

**UNIVERSITY OF TWENTE**

**Data-Based Decision Making in Improving Education: An Assessment of Data Use by Secondary Schools Teachers in Dodoma Region, Tanzania**

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## Abstract

Schools have a variety of data in place. The data can be used by teachers to improve planning and implementations of their duties as teachers as well as the school activities. However, most of studies on data use are based on developed countries, with very few from developing countries. The purpose of this study was therefore, to explore the kinds of data, its purpose, as well as factors promoting and hindering its use by heads of schools and classroom teachers in Dodoma Region, Tanzania. This study has been based on a theoretical framework showing factors hypothesized to influence data use in organisations. The study used multiple case study design to explore data usage in four schools, two are high data user and two low data user schools as determined by previous analysis. A total of 14 respondents, 7 from each group of high data use and low data use schools were purposively sampled, among which were 4 heads of schools and 10 classroom teachers. To answer the research questions, qualitative data were collected using semi-structured interviews. Instrument reliability was ascertained through piloting and research expert reviews. Validity of data was realized by triangulation and audio recording of all interviews and then transcribing and writing reports that were then taken to respondents for member checks for internal validation. External validity was realized using specific and cross-case thick description of the cases. Qualitative data obtained from in-depth interviews analyses were analysed on an ongoing process as themes and sub themes emerged. The inter-rater reliability check was conducted before the commencement of analysis of the interview data, and the interview reports were analysed using Weft QDA software that allowed coding of themes and sub-themes in line with the theoretical framework and research questions.

The study established that the two groups of schools under study have similar input, process and outcome data available. Process data were dominant in both the groups. Most of the data were used for school development, followed by data use for instruction. A very few data were used for just parts of accountability purposes. The study revealed further that the heads of schools used data mainly for school management purposes while classroom teachers used data that were directly involved with students' welfare and academic progress. The study showed that data use in developing countries can be different from those from Western countries in terms of data literacy, the role of governments in education system, as well as school environment. Although the factors promoting and hindering data use in high data use and low data use schools were different, there was no difference between data use practices between these groups of schools, because teachers and heads of schools lacked data literacy and they never attended any professional training on data use, and the concept of data and data use in schools were completely new to them. In addition, the study results suggested that teachers used intuitions to make most of their decisions, and they sometimes practiced unintended use of data. Therefore, the differences between high data use and low data use schools were mainly in terms of school leadership, availability of facilities and teacher qualification and attitudes. The study recommended that the government needs to invest on both long and short-term professional development training on data and data use in schools and teacher training institutions as a way to promote the quality of education. The inspectorate division needs to be strengthened to enhance standard settings and school quality checks. Future studies also need to take into consideration of the role of government policy, school environment, teacher qualification and motivation, as well as teachers' personal attributes as possible factors that may promote and hinder data use in the context of schools in developing countries.

**Key words:** *Data, data use, school development, school improvement, instruction, school accountability, high data use schools, low data use schools, promoting and hindering factors*

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## LIST OF ABBREVIATIONS

<b>ACSEE</b>	Advanced Certificate of Secondary Education Examination
<b>AIDS</b>	Acquired Immune Deficient Syndrome
<b>BEST</b>	Basic Education Statistics of Tanzania
<b>BRN</b>	Big Results Now
<b>CSEE</b>	Certificate of Secondary Education Examination
<b>CT</b>	Classroom teachers
<b>D by D</b>	Decentralisation by Devolution
<b>DEO</b>	District Education Officer
<b>EFA</b>	Education for All
<b>ETP</b>	Education and Training policy
<b>GPA</b>	Gross Performance Average
<b>HIV</b>	Human Immunodeficiency Virus
<b>HM</b>	Headmaster or Headmistress
<b>ICT</b>	Information Communication Technology
<b>MOEVT</b>	Ministry of Education and Vocational Training
<b>NBS</b>	National Bureau of Statistics
<b>NCLB</b>	No Child Left Behind
<b>NECTA</b>	National Examinations Council of Tanzania
<b>PMO-RALG</b>	Prime Minister's Office Regional Administration and Local Government
<b>PSLE</b>	Primary School Leaving Examination
<b>RAS</b>	Regional Administrative Secretary
<b>SEDP</b>	Secondary Education Development Programme
<b>TSD</b>	Teachers Service Department
<b>UN</b>	United Nations
<b>URT</b>	United Republic of Tanzania
<b>USA</b>	United States of America

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## **1.0 DATA USE IN THE SCHOOL ENVIRONMENT**

*This chapter introduces data use in the school environment, defines data, data-based decision making, and explains data use for accountability, instruction, and for school development with associated barriers and enablers. Next, it presents the background and rationale for data use in schools. Towards the end of the chapter, the context of the problem is described and the problem stated followed by formulation of the study objective and research questions.*

### **1.4 Introduction**

Decision making is very important in education. Educational institutions like schools, like any formal organisations, are basically decision-making structures (Hoy and Miskel, 2008). Schools need to have decisions that guide their actions for improvements. These may be for the aim of deciding how the schools governing rules will be enforced; setting academic expectations for schools and students; adopting long-range plans for the country's entire education system; collaborating with other educational and non-educational bodies and organisations; as well as approving teacher training and preparation programs. With this regard, school leaders and teachers are increasingly required to use data as a basis for their decisions as a result of international focus on holding schools more and more accountable for the education provided in their schools (Carlson, Borman & Robinson, 2011), and for improving the quality of the learning outcomes.

The above observation highlights the importance of the practice of making decisions at school level, which needs to focus on underlying problems and plan for strategies to improve the quality of schools (Geijsel, Krueger & Slegers, 2010). The use of the available data that are relevant in the school context for decision making is of paramount importance for school improvement. Literature provides evidence for advantages of data informed decision (e.g. Campbell & Levin, 2009; Carlson et al., 2011; Cawelti & Pretheroe, 2001; Datnow & Park, 2009; Lai, McNaughton, Amituanai-Tolosa, Turner & Hsiao, 2009; Schildkamp & Kuiper, 2010; Wayman & Stringfield, 2006) in terms of student achievement and other related areas.

Schildkamp and Kuiper (2010) studied data use in Dutch secondary schools. The aim of their study was to find out which data were used in schools, for which purposes data were used and which factors hinder or promote data-informed decision making in schools. The study of Data use in Kenya schools by Omoso replicated Schildkamp and Kuiper's (2010) study in the context of Kenya. This study builds on Omoso's study, and it studied data use in Tanzanian secondary school on attempt to enhance understanding about data and data use in African context.

#### **1.1.1 The concept of data and data use in schools**

##### *Data*

Schildkamp, Lai, and Earl, 2013 defined "data" in the context of schools as information that is collected and organised to represent some aspect of schools. They hold that these data could include information such as test performance of students, reports of observations of classroom teaching, or reports of parents meetings and questionnaires. Their definition was broad to include "any relevant information about students, parents, schools, and teachers derived from qualitative and quantitative methods of analysis" (p.10). Generally, this definition suggests that data is the same as information, and can include both qualitative (textual forma) and quantitative (numerical from). The study adopts and uses this very broad definition of data in the context of data use in schools throughout it.

##### *Data-based decision making in schools (Data use)*

For years, schools worldwide have been using data for planning, running and evaluating their practices. Literatures suggest a range of data-based processes in schools, although different terms might have been used to explain the practices. The most common terms used are data-driven decision making (DDDM)

(e.g. Ikemoto & Marsh, 2007; Mandinach, Honey & Light, 2006; Marsh, Pane, & Hamilton 2006;); data-informed decision making (e.g. Knapp, Copland & Swinnerton, 2007; U.S. Department of Education, 2009) and data use (e.g. Ehren & Swanborn, 2012; Farley-Ripple & Buttram, 2014; Jimerson, 2014; Schildkamp & Kuiper, 2010). In addition, terms related to evaluation, such as school-based evaluative inquiry or practice (e.g Cousins, Goh & Clark, 2006; Sutherland, 2004); are used. Lastly, some scholars use different terms like evidence-based decision making (e.g. Cooper, Levin & Campbell, 2009; Honig & Coburn, 2008); knowledge-based decision making (e.g. Tolley & Schulruf, 2009) evidence-based practices (McDonald, Andal, Brown & Schneider, 2007), data-based decision making (e.g. Ingram, Louis & Schroeder, 2004), just to mention a few. However, whereas these terms can be used in different contexts, they are usually used interchangeably, all meaning the same, using data as a guide to practices that lead to improving schools. In this study the term “data use” is used interchangeably with the term “data-based decision making”.

