal and school performance. The distribution of responses is recorded in Table 5.11(d).

Table 5.11 (d): Relationship between ICT application in monitoring of learning sessions and school performance

ICT in leadership functions	Response	Frequency	School performance index			Total
			Poor	Average	Good	
Monitoring of learning sessions	Strongly Disagree	N	73	38	56	167
		%	38.8%	20.2%	29.8%	88.8%
	Disagree	N	4	3	1	8
		%	2.1%	1.6%	.5%	4.3%
	Undecided	N	2	4	2	8
		%	1.1%	2.1%	1.1%	4.3%
	Agree	N	0	1	4	5
		%	0.0%	0.5%	2.1%	2.7%
Total		N	79	46	63	188
		%	42.0%	24.5%	33.5%	100.0%
		Spearman's correlation co-efficient (r= .069, p= .350)				

Data in the Table 5.11(d) indicates principals' responses showing that none strongly agreed, 5 (2.7%) agreed, 8 (4.3%) were undecided, 8 (4.3%) disagreed and majority 167 (88.8%) strongly disagreed that they applied ICT in monitoring learning sessions. There was a statistically non-significant very weak positive relationship ($p > .05$) between the application of ICT in monitoring of learning sessions and school performance. The effect size ($r = .069$) was very small and this implies that a principal's application of ICT in monitoring learning sessions is not associated with good performance; hence it plays no role in influencing school performance.

5.3.4.2 Control of school finance and stores

In this study, control of school finance and stores meant managing all financial transactions, procurement documents, stores and the library catalogue.

5.3.4.2.1 Application of ICT in monitoring school financial transactions

The study investigated the relationship between the application of ICT in monitoring financial transactions by a principal and school performance. The distribution of responses is recorded in Table 5.12 (a).

Table 5.12 (a): Relationship between ICT application in monitoring financial transactions and school performance

Application of ICT in leadership functions	Response	Frequency	School performance index			Total	
			Poor	Average	Good		
School financial transactions	Strongly Disagree	N	9	1	0	10	
		%	4.8%	0.5%	0%	5.3%	
	Disagree	N	34	17	9	60	
		%	18.1%	9.0%	4.8%	31.9%	
	Undecided	N	22	17	10	49	
		%	11.7%	9.0%	5.3%	26.1%	
	Agree	N	13	1	32	46	
		%	6.9%	0.5%	17.0%	24.5%	
	Strongly Agree	N	1	10	12	23	
		%	0.5%	5.3%	6.4%	12.2%	
	Total		N	79	46	63	188
			%	42.0%	24.5%	33.5%	100.0%
Spearman's correlation co-efficient (r= .463, p= .000)							

Data in Table 5.12 (a) indicates principals' responses showing that 23 (12.2%) strongly agreed, 46 (24.5%) agreed, 49 (26.1%) were undecided, 60 (31.9%) disagreed and 10 (5.3%) strongly disagreed that they applied ICT in monitoring school financial transactions. There was a statistically significant strong positive relationship ($p < .05$) between a principal's application of ICT in monitoring school financial transactions and school performance. The effect size ($r = .463$) was big and this implies that the application of ICT in monitoring school financial transactions is closely associated with leadership performance; hence it plays a significant role in influencing school performance.

5.3.4.2.2 Application of ICT in monitoring school procurement documents

The study investigated the relationship between the application of ICT in monitoring procurement documents and school performance. The distribution of responses is recorded in Table 5.12 (b).

Table 5.12 (b): Relationship between ICT application in monitoring of procurement documents and school performance

ICT in leadership functions	Response	Frequency	School performance index			Total
			Poor	Average	Good	
Procurement documents	Strongly Disagree	N	25	15	2	42
		%	13.3%	8.0%	1.1%	22.3%
	Disagree	N	34	18	26	78
		%	18.1%	9.6%	13.8%	41.5%
	Undecided	N	19	5	26	50
		%	10.1%	2.7%	13.8%	26.6%
	Agree	N	1	8	9	18
		%	0.5%	4.3%	4.8%	9.6%
Total	N		79	46	63	188
	%		42.0%	24.5%	33.5%	100.0%
	Spearman's correlation co-efficient ($r = .333, p = .000$)					

Data in Table 5.12 (b) indicates principals' responses that none strongly agreed, 18 (9.6%) agreed, 50 (26.6%) were undecided, 78 (41.5%) disagreed and 42 (22.3%) strongly disagreed that they applied ICT in monitoring procurement documents. There was a statistically significant weak positive relationship ($p < .05$) between application of ICT in monitoring procurement documents and school performance. The effect size ($r = .333$) was moderate and this implies that a principal's application of ICT in monitoring procurement documents is not closely associated with good performance, hence playing a minimal role in influencing school performance.

5.3.4.2.3 Application of ICT in controlling school stores

The study investigated the relationship between the application ICT in controlling stores and school performance. The distribution of responses is recorded in Table 5.12 (c).

Table 5.12 (c): Relationship between ICT application in controlling stores and school performance

ICT in leadership functions	Response	Frequency	School performance index			Total
			Poor	Average	Good	
Control of school stores	Strongly Disagree	N	39	15	5	59
		%	20.7%	8.0%	2.7%	31.4%
	Disagree	N	20	14	13	47
		%	10.6%	7.4%	6.9%	25.0%
	Undecided	N	19	13	32	64
		%	10.1%	6.9%	17.0%	34.0%
Agree	N	1	4	13	18	
	%	0.5%	2.1%	6.9%	9.6%	
Total		N	79	46	63	188
		%	42.0%	24.5%	33.5%	100.0%
		Spearman's correlation co-efficient ($r = .311, p = .000$)				

Data in Table 5.12 (c) indicates principals' responses that none strongly agreed, 18 (9.6%) agreed, 64 (34.0%) were undecided, 47 (25.0%) disagreed and 59 (31.4%) strongly disagreed that they applied ICT in controlling school stores. There was a statistically significant weak positive relationship ($p < .05$) between a principal's application of ICT in controlling school stores and school performance. The effect size ($r = .311$) was moderate and this implies that a principal's application of ICT in controlling school stores is not closely associated with good performance; hence it plays a minimal role in influencing school performance.

5.3.4.2.4 Application of ICT in monitoring of the library catalogue

The study investigated the relationship between a principal's application of ICT in monitoring of the library catalogue and school performance. The distribution of responses is recorded in Table 5.12 (d).

Table 5.12 (d): Relationship between ICT application in monitoring of the library catalogue and school performance

ICT in leadership functions	Response	Frequency	School performance index			Total
			Poor	Average	Good	
Monitoring of the library catalogue	Strongly Disagree	N	45	21	12	78
		%	23.9%	11.2%	6.4%	41.5%
	Disagree	N	32	15	30	77
		%	17.0%	8.0%	16.0%	41.0%
	Undecided	N	1	6	8	15
		%	0.5%	3.2%	4.3%	8.0%
	Agree	N	1	4	13	18
		%	0.5%	2.1%	6.9%	9.6%
Total	N		79	46	63	188
	%		42.0%	24.5%	33.5%	100.0%
	Spearman's correlation co-efficient ($r = .398, p = .000$)					

Data in Table 12 (d) indicates principals' responses that none strongly agreed, 18 (9.6%) agreed, 15 (8.0%) were undecided, 77 (41.0%) disagreed, 78 (41.5%) strongly disagreed that they applied ICT in monitoring the library catalogue. There was a statistically significant weak positive relationship between a principals' application of ICT in monitoring of the library catalogue and school performance. The effect size ($r = .398$) was moderate and this implies that a principals' application of ICT in monitoring of the library catalogue is not closely associated with good performance; hence it plays a minimal role in influencing school performance.

5.3.4.3 Management of human resources

In this study, the management of human resources meant a principal monitoring staff personal information records, learners' admission details, staff responsibilities records and communication with the school staff.

5.3.4.3.1 Application of ICT in monitoring of staff personal information records

The study investigated the relationship between the application of ICT in monitoring of staff personal information records and school performance. The distribution of responses is recorded in Table 5.13 (a).

Table 5.13 (a): Relationship between ICT application in monitoring staff personal information records and school performance

Application of ICT in leadership functions	Response	Frequency	School performance index			Total	
			Poor	Average	Good		
Staff personal information records	Strongly Disagree	N	11	16	34	61	
		%	5.9%	8.5%	18.1%	32.4%	
	Disagree	N	28	18	6	52	
		%	14.9%	9.6%	3.2%	27.7%	
	Undecided	N	18	5	4	27	
		%	9.6%	2.7%	2.1%	14.4%	
	Agree	N	22	7	19	48	
		%	11.7%	3.7%	10.1%	25.5%	
	Total	N		79	46	63	188
		%		42.0%	24.5%	33.5%	100.0%
		Spearman's correlation co-efficient ($r = .252, p = .000$)					

Data in Table 13 (a) indicates from principals' responses that none strongly agreed, 48 (25.5%) agreed, 27 (14.4%) were undecided, 52 (27.7%) disagreed and 61 (32.4%) strongly disagreed they applied ICT in monitoring staff personal information records. There was a statistically very weak positive relationship between a principal's application of ICT in keeping staff personal information records. The effect size ($r = .252$) was small and this implies that a principal's application of ICT in keeping staff personal information records is not closely associated with good performance; hence plays a negligible role in influencing school performance. .

5.3.4.3.2 Application of ICT in monitoring learners' admission details

The study investigated the relationship between the application of ICT in monitoring of learners' admission details and school performance. The distribution of responses is recorded in Table 5.13 (b).

Table 5.13 (b): Relationship between ICT application in monitoring learners' admission details and school performance

ICT in leadership functions	Response	Frequency	School performance index			Total	
			Poor	Average	Good		
Learners' admission details	Strongly Disagree	N	16	5	1	22	
		%	8.5%	2.7%	0.5%	11.7%	
	Disagree	N	26	5	6	37	
		%	13.8%	2.7%	3.2%	19.7%	
	Undecided	N	25	24	37	86	
		%	13.3%	12.8%	19.7%	45.7%	
	Agree	N	11	6	13	30	
		%	5.9%	3.2%	6.9%	16.0%	
	Strongly Agree	N	1	6	6	13	
		%	0.5%	3.2%	3.2%	6.9%	
	Total	N		79	46	63	188
		%		42.0%	24.5%	33.5%	100.0%
Spearman's correlation co-efficient (r= .361, p= .000)							

Data in Table 5.13 (b) shows principals' responses indicating that 13 (6.9%) strongly agreed, 30 (16.0%) agreed, 86 (45.7%) were undecided, 37 (19.7%) disagreed and 22 (11.7%) strongly disagreed that they applied ICT in monitoring learners' admission details. There was a statistically significant weak positive relationship ($p < .05$) between the application of ICT in monitoring learners admission details and school performance. The effect size ($r = .361$) was moderate and this implies that a principal's application of ICT in monitoring learners' admission details is not closely associated with good performance, hence playing a minimal role in influencing school performance.