This leads us to the second important concept in this study “data –based decision making” or data use in schools. This is a significant area of study because there is still much to learn from the link between data and decision making in schools. Generally, data is often not used in the form in which it is presented; instead, it is usable only after analysis, interpretation and taking action based on data (Cousins & Leithwood, 1993). This is because, as Schildkamp & Lai (2013) argues, data on their own provide no judgment or interpretation and no basis for action. In support of this, Schildkamp, Lai, & Earl, (2013) defined data use as the systematic analysis of data sources (internal or external to the school) aimed at informing improvement efforts on teaching and learning and/or at holding actor (and systems) accountable for educational processes and results. Furthermore, data-informed decision making describes the process of data becoming valuable information in schools by adding meaning to the data by “contextualizing, categorizing, calculating, correcting, and condensing the data” (Luo & Childress, 2009, p. 2). In this study, data-informed decision making refers to the process of teachers, schools leaders and students using data to make decisions that are aimed at improving schooling (Schildkamp & Lai, 2013). Improving schooling may involve using data to guide accountability, instruction, and school development practices in the school.

After presenting the meaning of data and different terms used for data-based decision making, the following part focuses on the historical background of data use in schools.

### **1.5 Background of data use in schools**

Although schools have been collecting and consolidating data for decades (Messelt, 2004), data-based decision making in schools have been studied only recently. In the Unites States of America (USA) for instance, the passing of the No Child Left Behind (NCLB) Policy in the year 2001 increased the way schools were accountable to inspection, and the schools began using data (Macbeath, 2010, Messelt, 2004; Schildkamp & Kuiper, 2010; Spillane, 2012). The policy envisioned that the collection, analysis and use of educational data are central to the improvement of student outcomes and it was accompanied by a demand for data systems capable of providing a longitudinal record of each student’s educational experiences and performance over time (USA Department of Education, 2009). Secondly, recent studies provided evidence linking data use to student achievement (Carlson, Borman & Robinson, 2011) and thirdly, the high- stake accountability pressures from the schools’ internal or external environment as in The USA and England made schools more accountable for the education they provide (Macbeath, 2010). All these reasons attracted more studies in the field, in terms of its effectiveness, context, factors as well as relationships between different aspects of data-based decision making.

There is strong evidence that outcomes of data-based decision making in the school environment are influenced by contextual differences in schools or countries. The evidences show that data use is influenced by historical, institutional and cultural factors. For instance, Hubbard, Datnow, and Prunyn (2014) report that how and when teachers used data was the result of a broader set of policies and



structures at the federal, district, and school levels, as well as the capacity of the teachers and principal at the school. This is supported by studies from other contexts like for instance New Zealand (Lai, McNaughton, Amituanai-Toloa, Turner & Hsiao, 2009; Lai, McNaughton, Timperley & Hsiao, 2009), The Netherlands (Schildkamp, & Kuiper, 2010; Schildkamp et al., 2012); South Africa, Flanders, England and Canada (Schildkamp, Lai, & Earl, 2013), and USA (Booher-Jennings, 2005; Korets, 2003; Wayman, 2005; Wohlstetter, Datnow, & Park, 2008). Generally, data use initiatives are founded in pre existing initiatives, routines and relationships which sometimes act against data-informed practice. For instance, efforts to fulfill high stake accountability are likely to generate strategic responses from school's staff, or schools focusing only on student achievement results or school inspection report.

Although studies on data use have been going on for long, the concept is still filled with misconceptions. Some practices reinforced by policy makers and researchers still focus on "aggregated standardized test results as the primary source of data about schools (particularly when there are national standards), and disregard other forms of data such as the quality of instruction in classrooms, other valued student outcomes, or school characteristics" (Schildkamp, Lai & Earl, 2013, p. 10). The authors hold that this narrow definition of data has not only led to ignoring some other sources of data, but also promoted negative uses and understandings about data. In addition, literature reveal that some schools still have distrusts on data to the extent that they ignore data from one source and only use data from specific source (Timperley & Phillips, 2003). Schildkamp, Lai, & Earl, (2013, p.11) called these people as "who view test data with suspicion", and "who prefer to only use their own anecdotal observations of students and/or their intuition and experience for decision-making". These too lead to negative effects for students because national assessments and other standardized test results which might have assessed the performance of students against a broader national perspectives and underestimate their potential.

However, in attempt to broaden understanding about data, Ikemoto and Marsh (2007) categorized data into four different forms namely input data (e.g. gender and school expenditures); process data (e.g. school curricula or school policies); output data (e.g. student achievement data); and satisfaction data (e.g. opinions of stakeholders). Building on Ikemoto & Marsh's categories, Schildkamp & Kuiper (2010) presented an interpretation that advocated a definition encompassing the multiple sources of data that can be employed for decision making by teachers and school leaders. These multiple sources include *input* data such as the demographics of the student population; *process* data such as data on the quality of instruction; and *outcome* data such as student test scores and student well-being and *context* data such as policy and resources. This means that schools have different data available and heads of schools and teachers need to make use of these different data sources. This view is adopted throughout the current study.

### **1.3 Rationale for data use in schools**

Data-based decision making has gained a significant attention in schools world-wide. This is due to the realizations that if used effectively, data can lead to school improvement in terms of increased student achievement (Carlson, Borman, & Robinson, 2011; Campbell & Levin, 2009; Lai, McNaughton, Amituanai-Toloa, Turner, & Hsiao, 2009). Heads of schools and students can use data for decision making for school improvement. These can be in terms of school development purposes (e.g. policy development), instructional purposes (e.g. change in instructional approach such as adjusting instruction to the need and ability level of students), and accountability purposes (e.g. communicating to inspectorate division and parents) (Breiter & Light, 2006; Coburn & Talbert, 2006a; Diamond & Spillane, 2004; Schildkamp & Kuiper, 2010; Schildkamp, Lai, & Earl, 2013; Wayman & Stringfield, 2006; Wohlstetter, Datnow, & Park, 2008; Young, 2006).

The section that follows discusses ways in which data have been used by schools for accountability, instruction, and school development. It is important to note that although these efforts seem to occur separately, all of them interact in one way or another, and act either directly or indirectly to enhance

school improvement. For example, data that may aid heads of schools and teachers to meet the required standards for accountability through self-evaluation, changing practices, and monitor effectiveness (Ingram, Louis & Schroeder, 2004). In doing so, the teachers and heads of schools are using data for school development and for instruction. In addition, when the teachers in a school use data to improve instruction (e.g. changing instructional strategy, and choosing materials or techniques), they use data to identify gaps in curriculum and determine effective teaching methods which may need broader school-wide initiatives like planning and changing policies that aid school development. These forms of interrelationships may be noticed throughout the discussion below.

### **1.3.1 Data use for accountability**

In some countries, schools have been given much autonomy in planning, executing, and evaluating their activities for school improvement. They have always been free to choose the religious, ideological, and pedagogical principles on which they base their education, their administration, finances, and general curriculum (Schildkamp et al, 2013). In these systems, there must be a way of counterbalancing this autonomy, to ensure that the schools have the needed quality. Data use plays an important role in these situations. Data use may be used to legitimize school improvement actions taken by school's staff (Coburn & Talbert, 2006; Diamond & Spillane, 2004). Heads of schools may use data to push teachers to change their practices. Diamond & Spillane (2004) for instance argue that based on hard evidence, teachers may re-teach a topic or use extra time in teaching. In addition, schools need to account for the quality of their school to parents and students. Therefore, they strive to make sure that they provide quality education. In their study on data use in Dutch schools, Schildkamp and Ehren (2012), hold that schools are obliged to publish a school prospectus every four years in which they describe their mission and goals and describe the types of lessons they provide, as well as the results they have achieved. In addition, the schools were required to publish school prospectus (public record for parents and teachers) and annual policy plan, for school use as well as an accountability document for the Inspectorate. This shows that teachers and heads of schools make use of data for not only the accountability purposes, but also making sure that the kind of education they provides is of expected standard and quality. Not only that, but also, that greater reliance on data enable teachers to be more accountable to their colleagues through reflective practices and collaboration (Douglas & Julie, 2002).