5.3.4.3.3 Application of ICT in monitoring staff responsibilities records

The study investigated the relationship between the application of ICT in monitoring of staff responsibilities records and school performance. The distribution of responses is recorded in Table 5.13 (c).

Table 5.13 (c): Relationship between ICT application in monitoring staff responsibilities records and school performance

ICT in leadership functions	Response	Frequency	School performance index			Total	
			Poor	Average	Good		
Staff responsibilities records	Strongly Disagree	N	18	5	4	27	
		%	9.6%	2.7%	2.1%	14.4%	
	Disagree	N	28	18	6	52	
		%	14.9%	9.6%	3.2%	27.7%	
	Undecided	N	11	16	34	61	
		%	5.9%	8.5%	18.1%	32.4%	
	Agree	N	22	7	19	48	
		%	11.7%	3.7%	10.1%	25.5%	
	Total		N	79	46	63	188
			%	42.0%	24.5%	33.5%	100.0%
			Spearman's correlation co-efficient ($r = .232, p = .000$)				

Data in Table 5.13 (c) shows principals' responses indicating that none strongly agreed, 48 (25.5%) agreed, 61(32.4%) were undecided, 52 (27.7%) disagreed and 27 (14.4%) strongly disagreed they applied ICT in checking staff responsibilities records. There was a statistically significant weak positive relationship ($p < .05$) between a principal's application of ICT in monitoring staff responsibilities records and school performance. The effect size ($r = .232$) was small and this implies that a principal's application of ICT in monitoring staff responsibilities records is not closely associated with good performance; hence it plays a negligible role in influencing school performance.

5.3.4.3.4 Application of ICT in communicating with school staff

The study investigated the relationship between the application of ICT in communicating with school staff and school performance. The distribution of responses is recorded in Table 5.13 (d).

Table 5.13 (d): Relationship between ICT application in communicating with staff and school performance

ICT in leadership functions	Response	Frequency	School performance index			Total
			Poor	Average	Good	
Communication with school personnel	Agree	N	70	35	55	160
		%	37.2%	18.6%	29.3%	85.1%
	Strongly Agree	N	9	11	8	28
		%	4.8%	5.9%	4.3%	14.9%
Total	N		79	46	63	188
	%		42.0%	24.5%	33.5%	100.0%
	Spearman's correlation co-efficient ($r = .029, p = .696$)					

Data in Table 5.13 (d) shows principals' responses that 28 (14.9%) strongly agreed, 160 (85.1%) agreed, none were undecided neither did they disagree that they applied ICT in communicating with school personnel. There was a statistically non-significant very weak positive relationship ($p > .05$) between a principal's application of ICT in communication with school staff and school performance. This implies that a principal's application of ICT in communication with school staff is not associated with good performance; hence it plays no role in influencing school performance because the responses do not vary with performance index.

5.3.4.4 Maintaining correspondence with stakeholders

In this study, maintaining correspondence with stakeholders meant corresponding with BOG/PTA and education offices.

5.3.4.4.1 Maintaining correspondence with BOG/PTA

The study investigated the relationship between the application of ICT in maintaining correspondence on all BOG/PTA matters and school performance. The distribution of responses is recorded in Table 5.14 (a).

Table 5.14 (a): Relationship between ICT application in maintaining correspondence with BOG/ PTA and school performance

ICT in leadership functions	Response	Frequency	School performance index			Total
			Poor	Average	Good	
Maintaining correspondence on all BOG/ PTA matters	Disagree	N	20	9	1	30
		%	10.6%	4.8%	0.5%	16.0%
	Undecided	N	46	14	11	71
		%	24.5%	7.4%	5.9%	37.8%
	Agree	N	13	18	32	63
		%	6.9%	9.6%	17.0%	33.5%
	Strongly Agree	N	0	5	19	24
		%	0%	2.7%	10.1%	12.8%
Total		N	79	46	63	188
		%	42.0%	24.5%	33.5%	100.0%
			Spearman's correlation co-efficient ($r = .170, p = .062$)			

Data in Table 5.14 (a) shows principals' responses indicating that 24 (12.8%) strongly agreed, 63 (33.5%) agreed 71 (37.8%) were undecided, 30 (16.0%) disagreed and none strongly disagreed that they applied ICT in maintaining correspondence on all BOG/PTA matters. There was a statistically non-significant very weak positive relationship ($p > .05$) between a principal's application of ICT in corresponding on all BOG/PTA matters and school performance. The effect size ($r = .170$) was very small and a principal's application of ICT in corresponding on all BOG/ PTA matters may not be associated with good performance; hence it may play no role in influencing school performance.

5.3.4.4.2 *Maintaining correspondence with education offices*

The study investigated the relationship between the application of ICT in maintaining correspondence with education offices and school performance. The distribution of responses is recorded in Table 5.14 (b).

Table 5.14 (b): Relationship between ICT application in maintaining correspondence with education offices and school performance

ICT in leadership functions	Response	Frequency	School performance index			Total
			Poor	Average	Good	
Maintaining correspondence with education offices	Strongly Disagree	N	23	5	2	30
		%	12.2%	2.7%	1.1%	16.0%
	Disagree	N	21	11	1	33
		%	11.2%	5.9%	0.5%	17.6%
	Undecided	N	22	8	24	54
		%	11.7%	4.3%	12.8%	28.7%
Agree	N	13	22	36	71	
	%	6.9%	11.7%	19.1%	37.8%	
Total		N	79	46	63	188
		%	42.0%	24.5%	33.5%	100.0%
		Spearman's correlation co-efficient ($r = .470, p = .000$)				

Data in the Table 5.14 (b) shows from principals' responses that none strongly agreed, 71 (37.8%) agreed, 54 (28.7%) were undecided, 33 (17.6%) disagreed and 30 (16.0%) strongly disagreed that they applied ICT in maintaining correspondence with education offices. There was a statistically significant strong positive relationship ($p < .05$) between a principal's application of ICT in maintaining correspondence with education offices and school performance. The effect size ($r = .470$) was big and this implies that a principal's application of ICT in corresponding with education offices is associated with good performance; hence it plays a significant role in influencing school performance.

5.3.4.5 Management of school physical facilities

In the current study, physical facilities meant school plant and equipment with all other facilities that require maintenance. The study investigated the relationship between the application of ICT in monitoring maintenance manuals and school performance. The distribution of responses is recorded in Table 5.15.

Table 5.15: Relationship between ICT application in monitoring of maintenance manuals for physical facilities and school performance

Application of ICT in leadership functions	Response	Frequency	School performance index			Total
			Poor	Average	Good	
Maintenance manuals for all physical facilities/equipment	Strongly Disagree	N	62	28	46	136
		%	33.0%	14.9%	24.5%	72.3%
	Disagree	N	17	13	7	37
		%	9.0%	6.9%	3.7%	19.7%
	Undecided	N	0	5	10	15
		%	0%	2.7%	5.3%	8.0%
Total	N		79	46	63	188
	%		42.0%	24.5%	33.5%	100.0%
	Spearman's correlation co-efficient ($r = .049, p = .501$)					

Data in Table 5.15 shows principals' responses indicating that none agreed, 15 (8.0%) were undecided and 136 (72.3%) strongly disagreed that they applied ICT in monitoring of maintenance manuals for all physical facilities. There was a statistically non-significant very weak positive relationship ($p > .05$) between a principal's application of ICT in monitoring maintenance manuals for all physical facilities and school performance. The effect size ($r = .049$) was very small and this implies that a principal's application of ICT monitoring maintenance manuals for physical facilities is not associated with good performance; hence it plays no role in influencing school performance.

5.3.4.6 Testing hypothesis 3

Hypothesis 3: There is no statistically significant relationship between ICT application in leadership functions and school performance.

The overall ICT application in school leadership functions was determined by combining the responses for organisation of the approved school curriculum, control of school finance and stores, management of human resources, maintaining correspondence with stakeholders and management of school physical facilities. The values of the responses for ICT application in school leadership functions were converted to an index: Low = 1, Moderate = 2 and High = 3 in order to determine the level of ICT application. The level of school performance was equivalent

to the school performance index which was determined by converting responses from questionnaire 2 (Appendix D2) to a scale: Poor = 1, Average = 2, Good = 3. The conversion was done using the Statistical Package for Social Sciences (SPSS). In order to determine the statistical relationship, the null hypothesis 3 was tested. The statistical relationship between a principal's ICT application in school leadership functions and school performance was shown using a bar graph as indicated in Chart 5.3.

Chart 5.3: Relationship between ICT application in leadership functions and school performance

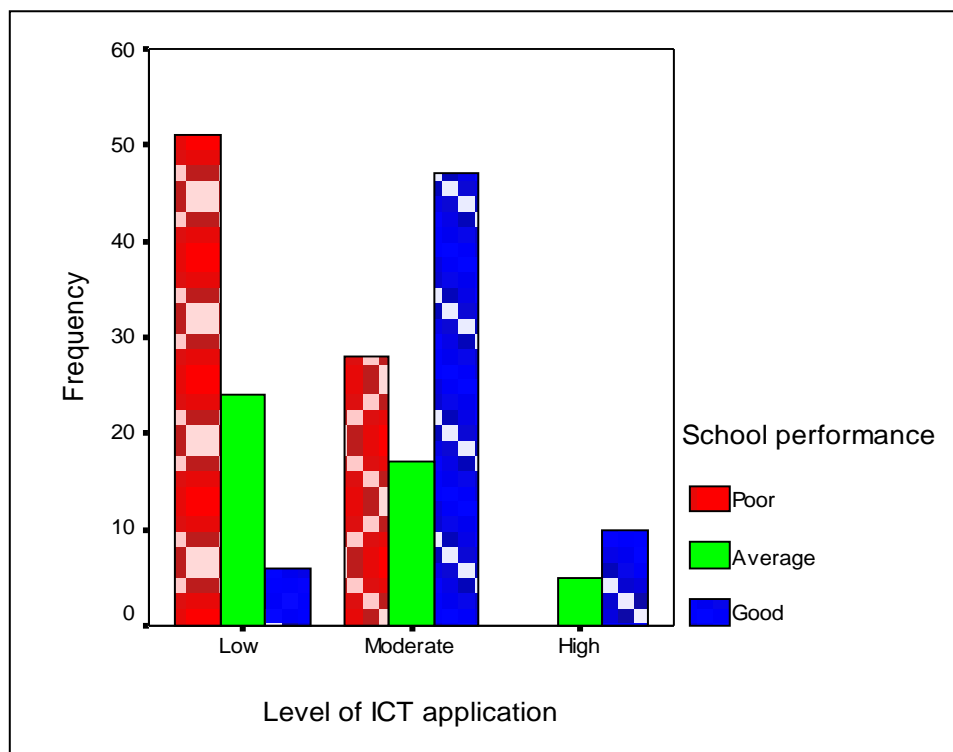


Chart 5.3 shows that poor school performance index was associated with a low level of ICT application. When the level of ICT application was moderate, there was no regular pattern on the performance index. However, it is notable that a high level of ICT application was seemingly not directly proportional to the school performance index. The data was further tested to investigate the degree of the statistical relationship using Spearman's rho correlation co-efficient which yielded $r = .490$, $p = .000$. This means that there was a statistically significant strong positive relationship between a principal's ICT application in school leadership functions and school

performance in the Western province. Since the $p < .05$, the null hypothesis that there is no statistically significant relationship between ICT application in school leadership functions and school performance is therefore rejected. This implies that the level of a principal's ICT application is associated with good performance, hence playing a significant role in influencing school performance.