### **1.3.2 Data use for instruction**

Studies show that schools have been using data for various instruction purposes because the quality of instruction by the teacher has a high influence on the way students achieve in their studies (Hattie, 2009; Campbell & Levin, 2009; Carlson, Borman & Robinson, 2011; McNaughton, Lai & Hsiao, 2012). There also studies (e.g. Spillane, 2012; Datnow, Park, Kennedy-Lewis, 2012) which entail that schools have used student achievement data to standardize, measure, and guide instructional decision making; as well as using student data to monitor the progress of students and identify ways of solving their problems. In addition, data help teachers to share evidence based- instructional techniques (Cawelti & Pretheroe, 2001). According to Schildkamp, Poortman, Ebbeler and Luyten, (2014), teachers may use data in various ways to improve their instructions, for instance to set learning goals for students, determine which topics and skills students possess, evaluate progress, and tailor instruction to individual student needs. Further studies show that the analysis of various student data for example student test results, homework classroom observations, student conferences and portfolios may provide teachers with different types of information such as discrepancies between student groups (Schildkamp et al., 2012). This may in turn, enable teachers to better understand student thinking and learning and therefore improve their classroom instruction (Calwelti & Pretheroe, 2001; Young, 2006; Honig & Coburn, 2008) and, or support better conversation with their students (Brunner, Fasca, Heinze, Honey, Light, & Mandinatch, 2005; Pretheroe, 2009). Similarly, teachers may use student assessment data, student views, own observations and self evaluation results data to change the way they handle their students in classroom during teaching (Wayman & Stringfield, 2006; Wohlstetter, Datnow & Park, 2008). This may be in terms of changing

their teaching techniques, choosing teaching aids, and deciding for the pace of their teaching in classrooms.

Secondly, some studies have found that the use of data guided curriculum development in various schools. Good examples provided were the use of student assessment data and intake data which improved ways in which teachers attended to the curriculum. Calweilti & Pretheroe (2001) and Young (2009) for instance, claimed that by analyzing examinations results, teachers may decide how to group students or what topics needed more attention in the next school years. In addition to the above, some scholars (e.g. Pretheroe, 2009) found out that the use of high quality assessment data in the hands of school staff trained to use it helped to improve ways in which teachers attend to the curriculum and in evaluation of the school. This means assessment data can be used not only as a proof that the school improves, but also as a way of self evaluation of the school which may lead to strategies for maintaining the good performance, or improving the curriculum in the school (Wohlstetter, Datnow, & Park, 2008; Young, 2006).

More studies have shown that use of data aid school's staff in monitoring curricular growth over time, identify and evaluate the curriculum and to, share best curricular practices (e.g. Streifer, 2002). The author argues that using data helps to analyse the curriculum through all grade levels by systematically refining the curriculum to improve flow, continuity, rigor of instruction and, to manage the process for sustainability. The study proved that it is the role of teachers and school leaders to influence changes in the curriculum, and thus the need for having proper data. This is similar to Messelt, (2004) who argues that data can enable staff to evaluate the way certain groups or individual students have been placed in various levels or in special education and therefore, put in place ways to close such achievement gaps. All these show that teachers can use data to reflect on their own functioning including establishing what went well and what did not (Breiter & Light, 2006; Brunner, et al., 2005; Young, 2006) and therefore data use can also be central to improvin the quality of instruction.

Finally, the use of data can also help in motivating students (Diamond & Spillane, 2004). Schools may decide to use assessment data, examination data to praise past performance of teachers and other school staff, and emphasize continuous improvement and higher performance. The practice, especially when it is done openly in staff or team meetings, displayed within the school, and communicated to parents, may have a positive contribution to motivating students and teachers and the way teachers handle their students and thus improve instruction.

### **1.3.2 Data use for School development**

When schools use data for their improvement, all the available data in the school can be used constructively. Data can be used for policy development and school improvement planning (e.g. internal and external evaluations). Studies (e.g. Schildkamp, Karbautzki & Vanhoof, 2014) showed that data can help school development efforts, and as Breiter & Light, (2006) claimed, because they can be a basis for planning and policy development. They argued that the analysis of test results, might present results that prompt schools to adjust policies related to their teaching timetables, testing, and grouping of students for administering more help, as well as deciding for study environment (e.g. outdoor lessons or field excursion). In a similar way, the study by Schildkamp, Reckers-Mambarg & Harms, (2012) in group differences in examinations results from Dutch schools established that final examinations and assessment scores provided significant insight into the level of learning for each student. This study show that based on school targets, the schools were able to use the data to revise their policies to improve and increase student achievement. This shows that examination results data were good tools for policy development in the schools. Further studies also report that school leaders were using data to plan, develop policies, set school priorities, goals, plan test activities and make annual school calendars (Breiter & Light, 2006; Coburn & Talbert, 2006). In addition, data use may help teacher development, especially to discuss and improve teacher performance (e.g. lesson observations, performance data, internal inspections,

achievement and assessment data, intake transfer, and school leaver data) (Schildkamp, Karbautzki, & Vanhoof, 2014). It is claimed that schools can use data for identifying gaps in teachers' knowledge and skills and guide teacher professional development decisions (Breiter & Light, 2006). The studies also proved that the use of data helped to improve teachers' attitude towards educational practice and the way they interact with their students (Armstrong & Anthes, 2001; Chrispeels, 1992; Massell, 2001). This indicates the way data use can have a contribution to the professional development of teachers and hence help in the general school development.

Some studies (e.g. Schildkamp, Karbautzki & Vanhoof, 2014, Schildkamp, Reckers-Mambarg & Harms, 2012) found out that schools can also use data to group students and placing students in suitable levels (e.g. intake data) as well as use data to set targets and monitor goals (e.g. assessment data, internal evaluations). In addition, data can be used to motivate staff (e.g. performance data and observations). Generally, several studies on school improvement hold that the use of data is central to the school improvement process and actually, data have proved to support decisions that favoured school development (Earl & Katz, 2002; Chrispeels, 1992; Fieldman & Tung, 2001; Symonds, 2003).

#### **1.3.4 Negative uses of data in the schools**

Although data-based decision making has proved to have merits in schools, several studies have uncovered some negative effects associated with the practice. Examples of potential negative effects of data-based decision making observed in the contexts of high stakes accountability systems include the following:

*Misuse of data*, Schildkamp & Kuiper, (2010), refers to a shorter superficial changes in practice (Diamond & Cooper, 2007). According to Schildkamp and Kuiper (2010), misuse of data happens when schools misinterpret data and ends up focusing on improving aspects of their education that do not need improvement. As a result, the school again loses an opportunity to improve.

*Abuse of data* also referred to as attempts to game the system (Booher-Jennings, 2005; Koretz, 2003). This occurs where teachers use data to fulfill or achieve a specific aspect that is required by a certain authority. A good example is when teachers "teach to the test" due to high-stake test-based accountability system. In addition, Booher-Jennings (2005) reported that teachers divided their students into three categories: "safe cases", "suitable cases for treatment", and "hopeless cases" (educational triage) in attempt to improve test scores. After this, the teachers focused their teaching and resources more to the safe cases (bubble kids) that would increase the school's accountability rating and subjected the "hopeless cases" for special education because they considered them as likely to decrease the school's accountability rating. As a result, the number of referrals (i.e. students dropping-out and repeaters) doubled, and this was attributed to data-based decision making within a new accountability requirements system. Moreover, Diamond and Spillane, (2004) also showed that when the schools were under pressure with little support, they strategically used data by narrowing their focus on policy demands and on improving the achievement of only a few selected students.

Lastly, Schildkamp & Kuiper, (2010) claim that the *strategic* use of data occurs when schools only select data that are easy to use while ignoring that data which involve more complicated or long term improvement trajectories. This approach is harmful and unwanted because it denies schools the opportunities to improve even when the chance is available to do so.