5.3.5 The relationship between challenges facing ICT literacy development among principals and school performance.

This section discusses the challenges facing ICT literacy development among principals and how the challenges relate with school performance in relation to the theoretical findings of this study. The objective was to establish the statistical relationship between challenges facing ICT literacy development among principals and school performance as discussed in section 3.3.5. It was assumed that such challenges can influence quality which impacts on school performance in terms of product outcomes, student-focused outcomes, financial and market outcomes, workforce-focused outcomes, process effectiveness outcomes and leadership and social responsibility outcomes.

The data for this research objective was obtained through items 11 and 12 of the survey questionnaire 1 (Appendix D1). The principals responded to item 11 in questionnaire 1 by indicating Strongly Disagree = 1, Disagree = 2, Undecided = 3, Agree = 4 and Strongly Agree = 5 to show their level of agreement with the given statements. In this study, challenges facing ICT literacy development among principals meant factors like: financial constraints, lack of time, lack of ICT learning centres, lack of ICT infrastructure, negative attitude towards ICT and lack of interest.

5.3.5.1 Financial constraints

The study investigated the relationship between financial constraints to principals and school performance. The distribution of responses is recorded in Table 5.16 (a).

Table 5.16(a): Relationship between financial constraints and school performance

Challenge	Response	Frequency	School performance index			Total
			Poor	Average	Good	
Financial constraints	Disagree	N	6	7	5	18
		%	3.2%	3.7%	2.7%	9.6%
	Undecided	N	17	11	11	39
		%	9.0%	5.9%	5.9%	20.7%
	Agree	N	25	12	19	56
		%	13.3%	6.4%	10.1%	29.8%
	Strongly Agree	N	31	16	28	75
		%	16.5%	8.5%	14.9%	39.9%
Total	N		79	46	63	188
	%		42.0%	24.5%	33.5%	100.0%
	Spearman's correlation co-efficient ($r = -.033, p = .650$)					

Data in Table 5.16 (a) shows principals' responses indicating that most of them 75 (39.9%) strongly agreed, 56 (29.8%) agreed, 39 (20.7%) were undecided and only 18 (9.6%) disagreed that financial constraint was a challenge. The distribution of responses indicates that there was an equivalent distribution of principals in good, average and poor performing schools who agreed that finance was a challenge to their learning of ICT skills. There was a statistically non-significant very weak negative relationship ($p > .05$) between finance as a challenge to ICT literacy development and school performance. The effect size ($r = -.033$) was very small and this implies that financial constraints regarding ICT literacy development affected principals, but played a negligible role in influencing school performance.

5.3.5.2 Lack of time

The study investigated the relationship between lack of time for ICT development and school performance. The distribution of responses is recorded in Table 5.16 (b).

Table 5.16(b): Relationship between lack of time and school performance

Challenge	Response	Frequency	School performance index			Total
			Poor	Average	Good	
Lack of time	Disagree	N	16	17	16	49
		%	8.5%	9.0%	8.5%	26.1%
	Undecided	N	9	3	6	18
		%	4.8%	1.6%	3.2%	9.6%
	Agree	N	44	18	25	87
		%	23.4%	9.6%	13.3%	46.3%
	Strongly Agree	N	10	8	16	34
		%	5.3%	4.3%	8.5%	18.1%
Total		N	79	46	63	188
		%	42.0%	24.5%	33.5%	100.0%
		Spearman's correlation co-efficient ($r = .028, p = .704$)				

Data in Table 5.16 (b) shows from principals' responses that 34 (18.1%) strongly agreed, 87 (46.3%) agreed, 18 (9.6%) were undecided, 49 (26.1%) disagreed and none strongly disagreed that lack of time was a challenge to their learning ICT skills. There is almost an equal distribution of responses across the three leadership performance categories of schools. There was a statistically non-significant very weak positive relationship ($p > .05$) between a principal's lack of time to learn ICT literacy skills and school performance. The effect size ($r = .028$) was very small and this implies that a principal's lack of time to learn ICT literacy skills is not associated with good leadership performance; hence plays a minimal role in influencing it.

5.3.5.3 Lack of ICT learning centres

The study investigated the relationship between lack of ICT learning centres to a principal and school performance. The distribution of responses is recorded in Table 5.16 (c).

Table 5.16(c): Relationship between lack of ICT learning centres and school performance

Challenge	Response	Frequency	School performance index			Total
			Poor	Average	Good	
Lack of ICT learning centres	Disagree	N	13	11	3	27
		%	6.9%	5.9%	1.6%	14.4%
	Undecided	N	10	1	9	20
		%	5.3%	.5%	4.8%	10.6%
	Agree	N	14	15	17	46
		%	7.4%	8.0%	9.0%	24.5%
Strongly Agree	N	42	19	34	95	
	%	22.3%	10.1%	18.1%	50.5%	
Total		N	79	46	63	188
		%	42.0%	24.5%	33.5%	100.0%
		Spearman's correlation co-efficient ($r = .048, p = .516$)				

Data in Table 5.16 (c) shows that majority of principals 95 (50.5%) strongly agreed, 46 (24.5%) agreed, 20 (10.6%) were undecided, 27 (14.4%) disagreed and none strongly disagreed that lack of ICT learning centres was a challenge to their learning ICT skills. The responses show an equivalent distribution in the school performance categories and there was a statistically non-significant very weak positive relationship ($p > .05$) between lack of ICT learning centres for principals and school performance. The effect size ($r = .048$) was very small and this implies that lack of ICT learning centres to a principal is not associated with good performance; hence playing a minimal role in influencing school performance.

5.3.5.4 Lack of ICT infrastructure

The study investigated the relationship between lack of ICT infrastructure available to a principal and school performance. The distribution of responses is recorded in Table 5.16 (d).

Table 5.16 (d): Relationship between lack of ICT infrastructure and school performance

Challenge	Response	Frequency	School performance index			Total
			Poor	Average	Good	
Lack of ICT infrastructure	Strongly Disagree	N	33	10	5	48
		%	17.6%	5.3%	2.7%	25.5%
	Disagree	N	26	16	18	60
		%	13.8%	8.5%	9.6%	31.9%
	Agree	N	6	5	0	11
		%	3.2%	2.7%	0%	5.9%
	Strongly Agree	N	14	15	40	69
		%	7.4%	8.0%	21.3%	36.7%
	Total	N	79	46	63	188
		%	42.0%	24.5%	33.5%	100.0%
Spearman's correlation co-efficient ($r = -.457, p = .000$)						

Data in Table 5.16 (d) shows a small number of principals 69 (36.7%) strongly agreed, 11(5.9%) agreed, none were undecided, 60 (31.9%) disagreed and 48 (25.5%) strongly disagreed that lack of ICT infrastructure was a challenge to learning ICT skills. The proportions of the distribution show that a higher number of principals in good performance than in poor performance schools agreed that lack of ICT infrastructure was a challenge to ICT literacy development. There was a statistically significant strong negative relationship ($p < .05$) between lack of ICT infrastructure as a challenge and school performance. The effect size ($r = -.457$) was big and this implies that availability of ICT infrastructure to a principal played a major negative role in influencing school performance.

5.3.5.5 Negative attitude towards ICT

The study investigated the relationship between the attitude of a principal towards ICT and school performance. The distribution of responses is recorded in Table 5.16 (e).

Table 5.16 (e): Relationship between negative attitude towards ICT and school performance

Challenge	Response	Frequency	School performance index			Total
			Poor	Average	Good	
Negative attitude towards ICT	Strongly Disagree	N	63	44	51	158
		%	33.5%	23.4%	27.1%	84.0%
	Disagree	N	16	2	12	30
		%	8.5%	1.1%	6.4%	16.0%
Total	N		79	46	63	188
	%		42.0%	24.5%	33.5%	100.0%
	Spearman's correlation co-efficient ($r = -.030$, $p = .679$)					

Data in Table 5.16 (e) shows that none of the principals agreed nor was undecided, but 30 (16.0%) disagreed and 158 (84.0%) strongly disagreed that they had a negative attitude towards ICT. This means that all principals in the school performance categories considered ICT as a necessary tool for the teaching profession. However, there was a statistically non-significant very weak negative relationship ($p > .05$) between the attitude of a principal towards ICT literacy development and school performance. The effect size ($r = -.030$) was very small and this implies that the attitude of a principal towards ICT plays negative role in influencing school performance.

5.3.5.6 Lack of interest to learn ICT skills

The study investigated the relationship between lack of interest of a principal towards ICT and school performance. The distribution of responses is recorded in Table 5.16 (f).

Table 5.16(f): Relationship between lack of interest to learn ICT skills and school performance

Challenge	Response	Frequency	School performance index			Total
			Poor	Average	Good	
Lack of interest	Strongly Disagree	N	19	18	12	49
		%	10.1%	9.6%	6.4%	26.1%
	Disagree	N	39	23	29	91
		%	20.7%	12.2%	15.4%	48.4%
	Undecided	N	6	0	12	18
		%	3.2%	0%	6.4%	9.6%
	Agree	N	15	5	10	30
		%	8.0%	2.7%	5.3%	16.0%
Total	N		79	46	63	188
	%		42.0%	24.5%	33.5%	100.0%
	Spearman's correlation co-efficient ($r = .044, p = .522$)					

Data in Table 5.16 (f) shows that none of the principals strongly agreed, 30 (16.0%) agreed, 18 (9.6%) were undecided, the majority 91 (48.4%) disagreed and 49 (26.1%) strongly disagreed that lack of interest was a challenge to ICT literacy development. There was a statistically non-significant very weak positive relationship ($p > .05$) between a principal's lack of interest to learn ICT literacy skills and school performance. The effect size ($r = .044$) was very small and this implies that the interest of a principal to acquire ICT literacy did not vary with the performance index; hence it plays a negligible role in influencing school performance.

5.3.6 Testing hypothesis 4

Hypothesis 4: There is no statistically significant relationship between challenges facing ICT literacy development among principals and school performance.

The overall challenges facing ICT literacy development among principals was determined by combining the responses for financial constraints, lack of time, lack of ICT learning centres, lack of ICT infrastructure, negative attitude towards ICT and lack of interest. The values of the responses for challenges facing ICT literacy development among principals were converted to an index: Low = 1, Moderate = 2 and High = 3 in order to determine the level of challenges facing ICT literacy development. The level of school performance was equivalent to the school performance index which was determined by converting responses from questionnaire 2 (Appendix D2) to a scale: Poor = 1, Average = 2, Good = 3. The conversion was done using the

Statistical Package for Social Sciences (SPSS). In order to determine the statistical relationship, the null hypothesis 4 was tested. The statistical relationship between challenges facing ICT literacy development among principals and school performance was shown using a bar graph as indicated in Chart 5.4.

Chart 5.4: Relationship between challenges facing ICT literacy development and school performance

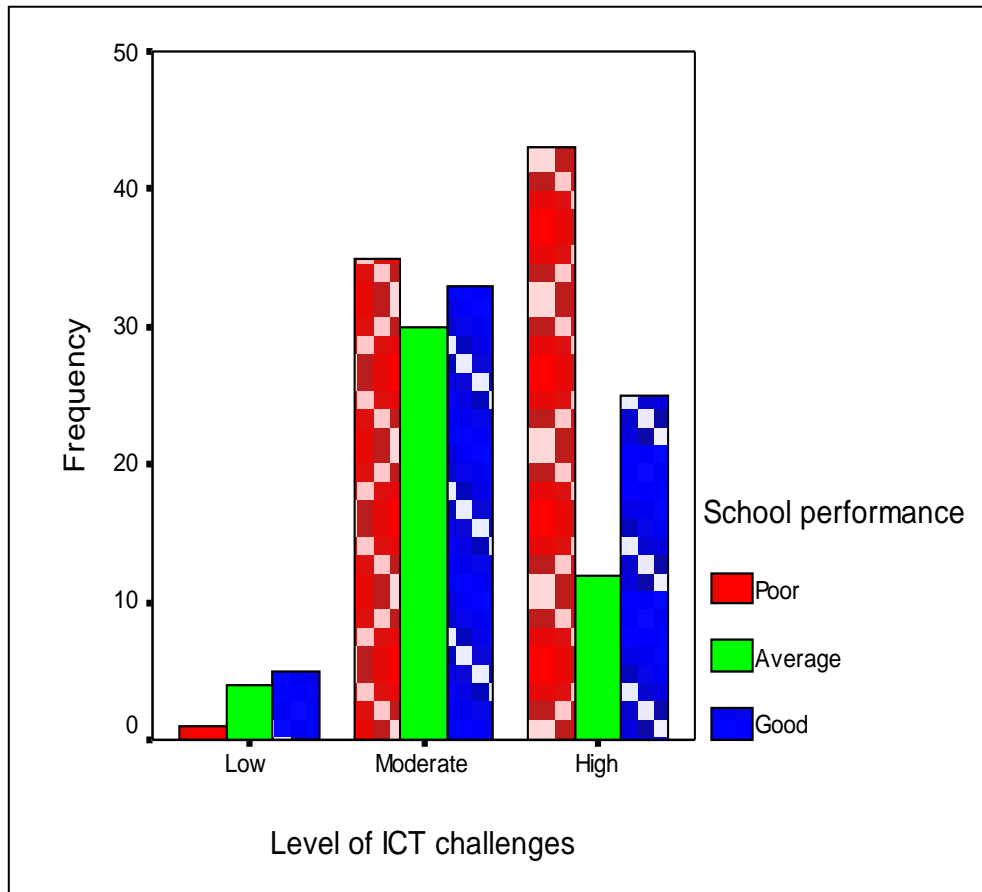


Chart 5.3 shows that poor performance index was associated with a low level of ICT challenges. When the level of ICT challenges was perceived as moderate, there was no an increase in the school performance index. The data was further tested to investigate the degree of the statistical relationship using Spearman's rho correlation co-efficient which yielded $r = -.168$, $p = .022$. This means that there was a statistically significant weak negative relationship between challenges facing ICT literacy development among principals and school performance in the Western province of Kenya. Since the $p < .05$ and the effect size ($r = -.168$) was small, the null hypothesis

that there is no statistically significant relationship between challenges facing ICT literacy development among principals and school performance, is therefore rejected. However, the weakness and direction of the statistical relationship imply that the level of challenges facing ICT literacy development is not closely associated with good performance, hence playing a minimal role in influencing school performance.

Responses from item 12 of the questionnaire 1 (Appendix D1) emphasise the challenges facing ICT literacy development among secondary school principals. In this case, 37% of the respondents indicated that they had some fear about technology which created resistance towards ICT. A reasonable number 52% of respondents in small rural schools lamented not being exposed enough to ICT like their counterparts in big schools or those in towns. Other challenges facing ICT literacy development among secondary school principals from the open-ended item and interviews were mentioned as follows:

- Lack of trained and skilled ICT personnel to train the principals
- Lack of enough security to install ICT facilities
- Resistance to technological change
- Frequent power blackouts
- Lack of rooms to install the ICT facilities especially in the low performing schools

5.3.7 The relationship between ICT literacy level and school performance

The cross tabulation of ICT literacy level and school performance yielded the values recorded in Table 5.17.

Table 5.17: Relationship between ICT literacy level and school performance

		School performance index			Total
		Poor	Average	Good	
ICT literacy level	Low	23(12.2%)	6 (3.2 %)	3 (1.7%)	32 (17.1%)
	Moderate	56(29.8%)	31(16.5%)	46(24.5%)	133 (70.7%)
	High	0 (0.0%)	9 (4.8%)	14(7.4%)	23 (12.2%)
Total		79(42.0%)	46(24.5%)	63(33.5%)	188(100.0%)
		Spearman's correlation co-efficient $r = .382$, $p < .05$			

The overall relationship between ICT literacy level of a principal and school performance yielded a statistically significant moderate positive relationship. This implies that the ICT literacy level of a principal is associated with good performance, but not to the extent of being crucial.

5.3.8 Strategies for enhancing ICT literacy development among secondary school principals

This section discusses the strategies for ICT literacy development among principals as suggested by respondents. The objective is to provide guidelines on strategies for ICT literacy development among secondary school principals. The data for this research objective was obtained from open-ended item 13 of the survey questionnaire 1 (Appendix D1) and item 4 of the interview schedule (Appendix D3). Strategies for enhancing ICT literacy development were discussed in section 3.3.6.

Responses from principals indicated they felt the Kenya government was doing well in promoting ICT use in schools; however, capacity building of principals in ICT should be given emphasis. One senior principal said, ... *the Ministry of Education should organise for regional ICT training centres especially at zonal level to make the training cost-effective.* Another principal in a low achieving school was for the idea that ...*the Kenya Education Staff Institute (KESI) should make ICT training more affordable to principals from small schools.* Several principals (41%) agreed that ... *my work is very involving as a principal. I don't have time to organise myself for ICT training. KESI or ICT training bodies should therefore introduce mobile ICT training facilities to training principals in their duty stations.* A good number of principals (38%) felt that ICT should be made compulsory to all principals, because it would compel them

to go for ICT training. Another principal posits, ... *why can't financing bodies like banks provide soft loans to teachers for ICT training only and recover their funds through the check-off system. I am also not comfortable with some of the training institutions. The government should control the quality of courses in the institutions principals should train from.*

There were other suggestions from various respondents on ways of improving ICT literacy development among secondary schools principals. They included the following:

- University training should offer relevant ICT courses for 'integration of ICT in school management.'
- Organise compulsory ICT seminars for principals especially during school holidays.
- The Teachers Service Commission should make ICT literacy training a requirement for one to be a principal.
- Make ICT literacy training compulsory for all practicing principals.
- The Teachers Service Commission should employ qualified ICT teachers in schools to encourage ICT use.
- Introduce computer training for all principals in their schools.
- The government should make it a requirement for all principals to have a working computer in their offices. The Ministry of Education should provide ICT equipment for every principal, for instance laptops.
- The Ministry of Education should give assignments to principals that require computer use. This would compel principals to learn ICT skills.
- ICT literate principals should be motivated through promotion and quantifiable incentives.
- KESI should decentralise their ICT training programs to enable more principals and others involved in administration to have access to ICT literacy training near their schools.
- Professional bodies like the Kenya Secondary Schools Heads Association should use part of its funds to train principals in ICT skills.
- ICT training bodies like Computers for Schools Kenya should motivate principals by sponsoring them to take their courses.

- Government should erect solar panels at schools as sources of energy to cater for frequent power blackouts.
- Education offices should organise for seminars and invite dedicated motivational speakers on the importance of ICT in school leadership.

5.4 CONCLUSION

From the analysis and discussions of the empirical findings of the study, it is clear that there is a positive correlation between the ICT literacy level of a principal and secondary school performance in the Western province of Kenya. The findings indicate that the level of ICT access, knowledge and application in school leadership functions play a positive role in influencing school performance. The factors that significantly influence the ICT literacy levels of secondary school principals include gender, age, education level, level of ICT training and distance of a school from the nearest town. Most principals have a positive attitude towards ICT. Challenges facing ICT literacy development among secondary school principals of Western province play a minimal role in influencing school performance.

The next chapter provides the conclusions and makes recommendations based on the discussed research findings.

CHAPTER SIX

FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

6.1 REVIEW OF THE RESEARCH

6.1.1 Introduction

This thesis evaluated the preparedness of secondary school principals in the Western Province of Kenya to cope with and utilise technological change. The study was undertaken with a hope of establishing the relationship between the ICT literacy level of a principal and school performance. This was done with reference to the aims and objectives of this study as stated in section 1.4. This chapter firstly provides a summary of the study, giving a general overview of what is contained in other chapters. Chapter one of this thesis sets the background of the whole study. The chapter provided a justification for the study by showing the position of the Kenyan government policy on ICT integration in Education. On the basis of the theoretical discussions in chapters two and three, and the empirical findings in chapter five; the main conclusions and recommendations are subsequently provided in this chapter.

6.1.2 Aims of the study

In order to describe the role of ICT literacy in improving school performance, the aims of the study (see section 1.4.1) were to:

- i) Investigate socio-demographic factors influencing the ICT literacy level of a secondary school principal.
- ii) Investigate how ICT access of a principal relates to school performance.
- iii) Investigate how ICT knowledge of a principal relates to school performance.
- iv) Investigate how ICT application in school leadership functions relates to school performance.
- v) Investigate how challenges facing the development of ICT literacy among principals relate to school performance.

- vi) Provide guidelines on strategies for ICT literacy development among secondary school principals of the Western province of Kenya.

6.1.3 Problem analysis and demarcation

The field of the study was demarcated to focus on secondary school principals in the Western Province of Kenya. The main research question was: What is the extent of ICT literacy among secondary school principals in the Western province of Kenya? (See section 4.2). The extent of ICT literacy was determined in terms of the levels of ICT access, ICT knowledge, ICT application in school leadership functions and the relationship of each of these levels with school performance.