#### **1.3.5 Enablers and barriers of data-based decision making in schools**

Various studies on data use (e.g. Coburn & Turner, 2011; Schildkamp & Lai, 2013; Supovitz, 2010) have highlighted several factors that may either foster or hinder the use of data in schools and other organisations. These factors have been grouped into three; namely, data characteristics, user characteristics and school organisational characteristics. The *characteristics of data* can influence the way data are used in schools. The presence or absence of good information management systems (Wohlstetter, Datnow & Park, 2008) that make it hard to gather and analyse the needed data and access to relevant, reliable and valid data that coincides with their needs (Schildkamp, 2007) are the major factors that

foresee the level of data use in schools. Furthermore, data use in schools is likely to be constrained if teachers feel that there are problems with the quality of the data (Breiter & Light, 2006; Cho & Wayman, 2013; Coburn & Turner, 2011; Datnow & Park, 2008; Schildkamp & Kuiper, 2010; Wayman & Stringfield, 2006; Wohlstetter). Moreover, *characteristics of the user* can also affect the effective use of data. Teachers and other staff in schools need to have the necessary knowledge, skills and attitude to use data. In normal circumstances, schools may have staff with these necessary attributes while other staff may not have. There are various studies emphasising the importance of data literacy to the intended users (Datnow & Park, 2008; Schildkamp & Teddlie, 2008; Wohlstetter, Ingram, Louis & Schroeder, 2004). The studies hold that employing data-based decision making need certain knowledge and skills especially in identifying, collecting, analysing and interpreting and finally the use of data. Lack of the knowledge and skills for teachers cause a majority of their decisions to base on intuition and on limited observations (Ingram, et al., 2004). Therefore, it is important to also look at factors at the individual data user level (Earl & Katz, 2006; Coburn & Talbert, 2006b; Jimerson & Wayman, 2012; Little, 2012). Another issue consider is the attitude of the teacher in terms of the level of commitment, belief on data, and the way that teacher perceive issues regarding data use in the school. Studies have shown that in some schools, experienced teachers felt that they did not need data because their “experience was enough” (Ingram, Louis & Schroeder, 2004; Schildkamp & Kuiper, 2010). Moreover, in another study (e.g. Schaffer, Stringfield, & Reynolds, 2001), schools perceived data analysis as a hard work needing a great deal of labour. In addition Schildkamp and Kuiper (2010), found that to some teachers data use is something to be done by school leaders, and even some teachers claimed that their duty was to teach, and not to collect or use data (Earl & Katz, 2002; Ingram, Louis & Schroeder, 2004; Schildkamp & Kuiper, 2010; Schildkamp & Ehren, 2012). All these are indications of how attitude and data literacy can interfere with effective data use in schools.

Another aspect to consider in the way data-based decisions take place in schools is school organisation and context conditions. What data are used and for what purpose are influenced by the organisational structures of the school. School leaders are the pillars to all practices in the schools and therefore they can model effective data use, determine which data teachers have access to, and support teachers in the use of data by facilitating them accordingly. In addition to that, teachers need to collaborate in their work as teachers, and in data use and this can easen more effective data use as well (Schildkamp, Poortman, & Handelzalts, 2013). Furthermore, school neede to have a shared vision and clear and measurable goals in all levels-school, classroom, and student level. If schools lack goals to compare the data to, or the goals are not clear enogh for teachers to use data, then it is very difficult to use data. As noted previously, heads of schools need to provide opportunity for teachers to train in the use of data and provide all kinds of support needed by the teachers (Coburn & Turner, 2011; Datnow, Park, & Kennedy-Lewis, 2013; Honig & Venkateswaran, 2012; Wayman & Jimerson, 2012; Schildkamp & Kuiper, 2010; Spillane, 2012; Wohlstetter, Datnow & Park, 2008; Young, 2006).

#### **1.4 The Tanzanian context**

The United Republic of Tanzania is comprised of two former sovereign states, Tanganyika (currently Tanzania Mainland) and Zanzibar which is made up of two islands (Unguja and Pemba) and a number of smaller islands, and covers an area of 945,087 sq km, with the total population of 44,928,923 (United Republic of Tanzania-URT, 2012). Education system in Tanzania Mainland has three levels, Pre- and Primary (2-7 years), Secondary (4 years of Ordinary level and 2 years of Advanced level) and Tertiary level (3+ years). Zanzibar has a different education system that is not in the scope of this study. This study focuses on Tanzania mainland’s secondary schools. Following Decentralization by Devolution (D by D) policy, Secondary Education is undertaken by two ministries; the first is the Ministry of Education and Vocational Training (MOEVT) and the second ministry is the Prime Minister’s Office Regional Administration and Local Government (PMO-RALG). The policy led to transfer of authority- functional responsibilities and resources to local government levels. The transfer of authority affected the

administration and activities in secondary schools because they were to respond to two different ministries with different responsibilities and authority.

In 1995, Tanzania established its Education and Training Policy (ETP). Some of the major aims to improve the quality of education sector in Tanzania (URT, 1995, p.4). This policy was a guide to how education should be conducted in all secondary schools and other educational institutions. As a result of ETP and other national and international commitments in education, various programmes like *Education Sector Development Programme (ESDP)* with SEDP I & SEDP II projects (from 2004-2009, and 2010-2014) respectively; and *Big Results Now (BRN)* (2013-2017) which were implemented in secondary schools. These programmes aimed to improve the quality of education in secondary schools, and have affected the way schools conduct their activities in terms of changes in curriculum, responsibilities of teachers and heads of schools, management of school-based activities.

Tanzanian secondary schools are supervised by inspectorate division. According to the Handbook for inspectors issued by the government through the ministry of education, the division is required to do a full inspection of the schools after every two years (URT, 2009). The handbook mentions the main types of inspection as whole school inspection, a follow up inspection visit, and special school inspection (URT, 2009). The last type is done in weak schools or schools with notable crisis or problems. The inspectorate department is responsible for overall quality assurance of the schools, and therefore they are expected to collect data that help in supervision of schools. The heads of schools are therefore supposed to prepare data for inspectors, and implement advice from them.

In addition to that, Tanzanian secondary schools are required to administer the mandatory Standardized examinations supervised by the National Examination Council of Tanzania (NECTA). This Council is responsible for preparation and administration of the examination, as well as selection of suitable candidates for placement to the next level. The Primary School Leaving Examination (PSLE) selects candidates to join the Ordinary level (O-level) secondary schools. In this level, students do the Certificate of Secondary Education Examination (CSEE) after which they are selected for either the Advanced level (A-level) secondary schools or other colleges. The A-level has a final Advanced Certificate of Secondary Education Examination (ACSEE) whose results can be used for placements to different Tertiary level institutions like Universities and other Tertiary colleges. NECTA prepares and administer all those examinations and oversees that the pre-set national standard cut-off point of performance are followed in each level (URT, 2000). This means that effectiveness of Tanzanian schools is measured by the school performance indicators based on the attainment of the students in their NECTA examinations. The performance of the schools is published after every major national examination (O-level, or A-level) in which schools are ranked according to their performance. These results are the main criteria to judge the general school achievement.

#### **1.4.1 Rationale of the study on data use in Tanzanian secondary schools**

Several studies in the area of DBDM have provided evidence for the importance of data in education through school improvement by enhancing teacher, school, and curriculum development (see for example; McNaughton, Lai & Hsiao, 2012; Spillane, 2012) emphasise the importance of educators to have knowledge for analyzing, interpreting, and use data to improve student achievement on assessments. In addition, they argued that schools with the practice of using data have more success in monitoring performance and reducing the achievement gap.

Tanzanian secondary schools have faced many challenges that need reformed practices and improvement strategies including the use of data. Schools face challenges including lack of accountability, availability of teaching and learning materials, low support for struggling students and poor school management (URT, 2012, World Bank, 2010). In addition, studies reported poor implementation status of development projects such as SEDP I & II, which, among other things, were attributed to unsatisfactory allocation of

funds-both in national and school levels-contrary to what was annually planned (Haki Elimu, 2012). Furthermore, many studies have reported a continuous decrease of quality of education, as measured by student achievement in National Examination Council of Tanzania (NECTA) results (Haki Elimu, 2010; Osaki, 2007; URT, 2012) despite many initiatives to address this challenge and reverse the trend (Komba & Nkumbi, 2008). This unsatisfactory student achievement might have a direct or indirect link to inadequate or improper use of data available in the schools.

From the discussion of the Tanzanian context, it is clear that for the reforms and programmes prepared by the government to succeed, there is a need for Tanzanian secondary schools to use data. This is because, first, all the programmes and projects prepared by the government have objectives and as well as measurable indicators and targets. That means there must be some kinds of data sent to, or collected from the schools from the government ministries. Furthermore, schools are supervised by and linked to the ministries, inspectorate division, and NECTA. This indicates that there are some kinds of data exchanged between the schools and these organs (URT, 1995). This suggests that wide ranges of data are available in Tanzanian secondary schools, such as:

- i. *Final examination results:* Secondary school students in Tanzania have three types of examination in different levels: Form II, form IV, and form VI national examinations prepared and administered by NECTA are used to decide for not only what students will continue in the next level of education but also their specializations.
- ii. *Data on intake/ enrolment and school leavers:* the schools also have records of the number of students admitted each year (intake data), students who have joined the school (enrollment data), as well as students who sat for NECTA examinations and completed their level of education (school leavers).
- iii. *Schemes of work and lesson plans:* these are very important documents for all teachers in their teaching job. The schemes of work are long-term plans used to prepare for content to cover, time of coverage, and resources needed. Lesson plans on the other hand, are short-term plans prepared before and used during the actual teaching to guide activities, techniques, time, and contents in a lesson.
- iv. *Fees payment data:* Each year, the government provides the capitation fund to each school calculated depending on the number of available students per school. However, every student pays School fees to supplement the capitation fund, which is not always sufficient for school needs.
- v. *Assessment or progress reports data:* each end of term, schools do character assessments of each students. The assessments results are combined with records on students' performance in school-based tests make progress reports of students.
- vi. *Student and teacher daily attendance data:* these are registers for monitoring punctuality and attendance of students and teachers in schools. *Data on school infrastructure and facilities:* Schools keep data of available classrooms, toilets, teachers' houses, laboratory buildings and equipments/instruments, and library building and books for monitoring and identifying the needs.