6.1.4 Methodology

The research methodology in this study was divided into a literature study and an empirical investigation. After the completion of the theoretical investigation and subsequent construction of the measuring instruments for gathering data, statistical techniques were used to analyse the data. These were descriptive statistics to summarise data in tabular form, Pearson's chi-square to show statistical differences and Spearman's correlation co-efficient to determine the statistical relationships and test the null hypotheses (see chapter 5). The main assumption was that ICT plays a role in improving school performance.

6.1.5 The sample

The study population involved 220 secondary school principals and 220 deputy principals. It was on the basis of the empirical study that the null hypotheses were tested (see section 4.4). The principals and their deputies were randomly selected from two strata, namely the highly achieving schools (110 schools) and the low achievement schools (110 schools) (see section 4.8).

6.2 FINDINGS FROM THE LITERATURE STUDY

6.2.1. Introduction

In order to investigate ICT literacy as a strategy for managing technological change, chapter 2 briefly described planned change and how the change can influence performance. The literature focused on how the process of planned change involves creating awareness for change, adapting to new attitudes and values, using reinforcing mechanisms to set new behaviours to become norms.

6.2.2 The leadership role in managing planned change

The success of implementing planned organisational change rests on the leadership (see section 2.2.3). The secondary school principal as a leader plays a crucial role in taking positive action to facilitate coping with technological change. By being ICT literate, the school principal can influence the overall school operations in terms of organisation of school curriculum, management of school finances and stores, management and motivation of human resources, functioning as secretary to the school Board of the Governors and managing the school plant and equipment (see section 2.2.4).

6.2.3 ICT literacy as a strategy for continuous improvement

Strategies to be ICT literate suggest continuous improvement of the level of an individual in an organisation and it is a useful standard of attaining quality (see section 2.2.5). Chapter 2 emphasises that quality management is the responsibility of all role players especially those in leadership; hence the need for Total Quality Management (see section 2.2.3). The principal whose core business is education, has little control over technology, but can facilitate the opportunities for its utilisation by the school team (teachers, students and non-teaching staff).

There are various approaches to planned change management (see section 2.2.5). TQM as an approach is a philosophy with core values for continuous improvement. The purpose of TQM is to provide a quality service at a minimum cost. Cotton (2003: 4) feels that the leader in a quality

oriented organisation seeks ways not merely to change, but to manage change and instil the change process itself. The literature study emphasises the Actor Network Theory (ANT) as a theory that shows the relationship between the human aspect and technology (see section 2.2.5.2). The importance of the ANT to leaders of technological change is to conceptualise the heterogeneous link of human and non-human agents in order to respond to technological challenges in improving organisational quality (Waryznski, 2006: 6).

The justification for improving the ICT literacy of principals is also shown by Fullan's theory (see section 2.2.5.3) and Senge's learning organisation approach (see section 2.2.5.4). The two theories emphasise capacity building: the more one invests in capacity building the better the organisational performance. In the current study capacity building is considered as one of the drivers of quality, because sustainability in performance improvement focuses on drivers but not end results. Therefore, if the Kenya government has to improve the leadership and performance of schools, capacity building of principals in ICT is necessary. The continuous improvement through ICT literacy of principals will embrace technological change in schools. School principals are considered to be change agents and Kurt Lewin's force-field analysis is a problem-solving tool for helping change to occur (see section 2.2.5.5). Lewin's contribution on group dynamics applies to group structure and its leadership. His model features basic skills training intended to help an individual function as a change agent (Smith, 2008:6)

6.2.4 Performance is a dimension of quality

Performance as demonstrated in chapter two is a dimension of quality in an organisation. Improving school performance is process improvement which involves planning strategies for better quality. The strategies for improving performance level include using qualitative and quantitative measurements; performance outcomes and learner performance (see section 2.3.5).

Visionary leadership establishes vision and creates policy as the mission to respond towards change in the school environment. The level of performance in organisational leadership can be determined by following ISO guidelines for Education (see section 2.3.5.1) and the Baldrige performance Excellence criteria (see section 2.3.5.2). The ISO standard for education promotes high quality assurance systems, while the Baldrige performance Excellence Framework leads to

continuous performance improvement. In this study therefore it was assumed that when a principal is ICT literate, the quality of performance as a leader is assured to improve, while the acquiring of ICT skills facilitates additional skills that lead to continuous improvement.

6.2.5 Determining the ICT literacy level

To improve the quality of leadership in secondary schools, the Kenya government can include ICT skills development. In chapter 3, therefore, the concept of ICT, significance of ICT literacy, challenges that face ICT literacy development and strategies that enhance ICT literacy development were discussed. The concept of ICT literacy entails three dimensions: access, knowledge and integration of the learned skills (see section 3.3.1). A look at the definition of ICT literacy offered by ETS (2002:16) shows that ICT literacy has three major dimensions, namely access, skills and knowledge, and application.

The literature in section 3.3.2.1 confirmed that ICT access involves awareness of and availability of ICT infrastructure. ICT access depends on the willingness of institutional leaders who determine availability of ICT infrastructure (Selwood *et al.*, 2003:63). Infrastructure is one of the factors in Michael Porter's Value Chain model, in which he explains that the flow of business success starts with infrastructure, then development of technology and growth of human resources. ICT knowledge is the ability to integrate learned ICT skills in organisational operations (see section 3.3.2.2). The skills are determined also by the period of experience with ICTs increasing proficiency. The application of ICT involves integration through actual use of skills in organisational operations (see section 3.3.2.3).

6.2.6 Factors influencing ICT literacy level

Chapter 3 revealed that the willingness and ability of an individual to learn ICT skills can be influenced by socio-demographic factors. Such factors included gender, age, education level, level of ICT training, period of experience with ICT and distance from a town centre (see section 3.3.4).

6.2.7 Challenges facing ICT literacy development

Despite the willingness of an individual to learn ICT skills, there are challenges that may hinder the learning of such skills. Literature in chapter 3 showed that such challenges include financial constraints, lack of ICT infrastructure, poor quality control, negative attitude towards ICT and lack of interest (see section 3.3.5).

6.2.8 Strategies enhancing ICT literacy development

Chapter 3 highlighted strategies that can enhance ICT literacy development. It was revealed that applicable strategies vary depending on the country and the nature of challenge faced in a given situation (Katz & Macklin, 2006:50). Strategies include ICT human capacity development, structuring of ICT policy development and implementation, improving the quality of ICT training programmes, reducing the cost of ICT products and services, pooling resources to develop ICT infrastructure and formation of ICT leadership networks (see section 3.3.6).

6.3 FINDINGS FROM THE EMPIRICAL STUDY

6.3.1 Introduction

The main objective of the empirical investigation was to establish the extent of ICT literacy by determining the correlation between the ICT literacy of a principal and the level of school performance. The level of school performance referred to the school performance index of a school in terms of product outcomes, student-focused outcomes, workforce outcomes, process effectiveness outcomes, financial and market outcomes and leadership and social responsibility (see section 2.3.5.2.2). A number of hypotheses (see section 4.4) were tested in order to establish whether relationships existed between ICT literacy level designated by this study as ICT access, ICT knowledge and ICT application and school performance. Statistical analyses were used for this purpose and the results of the statistical analyses are provided in section 5.2. The findings are discussed in the sections that follow.

6.3.2 Socio-demographic factors influencing ICT literacy of a principal

This part of the investigation attempted to establish the relationship between ICT literacy and the selected socio-demographic factors. In order to provide further information to the investigation, a number of socio-demographic variables were tested against ICT literacy levels. These were gender, age, education level, level of ICT training, period of experience with ICT and distance of the school from the nearest town (see section 5.2). Socio-demographic factors that influenced ICT literacy among principals in the Western province of Kenya were gender, age, education level, level of ICT training and the distance of a school from town. The period of experience with ICT did not influence the ICT literacy level of principals.

6.3.3 Extent of ICT access to a principal and school performance

This part of the investigation attempted to establish the link between ICT access, which included hardware and software, and school performance. The results of the analyses are reported in section 5.3.2. The most available ICT hardware to principals consisted of Internet/e-mail infrastructure, printer, electricity infrastructure and computer. The most available forms of ICT software were word processing and databases. None of the schools had a surveillance camera. Access to electricity infrastructure, computers, printers, copiers, word processing, spreadsheets and databases played a significant role in improving school performance.

6.3.4 Extent of ICT knowledge of a principal and school performance

This part of the investigation attempted to establish the correlation between ICT knowledge in terms of ability and frequency of ICT use and school performance. The results of the analyses are reported in section 5.3.3. Secondary school principals in Western province were most able to start and shut down a computer, use word processing, and use spreadsheets. The most frequently used ICT software were word processing and spreadsheets. The ICT skills that played the most significant role in influencing school performance were use of word processing, spreadsheets and general computer use.

6.3.5 Extent of ICT application in leadership functions and school performance

This part of the investigation attempted to establish the correlation between principals' application of ICT in their leadership functions and school performance. The results of the analysis are reported in section 5.3.4. Principals applied ICT most in monitoring teachers' schemes of work, learners, progress reports, financial transactions and maintaining correspondence with BOG/PTA and education offices. The application of ICT in monitoring learners' progress reports, teachers' schemes of work, controlling financial transactions, controlling the library catalogue, monitoring learners' admission details and maintaining correspondence with education offices played the most significant role in improving school performance.

6.3.6 Challenges facing ICT literacy development and school performance

This part of the investigation attempted to establish the correlation between challenges facing ICT literacy development of a principal and school performance. The results of the analysis are reported in section 5.3.5. Most principals agreed that they faced the following challenges in an attempt to be ICT literate: financial constraints, lack of ICT infrastructure and lack of interest to learn ICT skills. All principals had a positive attitude towards ICT literacy development. Lack of ICT infrastructure significantly reduced the level of school performance. Lack of time, lack of interest to learn ICT skills and ICT learning centres affected principals in poor, average and good performance schools. Challenges facing ICT literacy development among principals played a negligible role in influencing school performance.

6.4 CONCLUSIONS

After analysis of the findings from the literature review and empirical investigation, conclusions were drawn according to research questions in section 1.3.

6.4.1 Research question 1

What is the level of ICT literacy among secondary school principals in the Western province of Kenya?

The level of ICT literacy among secondary school principals in the Western province of Kenya included the levels of ICT access, ICT knowledge and ICT application. A reasonable number of principals (41.98 %) had access to ICT infrastructure. This means that the government and concerned stakeholders have done their part noticeably in ensuring the availability of ICT infrastructure. The availability of the ICT infrastructure implies that there is a high level of readiness for ICT integration in schools in the Western province of Kenya. Despite the fact that a good number of principals have access to ICT infrastructure, there was a lower percentage (34.91%) of principals who were ICT knowledgeable. The implication is that there is a need for principals to learn ICT skills in order to make use of the available ICT facilities. As regards ICT integration, a relatively smaller number of principals (28.08%) applied ICT in school leadership functions. It implies that availability of ICT facilities to secondary school principals is not enough, but should be followed by acquiring skills on how to use the facilities. The importance of the ICT facilities and knowledge of their use is beneficial in education when they are applied in school operations. Such an application includes use of ICT facilities in carrying out a school principal's responsibilities (see section 2.2.4).