Despite these variety of data in Tanzanian secondary schools, however, several studies have shown that many teachers world-wide do not use data properly or at all (Ingram, Louis & Schroeder, 2004; Schildkamp & Kuiper, 2010). There is also a limited understanding of how heads of schools and teachers notice, interpret, and use data within different contexts (Spillane, 2012). There is a need to know about the kinds and purposes of data used by teachers. A related focus is about establishing factors influencing the practice of data use, as studies show that there are distinct differences in the way schools use (or not use) data, differences between schools within one region in one country (Honig & Coburn, 2008; Goren, 2012). Additionally, most of the available studies are western based (see for example; Schildkamp, et al., 2012; Schildkamp & Kuiper, 2010; Schildkamp & Handelzalts, 2011; Schildkamp & Teddlie, 2008; Wohlstetter, Datnow & Park, 2008; Diamond & Spillane, 2004; Booher-Jennings, 2005; Crocco & Costigan, 2007; Ehren & Swanborn, 2012 and Lai, et al., 2009). There are very few studies focusing on

the African and developing countries context (see for example; Omoso, 2012, for a study in Kenya). In Tanzania, there have been a few studies that are only slightly related to data use in education (see for example; Chonjo, Osaki, Possi, and Mrutu, 1996; Osaki, 2007; URT, 2010), suggesting that there is a scarcity of knowledge about data use in Tanzania. This study, therefore, was an attempt to enhance understanding of data use in schools in an African context.

### **1.5 Research questions**

This study has three main questions.

The first question relates to kinds of data available for use by secondary school teachers in Tanzania, and formulated as: "What data are used by secondary school teachers in Tanzania?"

The second question is concerns the purpose to which data is used in Tanzanian secondary schools and is formulated as: "For what purposes are the data used by secondary school teachers in Tanzania?"

The third question is related to the factors that promote or hinder data use in Tanzania secondary schools and is formulated as: "What factors promote or hinder data use by Heads of secondary schools and teachers in Tanzania?".

The results of the study aim to help education stakeholders to understand how data use or data-based decision making take place in the selected schools, and used as a guide and reference point for data use studies in Tanzania and other developing countries with similar contexts. This brings our focus to the theoretical underpinnings that guided this study presented in the next chapter.



## CHAPTER TWO

### 2.0 THE THEORETICAL FRAMEWORK

*This chapter introduces the conceptual framework to guide the study. The framework summarises the relationships between kinds of data, its purposes, and variables influencing data use in organisations. The remaining parts of the chapter describe various components of the framework.*

#### 2.1 Data and data-based decision making in schools

Data is defined as all the relevant information, both qualitative and quantitative, which students, schools, and teachers need for decision-making (Schildkamp, Lai and Earl, 2012). Data based decision making (DBDM) is defined as systematically analysing existing data sources within the school, applying outcomes of analyses to innovate teaching, curricula, and school performance, and implementing and evaluating these innovations (Schildkamp & Kuiper, 2010). It is therefore a purposeful use of information generated from data to inform actions for school improvement. Studies have emphasised the importance of the contribution of data in the improvement of educational practice (Honig & Coburn, 2008). With proper use of data, schools can identify where to channel resources, identify root causes of problems, and improve students' achievement (Breiter & Light, 2006; Carlson, Borman & Robinson, 2011; Young, 2006) and hence improve schools.

There was a need for Theoretical framework to guide this study in exploring data use in Tanzanian secondary schools. Although there still is no generally accepted framework for studying data use in the school environment, the conceptual framework modified by Omoso (2012) from Schildkamp and Kuiper, (2010) model, used in a data use study conducted in Kenya, was modified to study data use in Tanzania schools. The framework bases on factors hypothesized to influence data use in organisations (see figure 1). Schildkamp and Kuiper (2010) used this framework to study data use in Dutch schools and found as a basic guide for such studies. In the framework, part A shows the *kinds of data* available in schools, and Part B shows the *purpose* for which the data are used. Part C presents the factors influencing data use-school *organisational*, *data*, and *data user characteristics*. The researcher considered the framework suitable in answering the research questions in this study, aiming to explore data use in Tanzanian secondary schools. Kenya and Tanzania have similar socio-cultural and educational context, therefore the use of Omoso's framework assumed that the contexts of data use will likely be similar. However, based on an extensive literature study (Breiter & Light, 2006; Coburn & Talbert, 2006; Diamond & Spillane, 2004; Schildkamp, Karbautzki, & Vanhoof, 2014; Schildkamp & Kuiper, 2010; Schildkamp, Lai, & Earl, 2013; Wayman & Stringfield, 2006; Wohlstetter, Datnow, & Park, 2008; Young, 2006), the current study distinguished purposes of using data for instruction, for accountability and for school development. In addition, with regards to factors which may promote or hinder data use in school, the study considered the following: data characteristics (accessibility and quality of data); user characteristics (data literacy, and attitude of user-belief in data, perceived ownership/teacher autonomy, and locus of control); and School organisational characteristics (school leadership; teacher collaboration; vision, norms and goals for data use; and support for data use). Although the framework may not be exhaustive in different contexts, it is adequate to guide the study and will guide data coding. The study results may further improve the framework for future studies in the context of African countries. The following discussion bases on it. For a more extensive discussion of the original variables, the reader is referred to Schildkamp and Kuiper (2010).

## The Theoretical Framework for the study

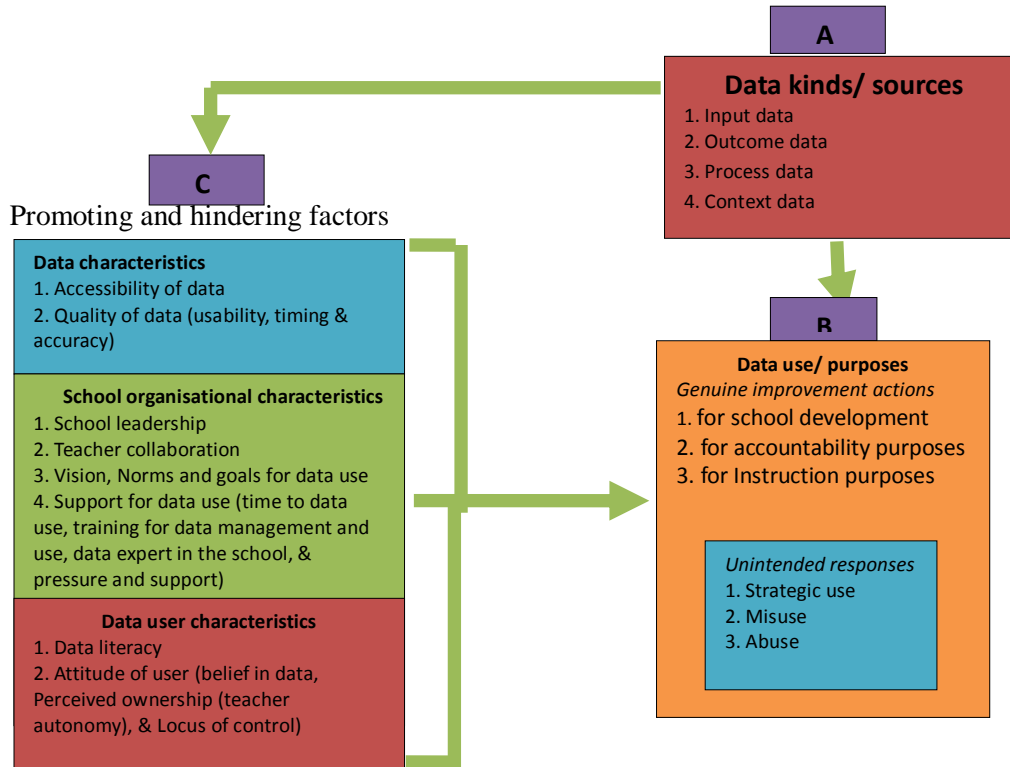


Figure 1: Factors hypothesized to influence data kinds and use

In the above framework, Part A shows the *kinds of data* available in schools, and Part B shows the *purpose* for which the data are used. Three main factors influencing data use are school *organisational, data*, and *data user characteristics* in Part C. For example, input data such as prior achievement levels of students in Part A can be used as a basis for discussions by school management in Part B. The choice to use the data from prior achievement levels of students depends on three groups of factors. The first is *characteristics of the user* (e.g. data literacy, and attitude of user-belief in data, autonomy, & locus of control). The second is *the characteristics of data* (e.g. accessibility, and quality of data); and the third is *characteristics of school organisation* (e.g. school leadership, teacher collaboration, vision, goals and norms for data use, and support-i.e. time for data use, training for data management and use, data expert in school & pressure and support) shown on Part C.