6.4.2 Research question 2

What socio-demographic factors influence ICT literacy among secondary school principals in the Western province of Kenya?

The socio-demographic factors that influenced ICT literacy among secondary school principals in the Western province of Kenya were gender, age, education level, level of ICT training and the distance of the school from a town. There were more male than female principals who were ICT literate (see section 5.2.1). Middle-aged principals (41-50 years) were the most ICT literate and their counterparts above 50 years were the least ICT literate. This means that there is potential for ICT integration in the Western province, because the majority of principals are aged 41 to 50

years and at the same time they are the most ICT literate group (see section 5.2.2). Most principals have a Bachelors degree and the proportion indicates that it is the most ICT literate group (see section 5.2.3). The fact that education level correlates positively with ICT literacy implies that the secondary school principals in the Western province are a suitable target group for ICT integration in education. The principals who were formally trained with ICT certificates were the most ICT literate. This implies that formal ICT training of principals should be emphasised because it positively relates with the level of ICT literacy of principals (see section 5.2.4). The proximity of a school from a town centre determined the level of ICT literacy of a principal, because none of the principals in schools less than 5 kilometres away from a town centre had a low ICT literacy level (see section 5.2.6). It implies that the nature of ICT facilities provided in schools should depend on the location of the school as village or town school, for instance using wireless networks in schools that have no telephone landlines.

6.4.3 Research question 3

Is there a significant relationship between the level of ICT literacy of a principal and school performance?

The level of ICT access to a principal is closely associated with the level of school performance, because there is a statistically significant positive relationship between the ICT access level and school performance (see section 5.3.2.3). The level of ICT knowledge of a secondary school principal is closely associated with the level of school performance, because there is a statistically significant positive relationship between the level of ICT knowledge and school performance (see section 5.3.3.3). A principal's application of ICT in leadership functions is closely associated with school performance, because there is a statistically significant positive relationship between the level of ICT application and school performance (see section 5.3.4.6). The challenges that principals face in an attempt to be ICT literate correlate negatively with school performance. It is evident from the study that there is a statistically significant positive relationship between the level of ICT literacy of a secondary school principal and school performance.

6.4.4 Research question 4

What is the role of ICT literacy in improving secondary school performance?

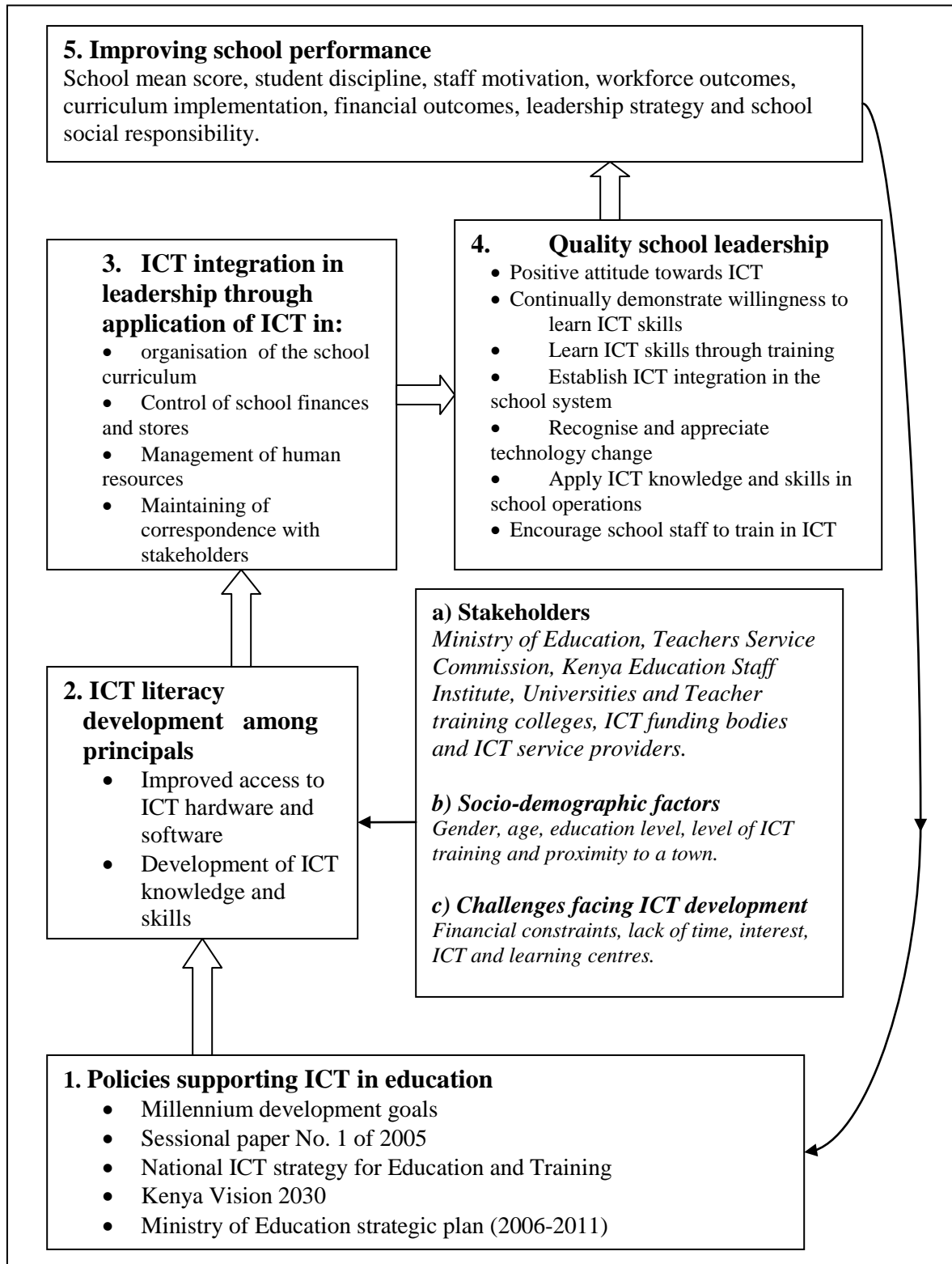
Research findings in the current study have shown that a principal's access to ICT infrastructure plays a significant role in improving secondary school performance in the Western province of Kenya (see section 5.3.2.3). In addition, the level of ICT knowledge of a principal appears to have a significant impact on school performance in the Western province of Kenya (see section 5.3.3.3). For the principals who are ICT knowledgeable, their application of ICT in school leadership functions plays significant role in improving school performance in the Western province of Kenya (see section 5.3.4.6). The challenges facing ICT literacy development however, play a minimal role in influencing school performance (see section 5.3.5.7).

6.4.5 Research question 5

Can features of ICT integration in school leadership be combined in a model for purposes of improving secondary school performance?

The success of a formulated strategy is determined by how well it is implemented in a sustainable manner, because strategy has a long-time value (Kaplan & Norton, 2008:1). The ICT strategy in Kenya is based on the vision that ICT is a universal tool in education and training (see section 1.2.3). The strategy implementation process involves an integrated set of choices and activities that are used to allocate ICT resources, continuous improvement of human resources and evaluation of institutional performance. Among the strategic pillars for educational ICT implementation, is integration of ICTs in education (see section 1.2.2). A framework that is suitable for educational leaders can be expressed in a model showing stages for ICT integration in the education sector in Kenya. The model is shown in figure 6.1.

Figure 6.1: Proposed model for ICT literacy integration in school leadership in Kenya



The model is based on the Quality Management Systems model of a process-based approach as explained in the literature review (see section 2.3.5.1.4) and the findings of this study. It describes ICT integration as product realisation in strategy implementation. The product realisation in this study is quality leadership influencing school performance.

The model in figure 6.1 depicts ICT literacy as a means for continuous improvement. The first stage is building an organisation capable of executing strategy in order to turn strategy into reality; hence the need for ICT policy formulation. The second stage shows establishing a supportive environment where concerned stakeholders must provide facilities and resources to implement a strategic plan. Such support is through capacity building of human resources and in this study, it is ICT literacy development. Thirdly, installing internal administrative support systems must support the management process and monitor strategic progress by ICT integration. Lastly, a strategy-supportive co-operative culture causes the school to work towards strategy accomplishment by ICT application. The ICT application impacts on leadership quality which eventually improves school performance, which is followed by feedback through evaluation.

The model presented in figure 6.1 is useful to the Ministry of Education (MoE) and Teachers Service Commission (TSC) as a guide for implementing Kenya's ICT strategies. The model is a guide because it shows that the ministry can start with the laid down ICT strategies, followed by developing the ICT skills among secondary school principals. For proper use of the Management Information Systems in education, the educational leaders like school principals can apply the learned ICT skills. The level to which such leaders learn ICT skills determines their quality which also influences the performance level of a school.

The model is useful to the Kenya Education Staff Institute to improve on the ICT training of school principals. The findings on the influence of the proximity of a school from town, provide a guideline to KESI that mobile training facilities and wireless ICT networks are most suitable for principals in small and rural schools. The model also provides an idea to various stakeholders like ICT service providers and financing bodies that the progress in ICT literacy integration is not a smooth path, but faces challenges like financial constraints, lack of ICT training centres, lack of interest and resistance to changes in technology.

In stage 4, the fact that quality leadership is characterized by continuous improvement through ICT skills learning, is a suggestion that secondary school principals themselves can appreciate that ICT literacy improves school operations. Such school operations are curriculum implementation, managing the school human resource, controlling school finance and resources and general communication with concerned stakeholders. The model is generally a roadmap to ICT integration and shows that ICT integration is a process in five stages, namely: developing of educational ICT policies; ICT skills development of the educational leadership; application of the learned skills in school leadership; and performance improvement through improved leadership quality.