### 2.2 Kinds of data in schools

Data-based decision making in improving education needs the Head of schools, classroom teachers and the non/teaching staff to collaborate, collect, analyse and interpret the various available data in their schools to guide their decisions (Marsh, Pane, & Hamilton, 2006). From part A of the Theoretical framework, the school environment may have four different kinds of data: Input data, such as fee payment, demographic and teacher qualification data; Process data, like documents about policy, mission and goals of school, and data on financial operations. Others are Output data, for instance, data on performance indicators such as and student achievement as well as Context data including resources at school and their usability, culture, and opinions from the school community (Ikemoto & Marsh, 2007; Schildkamp & Ehren, 2012).

### 2.3 Purpose of data use

Data use in schools can lead to school improvement. This is the process of making schools better through programme for innovation focusing on change and problem-solving in educational practice. Part B of the Theoretical framework used in this study, data in schools are used for school development, instruction purpose and for accountability purpose (Breiter & Light, 2006; Coburn & Talbert, 2006; Schildkamp & Kuiper, 2010; Schildkamp, Lai & Earl, 2012; Wayman & Stringfield, 2006; Wohlstetter, Datnow & Park, 2008; Young, 2006). This means that schools have to design and invent their own solutions for specific problems and improvement in general. The use of data for genuine improvement actions (e.g. for school development, for Instruction purposes, and for accountability purposes) may lead to school improvement in terms of increased student achievement (Schildkamp & Kuiper, 2010). However, these aspects do not work isolately. There is an interaction of activities with more than one purpose, or one group of activities for one purpose may have direct or indirect effects to other activities for different purposes.



Figure 2: The overlapping nature of the purpose of data for school improvement

#### 2.3.1 School development purpose

Data can be used for school development. This is the process of enhancing the quality of pupil's learning and test score achievement (Hollins, Gunter, & Thomson, 2006). In the current study, school development refers to the process where the school community and stakeholders utilize the available materials and financial means to ensure that learners are provided with quality education, which in turn enhance school achievements. For example, internal and external evaluation data can be used for school policy development and school improvement planning. Schools can also use performance data, lesson observation data and internal evaluation data to discuss and improve teacher performance. Observation and performance data may be used to identify gaps in the curriculum and lead to decision to what kind of

professional development is needed in those schools. These teacher development decisions may also be based on achievement data, assessment data, intake, transfer, and school leaver data. The school can also use intake data and other student data to group and place students in specified classes or streams. In addition, achievement data and assessment data to set targets for departments or school, and monitoring the goals previously set by the school. Finally the performance and observation data can be used to determine the contribution of teachers to student and school achievement and as a basis to motivate staff. Heads of schools and teachers can use data to evaluate different school goals and to what extent they have been achieved. Therefore, data use may be a tool to determine effective teaching methods (Breiter & Light, 2006; Coburn & Talbert, 2006; Schildkamp & Kuiper, 2010; Schildkamp, Lai & Earl, 2012; Wayman & Stringfield, 2006; Young, 2006; Wohlstetter, Datnow, & Park, 2008).

### **2.3.2 Instruction purpose**

Decisions on types or trends of instruction may use data. Teachers have a very big contribution towards quality instruction and student achievement in their schools (Campbell & Levin, 2009; Carlson, Borman & Robinson, 2011; Lai et al., 2009; McNaughton, Lai & Hsiao, 2012). Actually, teachers are the main determinants to the quality instruction that leads to student achievement (Hattie, 2009). This is because, teachers can use data to select topics which students need in specific time, set short and long-term goals for students, and determine progress of students. They can also set the speed of lessons, adjust instruction to individual student needs, and choose instruction contents to cover during class sessions. Furthermore, teachers can use data to identify causes of mistakes made by different students, and adapt instruction based on the needs of exceptional students. Data can also be used by the school or teachers to reward individual efforts of the student for the aim of motivating them, as well as developing the curriculum of the school. Not only that, data can also be used for schools to do self evaluation of the trend of achievement and apply ways of improving the trend (Breiter & Light, 2006; Coburn & Talbert, 2006; Schildkamp & Kuiper, 2010; Schildkamp, Lai & Earl, 2012; Wayman & Stringfield, 2006; Wohlstetter, Datnow & Park, 2008; Young, 2006;).

### **2.3.3 Accountability purpose**

Schools can use data for accountability purpose towards different stakeholders such as parents and school inspectors. Teachers can use data, both from inside and outside the school as evidence of how they do things (Diamond & Spillane, 2004; Coburn & Talbert, 2006; Schildkamp & Kuiper, 2010; Schildkamp, Lai & Earl, 2012; Wohlstetter, Datnow & Park, 2008; Young, 2006). Every country has its own education system in which schools are required to link with or comply with the requirements for these organs. Schools must have mechanisms that ensure that they execute all activities required by these offices or organs. Sometimes these offices are required to make sure that all schools are managed according to the country's regulations and policies. Literature suggests that tensions and conflicts are likely to arise between accountability and improvement of schools despite the good aim of the two (Hargreaves & Braun, 2013). Therefore, to ensure effective accountability policies, it is important to use data to evaluate the standards and accomplishments as well as change practices and monitor the school effectiveness (Lee, Seashore Louis, & Anderson, 2012).

### **2.3.4 Unintended responses/ negative use of data**

According to Schildkamp and Kuiper (2010), in addition to the improvement and accountability perspective, schools can also use data in undesirable ways. Within unintended use of data, there is abuse, misuse, and strategic use of data (see part B in figure 1). *Strategic use* of data occurs when schools only select easy to use data while ignoring complicated data, for instance, narrowing of the curriculum for example, through teaching only what is likely to appear in the examinations (Crocco & Costigan, 2007; Diamond & Cooper, 2007). This is an unwanted or unintended approach because it denies schools the opportunities to improve even when the chance is available to do so. *Misuse of data* happens when schools misinterpret data and improve unimportant aspects leading schools to losing opportunities to improve. Examples of misuse of data are shorter superficial changes in practice (Diamond & Cooper,

2007). *Abuse of data* is also referred to as attempts to game the system (Booher-Jennings, 2005; Koretz, 2003) for instance, schools may use data to focus only on students with high chance of passing the tests known as ‘bubble kids’.

## **2.4 Promoting and hindering factors for data use**

Part C of the framework suggests three categories of factors that may promote or hinder data use in schools. These are data characteristics, school organisational characteristics, and user characteristics.

### **2.4.1 Data characteristics**

In our theoretical framework, data characteristics involve its accessibility and data quality. *Accessibility* to data in schools may hinder or promote its use in schools (Kerr, Marsh, Ikemoto, Darilek, & Barney, 2006). In some schools, data may be completely accessible, accessible for only a few people, or inaccessible to teachers. *Data quality* involves usability, accuracy, and timeliness of data (Kerr, et al., 2006) and it is important for promoting or hindering data use in schools. In addition, usability, accuracy and timeliness involves data which are reliable and from a valid source (Kerr, et al., 2006; Mingchu, 2008; Schildkamp, 2007; Visscher, 2002), relevant data, (Schildkamp, 2007; Visscher, 2002), and data that coincides with the needs of the user (Schildkamp, 2007; Visscher, 2002). A combination of these plays a role in the quality of data in schools. All the aspects of data characteristics depend on the way schools collect, store and use data. These observations show the importance of information systems and technology in schools (Breiter & Light, 2006; Kerr, et al., 2006; Wohlstetter, Datnow & Park, 2008) that will enhance data accessibility and quality. Therefore, the status of data systems at school level may affect data use practices, which in turn affect activities for school improvements.