6.5 RECOMMENDATIONS

The recommendations from this study are based on the suggested ICT development strategies in section 5.3.6, the findings of the empirical data analysis and interpretation in section 6.3 and the research conclusions in section 6.4. The ICT literacy of secondary school principals in the Western province of Kenya shows that there is a need for ICT training, because the levels of ICT knowledge and application are low. In addition, the following recommendations are made:

- a) The Ministry of Education should:
1. Provide standard Management Information Systems to schools for uniformity and quality in ICT use in schools in order to increase the frequency of use and application.
 2. Make it a requirement that all principals must have working computers in their offices, where the government provides the ICT infrastructure.
 3. Encourage application of ICT by providing the ministry's circulars and other forms of communication to school principals through electronic media like CDs.
 4. Give priority to providing electricity infrastructure, computers, printers, copiers, word processing and spreadsheets to improve on ICT access as it was found that their availability yielded a positive relationship with school performance.
 5. Set standards for delivering ICT competency and literacy training by organising for regional or zonal ICT training centres for easy access to assist the busy

principals learn ICT skills. This means that the ministry should take the lead in setting standards and mechanisms for assessing ICT competency training.

b) Kenya Education Staff Institute (KESI) should:

1. Ensure that all principals get basic ICT skills by organising for mobile ICT training facilities to train principals in their schools as it was found that about 60 % were not able to use a computer, Internet/e-mail and Microsoft office packages.
2. Make ICT training more affordable to principals from small schools.
3. Organise for compulsory ICT training seminars during school holidays.
4. Decentralize the training centres to enable more principals in rural areas appreciate the value of ICT in school management.
5. Offer conferences and seminars to school principals in various courses using ICT like word processing and PowerPoint and giving seminar notes on flash disks in order to compel principals to learn how to use ICT facilities.
6. Develop appropriate secondary school management-appropriate contents of ICT literacy training curricula. The ICT curricula should have contents relevant to secondary school management.

c) Teachers Service Commission (TSC) should:

1. Make it a requirement that ICT literacy is a qualification for one to be a principal.
2. Provide its services to principals by using ICT enabled communication like e-mails, to encourage ICT use by school principals.
3. Motivate ICT literate principals through promotion or other quantifiable incentives, in order to encourage other principals to train in ICT.

d) Professional bodies like the Secondary Schools Heads Association should sponsor principals to ICT skills training.

e) Educational leaders can form a consortium that will ensure that agreed-upon ICT literacy competencies i.e. basic ICT knowledge, technical skills and critical

assessment skills are redefined and the desired standards of ICT literacy skills for Kenya are outlined.

- f) ICT training bodies like Computers for Schools Kenya (CFSK) should motivate principals to register for ICT courses by sponsoring them.
- g) Principals themselves should delegate some duties to other staff to create time for ICT training.
- h) ICT software providers should reduce the cost of Management Information Systems to make it affordable to small schools.

6.6 SUGGESTIONS FOR FURTHER RESEARCH

1. The researcher considered a number of factors that influence the level of ICT literacy of a principal. There is a need to investigate other factors like attitudes towards ICT which could influence ICT literacy among educators.
2. In order to broaden the scope of the research population, future researchers should also target the education officers at zonal, district and higher levels in the Ministry of Education. The awareness of education officers in ICT skills is a useful starting point for ICT integration in educational institutions in Kenya.
3. It is important to acknowledge that ICT literacy development is a continuous and long-term strategy to improvement. The practical nature of an ICT skills development programme requires practical verification to confirm the actual levels of the ICT literacy. This study only investigated the level of ICT literacy indirectly by depending on the responses of principals in a questionnaire. Clearer outcomes may have been obtained if principals were practically exposed to ICT skills in order to know the actual level of ICT knowledge.
4. Researchers in educational leadership should consider an evaluation of ICT policies in relation to improvement of school leadership in Kenya.

6.7 LIMITATIONS OF THE STUDY

Limitations of a study empower a researcher to appreciate constraints imposed and to understand the context under which claims are set (Souls, 2005:11). The fact that ICT in school management is still a new concept, limits the scope of the literature review because of little previous research in Kenya. Since testing for ICT literacy practically takes very long and requires expensive facilities, the researcher was limited to a theoretical investigation. The investigation on ICT literacy was limited to principals responding to a questionnaire. This limited the actual information on practical ICT skills and a true measurement scale of ICT literacy.

It can be hypothesized that since the educational administrative structure in Kenya is similar in all provinces, findings of the study hold true for a large proportion of secondary schools and may be implemented regardless of their location. However, the results were generalised with caution because individual provinces may vary in their constraints towards ICT literacy development.

The study was also limited to the fact that in some schools, principals who had contributed to the level of the school performance for the selected five years were not those who responded to the questionnaires. Some principals might have left the schools due to resignation, retirement and routine transfer to other schools, natural attrition or promoted to higher offices within the ministry. This was a limitation to investigating the correlation between the ICT literacy of a principal and school performance.

6.8 CONCLUDING REMARKS

In a technologically changing world, there is a need for an approach to manage the change in the education sector. Such an approach includes ICT integration in school leadership and in order to successfully implement the integration, it is essential to consider planned technological change management. As a way of managing planned change, improving school leadership through learning of ICT skills is an innovation strategy for school performance improvement. Human capacity building through ICT literacy development is an essential step in planned change management. The secondary school principal as a leader has a role to play in influencing the use of ICT in school operations.

The nature of this research and investigation has hopefully highlighted the need for ICT literacy development among secondary school principals. The development of ICT skills of principals as a step towards ICT strategy execution enhances continuous performance improvement. Such performance improvement is associated with change which positively influences growth with focus on the use of technology. The emphasis on the preparedness of principals in ICT skills development is based on the premise that the level of school performance is determined by the quality of school leadership. Improving the quality of leadership is essential for raising the level of school performance as evidenced from both the literature and empirical findings that the ICT literacy level of a principal positively correlates with school performance.

ICT integration in school leadership is not a one step issue, but a process involving several steps. The steps include ICT policy formulation, human capacity development and application of ICT skills for school performance improvement as proposed in the ICT integration model. The model may make a meaningful contribution towards technology use in leadership for school performance improvement. Lastly it must be pointed out that this study's investigation of the level of ICT literacy of principals and the significance of technology among secondary school principals has highlighted ICT challenges which are not confined to the realm of education management. The findings and recommendations thus have value in addressing ICT challenges in Africa.

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APPENDICES

APPENDIX A1: RESEARCH AUTHORIZATION FROM THE NATIONAL COUNCIL FOR SCIENCE AND TECHNOLOGY

NATIONAL COUNCIL FOR SCIENCE AND TECHNOLOGY

Telegrams: "SCIENCETECH", Nairobi
Telephone: 254-20-241331, 241349,
254-20- 311761, 241376,
Fax: 254-20- 213215
When replying please quote



P. O. Box 30623 -00100
NAIROBI- KENYA

REF: NCST/5/002/R/045 24th December 2008

Ms. Everlyne S. Makhanu
P.O. Box 712-50204
KIMILILI

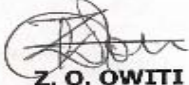
RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on "**Towards Quality Secondary School Leadership for Improving Student Achievements in Kenya: the Role of ICT.**",

I am pleased to inform you that you have been authorized to carry out research in **Western Province** for a period ending **30th June, 2010**.

You are advised to report to the Provincial Commissioner and Provincial Director of Education, Western Province before embarking on your research.


On completion of your research, you are expected to submit two copies of your research report to this office.


Z. O. OWITI
FOR: EXECUTIVE SECRETARY

Copy to:

Provincial Commissioner
Western Province

Provincial Director of Education
Western Province



APPENDIX A2: RESEARCH AUTHORIZATION FROM THE PDE WESTERN PROVINCE

MINISTRY OF EDUCATION

Telephone: 056 - 30048
FAX: 056 - 31307
E-mail: wespropde@yahoo.com
When replying please quote.



PROVINCIAL DIRECTOR OF EDUCATION
Western Province,
P. O. BOX 137,
KAKAMEGA.

REF: WP/GA/29/17 VOL.II/65

17th February 2009

**All Principals
Secondary Schools
Western Province**

RE: RESEARCH AUTHORIZATION
MS EVERLYNE S. MAKHANU

The above named is pursuing her PhD programme at UNISA. She has been authorised to carry out research in Western Province for a period ending 30th June, 2010. She intends to carry out research on **"Towards Quality Secondary School Leadership for Improving Student Achievement in Kenya: the Role of ICT"**.

Kindly accord her the necessary assistance to enable her carry out her research successfully.

Mukabi I. Thomas
FOR: PROVINCIAL DIRECTOR OF EDUCATION
WESTERN PROVINCE

**All District Education officers
Western Province**

**APPENDIX B: LETTER OF PERMISSION TO CONDUCT RESEARCH IN
SECONDARY SCHOOLS.**

P.O Box 712-50204
Kimilili.

The principal,
.....
.....
.....

Dear sir/ madam,

RE: Research permission

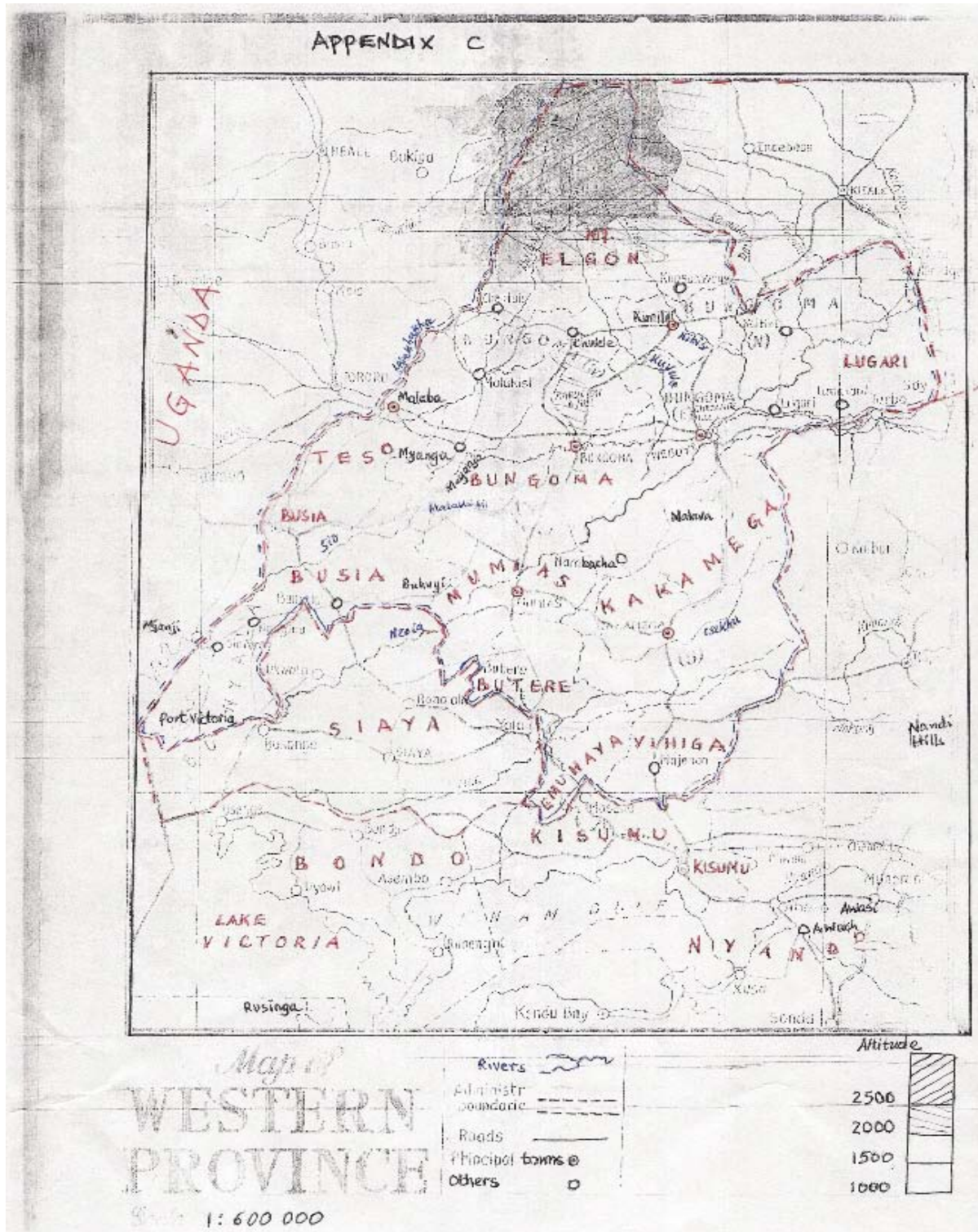
I MAKHANU E. S have registered with the University of South Africa (UNISA) for DEd (Management). I am at present completing the empirical part of my study entitled: *‘Towards quality leadership for improving student achievement in Kenya: The role of ICT.* The aim of the study is to establish the relationship between the ICT literacy of a principal and school performance.