### **2.4.2 The school organisational characteristics**

This factor may have effects on the way schools use data. It involves a group of variables like school leadership, collaboration of teachers towards data use, vision, norms, and goals of schools towards data use as well as the support teachers get in using the data.

#### *School leadership*

Studies on school leadership suggest that distributed leadership can be a solution to barriers that face use of data in schools because it involves decision making authority over several groups in schools and across several levels (Kerr, et al., 2006; Wohlstetter, Datnow & Park, 2008; Young, 2006). These groups and levels may include heads of departments and data teams thus contributing to majority of the staff members to use data (Schmidt & Datnow, 2005). Generally, the heads of schools may have a major supervisory role on modeling, planning, and supporting teachers on data use (Young, 2006). This suggests that their leadership style may have a huge impact on the way teachers in their school use data.

#### *Teacher collaboration*

The way teachers collaborate in different school, activities have an effect on data use in schools. High collaboration fosters, while low collaboration hinders data use in schools. Studies suggest that schools should have teams of teachers for reviewing and planning about data use as frequent as possible (Wohlstetter, Datnow & Park, 2008). This collective approach to data use enhances negotiation among the teachers (Spillane, 2012) which fosters more participation and sharing of data at school level. Therefore, schools where teachers work isolately reduce the possibility of practice of data use. On the other hand, schools where there is teamwork of teachers, data use practice may be fostered because of the teachers sharing in the collection, analysis, interpretation, and use of data.

#### *School's vision, norms and goals for data use*

According to Kerr, et al., (2006), Wohlstetter, Datnow & Park, (2008), and Young (2006); the presence or lack of school's clear vision, norms, and goals for data use may have an effect on the way data use occurs

in schools. Schools with much clear and shared vision, norms and goals may have a higher data use than schools without. This means schools are supposed to create conducive environment for using data, for instance in setting clear goals for each school activity meant to improve schools. Teachers should also have open discussions on what and how they collect and use available data in their school. Therefore, the heads of schools are responsible to oversee that their schools create clear vision, norms, and goals that facilitate data use; as well as enable teachers to have a collective meaning about data in their school environment. This may be facilitated through sharing in planning and implementing activities for achievements of the vision and goals.

#### *Support for data use*

This is another group of factors that promote or hinder or data use in schools. They are time for data use, training for data management and use, data experts in schools, and pressure and support in the use of data. Concerning *time to use data*, studies show that structuring time to use data enhances data use in organisations (Wohlstetter, Datnow & Park, 2008; Young, 2006). The commitment to data use has been associated to schools that structure time with clear objectives to discuss data than schools that do not structure time, or without having clear objectives to discuss data in the structured time (Wohlstetter, Datnow & Park, 2008). Further studies suggest ne need for teachers to meet (in various forms of meetings in their schools) to discuss, and learn from each other about data, instead of focusing only on collecting, analyzing and interpretation of data (Young, 2006).

Another form of support is *staff training on the management and use of data*. Studies on the impact of teacher training on data use revealed that after the training, teachers were able to use data to formulate instructional goals and objectives of their students (Coddington, Skowron, & Pace, 2005), the practice that they were not able to do before. This proves that staff training on data management and use can increase data use in organisations (Breiter & Light, 2006; Kerr, et al., 2006; Wohlstetter, Datnow & Park, 2008).

Teachers can have support of data collection, analysis, interpretation, storage and retrieval of data use from a designated or hired *data expert* in their schools (Kerr, et al., Young, 2006). Studies suggest that the data use processes are sometimes very difficult for teachers to comprehend and master as required (Schaffer, Stringfield, & Reynolds, 2001). Some teachers may not use data because they lack knowledge to collect, analyse and interpret data. Therefore, schools with designated data experts may have more data use than schools without such a per

Another form of support for data use is the use of *pressure and support* given to teachers in the area of data use. Studies advocate for a balance between pressure and support in order to promote data use (Schildkamp and Kuiper, 2010). Teachers may ignore or disregard kinds of data which they consider as lacking quality or invalid (Kerr, et al., 2010) but they may use the same data when subjected to pressure (Kerr, et al., 2006; Marsh, Pane & Hamilton, 2006). There is a need therefore to both give teachers the support they need as well as impose close monitoring and pressure to make sure that resources are not wasted and ensure mutual agreements in data use. This discussion shows that the characteristics within the school have major contributions to the way teachers use data as suggested in our theoretical framework.

#### **2.4.3 Data user characteristics**

From part C of our conceptual framework, data user characteristics involve data literacy, and attitude of the user such as belief in data, perceived ownership (teacher autonomy), and locus of control.

##### *Data Literacy*

It is important for the teacher to have ability to make meaning of data, so that they can use data effectively (Goren, 2012). Various studies show that one of the most important variables that can promote or hinder the use of data is skills possessed by the person (Kerr, et al., 2006; Mingchu, 2008; Wohlstetter, Datnow & Park, 2008). This means that teachers are supposed to have ability to collect, analyse and

interpret data. Obviously, teachers who are ‘data literate’ have more possibilities of using data than teachers who are ‘data illiterate’.

#### *Attitude of the user*

In our theoretical framework, attitude of the user comprises of buy in belief, teacher autonomy, or perceived ownership of the teacher, and locus of control. *Buy-in belief* means the extent to which teachers accept and believe on data (Kerr, et al., 2006; Mingchu, 2008; Wohlstetter, Datnow & Park, 2008). Teachers are in a position to promote the use of data when they believe that data is important to guide their practice (Schildkamp, 2007). When teachers believe that their experience is enough and do not believe in data (Ingram, et al., 2004) then the use of data is minimized or hindered altogether. Another aspect of the attitude of the user that may have impact on the use of data is *perceived ownership* or *teacher autonomy* (Kerr, et al., 2006; Wohlstetter, Datnow & Park, 2008; Young, 2006). When teachers are involved or participate in processes in data use they take more ownership than when they are not. For instance, if teachers participate in data collection, analysis, and interpretation they may have more feeling of ownership and responsibilities than when these are done by other people such as researchers (Huffman & Kalnin, 2003). Therefore, it is important to consider good ways to which data are delivered to people in school environment and how they participate in data activities in order to have their blessings and ownership. This will help teachers to have more trust on data.

Furthermore, attitude of the user may entail *Locus of control*. This is a personality trait coined by Julian B. Rotter in 1954, and refers to the extent to which individuals believe that they can control events that affect them. Studies (Tokar, Fischer, & Subich, 1998) show that people with high internal locus of control tend to attribute success or failure to themselves, and hence with a better chance to change than those with high external locus of control. In schools, teachers who accept that they contributed to what caused failure of their students have a high internal locus of control, and are more willing to change and easily use data for improvement strategies. On the other hand, teachers with high external locus of control when their students fail, tend to find other factors to blame such as difficult examinations, rather than themselves (Kerr, et al., 2006; Schildkamp, 2007). These teachers are more reluctant to accept the change process and hence difficult to employ data use for improvement processes.

Generally, the theoretical framework presented above aimed to guide the study, covering most kinds of data, purpose of data use and factors for or against data use in the school context. The framework shows that most of the factors promoting or hindering data use are school organisational characteristics. This suggests that when, why, what and how activities are conducted in schools may have a huge impact in data use. While this is in mind, the framework was used as a guide to uncover some significant data use aspects that are not forwarded by the present framework.

After forwarding the theoretical framework guiding this study, it is time to move our focus to the methodological approaches and procedures adopted by the study. These are presented in the next chapter.

## CHAPTER THREE

### 3.0 METHODOLOGY

*This chapter is a methodology chapter, which presents the procedures employed to conduct the study. It gives a description of the research design, study site, target respondents sampling, instruments, data collection, data analysis, reliability, and validity as well as ethical considerations of the study.*

#### 3.1 Research Design

The study used a multiple case study research design to investigate data use by school heads of schools and teachers in Tanzanian secondary schools. Yin (2009) holds that case study is an empirical study that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not evident. Data use in Tanzanian secondary schools largely matches this type of study. The study was conducted in four government schools in Tanzania, where the researcher used the same research questions and an instrument to collect the data. The units of analysis were input, process, outcome, and context data sources. Although the data collected from the four schools do not permit generalization, the design was appropriate to provide in-depth evidence of a phenomena (data use) and, as Herriot & Firestone (1983) claimed, permits replication of findings thus making the findings more compelling and robust. The study also enabled comparisons between the two groups of schools, low data users, and high data users. The case study design was chosen because although it does not permit generalizations to population, it can be generalised to theoretical propositions in the field of data use.