Your school has been purposefully selected to participate in the study. I hereby request for your permission to fill in questionnaire 1 and your deputy to fill in questionnaire 2. Your assistance in granting me an interview and allowing me to make observations in relation to the study will be highly appreciated. All principles of confidentiality will be adhered to.

Thanking you in advance for your kind assistance.

With regards,
Everlyne S. Makhanu
Mobile: 0722672473
E-mail: evamakhanu@gmail.com

APPENDIX C: MAP OF WESTERN PROVINCE



APPENDIX D1: QUESTIONNAIRE 1 FOR PRINCIPALS

This questionnaire is part of a research project to investigate Information and Communication Technology (ICT) literacy of secondary school principals of the Western province of Kenya. The main purpose is to investigate the role of ICT literacy in the quality of leadership for improving secondary school performance. For this study to be successful, your co-operation and honesty in responding to the items will be appreciated.

Please be assured that the information you will provide is completely confidential and will be used for the purposes of this study only.

The questions from parts A to E require you to indicate your answer by encircling the applicable number.

A.			For office use
1. Gender:	Male	= 1	v2
	Female	= 2	
2. Age :	30 and below	= 1	v3
3. Education level:	Diploma	= 1	v4
	Bachelors degree	= 2	
	Masters degree	= 3	
4. Level of ICT training	No training at all	=1	v5
	Informal training	=2	
	Formal training with certificate	=3	
5. Period of experience with ICT	No experience	=1	v6
	Less than 1 year	=2	
	1 to 5 years	=3	
	More tan 5 years	=4	
6. Distance of the school from the nearest town:	More than 10 kilometres	=1	v7
	5 to 10 kilometres	=2	
	Less than 5 kilometres	=3	

B. ICT ACCESS

7. Indicate the availability of the listed ICT hardware and software in your school

	1=No	2= Yes
ICT hardware		
Electricity infrastructure	1	2
Computer	1	2
Internet / e-mail infrastructure	1	2
School telephone	1	2
Digital/Video camera	1	2
Printer	1	2
Scanner	1	2
Fax machine	1	2
Copier	1	2
Surveillance camera	1	2
Projector	1	2
ICT software		
Word processing	1	2
Spreadsheets	1	2
Databases	1	2
PowerPoint	1	2

C. ICT KNOWLEDGE

8. Indicate the degree of your agreement with the following statements.

Key:**1 = Strongly Disagree (SD) 3 = Undecided (U) 5 = Strongly Agree (SA)****2 = Disagree (D) 4 = Agree (A)**

ICT skill	1= SD	2= D	3= U	4=A	5=SA
I can start and shut down a computer	1	2	3	4	5
I can use an Internet /e-mail	1	2	3	4	5
I can use word processing	1	2	3	4	5
I can use spreadsheets	1	2	3	4	5
I can use databases	1	2	3	4	5
I can use PowerPoint	1	2	3	4	5

For
office
use

V8

V9

V10

V11

V12

V13

V14

V15

V16

V17

V18

V19

V20

V21

V22

V23

V24

V25

V26

V27

V28

9. Indicate your frequency of use of the ICT tasks in school?

ICT task	1= Never	2=Rarely	3= Occasionally	4= Frequently
Starting and shutting down a computer	1	2	3	4
Using Internet /e-mail	1	2	3	4
Using word processing	1	2	3	4
Using spreadsheets	1	2	3	4
Using databases	1	2	3	4
Using PowerPoint	1	2	3	4

For office use

V29

V30

V31

V32

V33

V34

D. ICT APPLICATION IN SCHOOL LEADERSHIP FUNCTIONS

10. Indicate your degree of agreement with the following statement: I use ICT in monitoring the listed leadership functions in my school

1 = Strongly Disagree (SD) 3 = Undecided (U) 5 = Strongly Agree (SA)
2 = Disagree (D) 4 = Agree (A)

	1= SD	2= D	3= U	4=A	5=SA
Organisation of the approved curriculum					
School timetable	1	2	3	4	5
Schemes of work	1	2	3	4	5
Students' progress reports	1	2	3	4	5
Learning sessions	1	2	3	4	5
Control of school finance and stores					
Financial transactions	1	2	3	4	5
Procurement documents	1	2	3	4	5
Control of school stores	1	2	3	4	5
Library catalogue	1	2	3	4	5
Management of human resources					
Staff personal information records	1	2	3	4	5
Students' admission details	1	2	3	4	5
Staff responsibilities records	1	2	3	4	5
Communication with school Staff	1	2	3	4	5
Correspondence with stakeholders					
Maintain correspondence on all Board of Governors (BOG) and Parents Teachers Association (PTA) matters	1	2	3	4	5
Maintain correspondence with education offices	1	2	3	4	5
Management physical facilities					
Monitoring the maintenance manuals for all physical facilities	1	2	3	4	5

V35

V36

V37

V38

V39

V40

V41

V42

V43

V44

V45

V46

V47

V48

V49

E. CHALLENGES FACING ICT LITERACY DEVELOPMENT

11. The following are some challenges in increasing one’s personal ICT literacy. Please indicate the degree of agreement by encircling the one most applicable to you.

1 = Strongly Disagree (SD) 3 = Undecided (U) 5 = Strongly Agree (SA)
2 = Disagree (D) 4 = Agree (A)

	1=SD	2=D	3=U	4=A	5=SA
Financial constraints	1	2	3	4	5
Lack of time	1	2	3	4	5
Lack of ICT learning centres	1	2	3	4	5
Lack of ICT infrastructure	1	2	3	4	5
Negative attitude towards ICT	1	2	3	4	5
Lack of interest in ICT	1	2	3	4	5

V50

V51

V52

V53

V54

V55

V56

Apart from the mentioned challenges, what other challenges do you think you face in an attempt to be ICT literate

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F. STRATEGIES THAT CAN ENHANCE ICT LITERACY DEVELOPMENT

13. Suggest any strategies through which you think ICT literacy development among secondary school principals can be enhanced.

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V57

THANK YOU FOR YOUR CO-OPERATION

APPENDIX D2: QUESTIONNAIRE 2 FOR DEPUTY PRINCIPALS

This questionnaire is part of a research project to investigate the relationship between the Information and Communication Technology (ICT) literacy of a principal and secondary school leadership performance. For this study to be successful, your co-operation and honesty in responding to the items will be appreciated. Please be assured that the information you will provide is completely confidential and will be used for the purposes of this study only.

The items 1- 30 require you to indicate your answer by encircling the applicable number.

Strongly Disagree (SD) = 1 Disagree (D) = 2 Undecided (U) = 3 Agree (A) = 4 Strongly Agree (SA) = 5						For office use
	SD	D	U	A	SA	
Product outcomes						
1. My school's mean score has been on an upward trend	1	2	3	4	5	1
2. My school's mean score has been among the best in the western province	1	2	3	4	5	2
3. Most students from my school join public universities for degree courses	1	2	3	4	5	3
Student-focused outcomes						
4. Students are courteous to other people	1	2	3	4	5	4
5. Students respond promptly to the bell	1	2	3	4	5	5
6. Students are self-driven	1	2	3	4	5	6
7. Students do not show willingness to transfer to other schools	1	2	3	4	5	7
Workforce outcomes						
8. Teachers in my school are trained in their subject areas	1	2	3	4	5	8
9. Support staff in my school are skilled in their areas of work	1	2	3	4	5	9
10. Teachers work well without supervision	1	2	3	4	5	10
11. Teachers are not willing to transfer to other schools	1	2	3	4	5	11
Process effectiveness outcomes						
12. Teachers have easy access to teaching aids	1	2	3	4	5	12
13. Teachers attend to all their lessons	1	2	3	4	5	13
14. Technology is integrated in teaching	1	2	3	4	5	14
15. Assessment tests are done at regular intervals	1	2	3	4	5	15
16. Assessment test materials are filed in soft and hard copies for future use	1	2	3	4	5	16
17. Assessment test results are analyzed using computers	1	2	3	4	5	17
18. Frequent meetings are held to discuss assessment test results	1	2	3	4	5	18
19. School operations show preparedness for emergencies	1	2	3	4	5	19
Financial and market outcomes						
20. School expenditure runs smoothly according to the budget	1	2	3	4	5	20
21. Students are sent home frequently for school fees	1	2	3	4	5	21
22. There are income generating activities in my school	1	2	3	4	5	22
23. Student enrolment is on an upward trend	1	2	3	4	5	23
Leadership and social responsibility						
24. My school has a strategic plan	1	2	3	4	5	24
25. The principal uses appraisal procedures to reward school personnel	1	2	3	4	5	25
26. The principal takes lead in transformational processes	1	2	3	4	5	26
27. The principal funds school personnel for in-service courses	1	2	3	4	5	27
28. The principal has written codes of ethics for school personnel	1	2	3	4	5	28
29. The principal is easily accessible to the school community	1	2	3	4	5	29
30. My school has regular outreach programs	1	2	3	4	5	30

APPENDIX D3: INTERVIEW SCHEDULE FOR PRINCIPALS

Category of school

- a) High achieving school (according to the mean score) -----
- b) Low achieving school (according to the mean score) -----

1. Do you feel it is necessary for principals to be ICT literate?

Field notes

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2. What do you think are the most important ICT skills for secondary school principals?

Field notes

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3. Do you think there is a relationship between the ICT literacy of a principal and school performance?

Field notes

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4. In your opinion, has the Ministry of Education done enough to encourage ICT literacy development among secondary school principals?

Field notes

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