#### 3.2 Study Location and site

Tanzania has 4,528 registered secondary schools, among which 3,508 are government-owned and 1020 privately owned schools (Basic Education Statistics of Tanzania-BEST, 2012). The study was conducted in government schools because they have similar contexts in terms of support from the government and school environment. The two phases of the study were conducted in a Central region of Tanzania, Dodoma, the Capital of Tanzania with an estimated population of 2,083,588, (URT, 2012). The case study schools were located around the town centre. These schools were preferred because their location allowed accessibility to the Ministry of Local Government and Regional administration responsible for secondary education in Tanzania, and familiarity of the researcher to the area. This reduced study cost and time required for data collection and allowed rapport with the informants (Singleton, 1993).

#### 3.3 Sampling procedure and Sample size

##### 3.3.1 Sampling of Case study schools

The selection of the case study schools based on previous analysis of the survey conducted in 21 schools with the aim of determining the extent of data use in these schools. Based on descriptive of the analysis, four schools were identified, two with the high data use and the other two with the lowest data use practice. The schools were considered as the best source of information for present data use study in Tanzanian secondary schools. The two high data use schools were expected to provide an insight of conditions suitable to fostering data use, while the two low data use schools were expected to enhance the understanding of challenges associated with data use in Tanzanian secondary schools.

The choice of schools considered the following aspects:

*Location:* Tanzanian secondary schools are located either in urban areas, sub-urban or rural areas. These areas have differences in terms of accessibility through roads, and availability of social services like medical centres/dispensaries, water supply and electricity. Generally, urban and sub-urban schools are more accessible with good roads and have more social services compared to rural schools.

*Nature of the school:* There are two types of public schools in Tanzania, *Boarding* schools, and *Day* schools. Boarding schools admit students from all over the country, and have facilities where students in most times of the year, live in the schools, except two or three month's holidays, since students' homes are far from the school. Day schools on the other hand, admit students within the surrounding villages and students go to school in the morning and back to their parents at the end of each day.



*Student composition:* Secondary schools in Tanzania have either both boys and girls enrolled (mixed sex), or single sex, where the school has only boys or only girls. However, schools can have either only ordinary level classes, O-level (Form I-IV) or Advanced level classes, A-level (Form V-VI). In some schools both O-level and A-level students are accommodated, and in this situation, a school can have the mixed sex in one level and single sex in another level or same status in both levels.

*Number of teachers and students:* Secondary schools in Tanzania have different number of teachers and students. Number of students depends on selection and allocation after completing a particular NECTA examination level. The numbers of teachers available in schools depend on postings from the District education office. Generally, whereas there is no big difference between the number of students enrolled in urban and rural areas, the number of teachers in urban and sub-urban schools tend to be higher than in rural schools.

The study assumed that these other school attributes may explain the differences in data use and will enhance an understanding of the complexity of data use in Tanzania, and African countries in general. Table 1 presents the summary of the details of the selected schools.

Table 1: Characteristics of the selected study schools

School	High data user schools		Low data use schools	
	1	2	3	4
<i>Location</i>	Rural	Sub-urban	Sub-urban	Rural
<i>Nature (Day/boarding)</i>	Day	Boarding	Day	Day
<i>Student composition</i>	Mixed	Mixed-A-level, Boys-O-level	Mixed	Mixed
<i>Number of students</i>	203	404	230	274
<i>Number of teachers</i>	12	28	18	14

### 3.3.2 Sampling of the Respondents in study schools

The study used purposeful sampling to select 3-4 respondents per school. The sample consisted of a total of 14 respondents, including one Head of school in each school, and 2 or 3 classroom teachers. The heads of schools were chosen because they are the ones mostly dealing with and handling data in schools as entailed by their roles qualifications, and designations in Tanzanian context. In addition, with gender in consideration, the study employed convenient sampling to choose classroom teachers, one from each class, with assumption that their roles have exposed them to various experiences of data use within the schools and in the classrooms. These types of sampling therefore, allowed the researcher to select specific people, sites or events that can provide rich information to enhance understanding of the issue under study (Creswell, 2005; Dane, 1990). The sampling allowed getting respondents who can produce rich, robust, holistic description of the practice of data use within their schools. Table 2 below summarizes this category of respondents of the study.

Table 2: Sampling of respondents

Teachers	High data use								Low data use							
	School 1				School 2				School 3				School 4			
Sex	1 M	2 F	3 M		1 M	2 M	3 F	4 M	1 M	2 F	3 M		1 F	2 M	3 F	4 M
Designation	HM	CT	CT		HM	CT	CT	CT	HM	CT	CT		HM	HM	CT	CT
Subject	Agr	Mat	Che		Mat	Eng	His	Bio	Eng	Phy	Geo		His	Swh	Che	Geo
Specialized Teachers	3				4				3				4			

Total teachers interviewed 14 Teachers (5 Females and 9 Males)

Key: HM-Head Master or Head Mistress; CT-Classroom teachers (may include Head of departments)

Agr=Agriculture; Mat=Mathematics; Che=Chemistry; Eng=English Language; His=History; Phy=Physics; Geo=Geography; Swh=Swahili Language; Bio=Biology

### 3.4 Study Approach

The study employed a qualitative data collection through interviews aligned with the research questions. Cohen, Manion, and Morrison (2000) advocates that qualitative study allows subjects to provide their interpretations of the world in which they live, and to express how they regard the situation from their own point of view. Therefore, qualitative study enhanced more insight in the form of comments and statements portraying feelings, attitudes, and experiences of data use among the respondents. This assured the researcher that the information collected were from the respondents' own point of view rather than from that of the researcher (Rees, 1996). The use of qualitative approach in this study was therefore important to enable the collection of purposive and objective information about data use, as well as to capture explanations and realities that increased the researchers' understanding of data use in Tanzania Secondary schools.

### 3.5 Research instruments

The study used interview schedule for heads of schools and classroom teachers as the main tools for data collection.

#### 3.5.1 Interviews

The stud used semi-structured interviews to collect information from heads of schools and teachers. The interview guides contained items common to both heads of schools and teachers. Kombo and Tromp (2006) defined interviews as oral questions of various forms. Robson (1993) supports the use of interviews because they give a room for modification of direction of enquiry, probing for responses and investigating the underlying motives which in-turn enhances reliability of the data. Therefore, the use of semi-structured interview enhanced considerable flexibility and allowed follow-up questions to gain deeper understanding of interviewee's experiences, feelings, and perspectives about data use. The information was collected from heads of schools and Classroom teachers. The interview guides for the two groups contained items covering all the objectives of the study-the kinds of data available, purposes for which the data is used, as well as factors fostering and hindering data use in schools (see appendices A & B). Table 3 below summarizes the research themes, their corresponding instruments, and specific questions used to collect the information from respondents.

Table 3: Instruments per each research theme

Research theme	Respondents interview		
	Head of School	Teachers	Questions in interview guide
Kinds of data available for use in Schools	✓	✓	1b, 2, 2a, 2b, 3a, 3b
Purpose of the data used in schools	✓	✓	1c, 1 e, 1b, 2c, 3a, 3b, 4a, 4b
Factors promoting or hindering data use	✓	✓	3a, 5b, 5c, 6a, 6b, 6c,

### 3.6 Data analysis procedure for analysis of the interview data

The analysis involved within-case analysis per kinds of schools, (low data use and high data use), followed by cross-case analysis. The purpose of within case analysis was to get in depth information related to data use within the schools. As qualitative data are believed to be 'a source of well-grounded, rich descriptions and explanations of processes in identifiable local contexts' (Miles & Huberman, 1994, p.1), the information from within case analysis was expected to provide deep insights on data use in these schools. All interviews were audio taped, and transcribed. The analyses of interview data were preceded by organisation of the data into ideas and concepts, and building into overarching themes. The researcher adopted the ungrounded theory approach, (Miles & Huberman, 1994) by preparing a start list of codes before data collection. The Weft QDA software assisted the analysis of data into relevant codes and categories. Summarized tables of responses from the heads of schools and classroom teachers were prepared for each school, and results from each case were compared in cross-case analysis. The

similarities and differences observed led to conclusions of the current study in relation to the research questions.

### **3.6.1 Coding of interview data**

The coding of key themes based on the Theoretical framework used. For instance, for the theme kinds of data available in Tanzanian secondary schools was coded under the category of input data, process data, outcome data, and context data. Similar to this grouping, the theme on the purpose of data was divided into four categories namely: for accountability purpose, for Instruction purpose, for school development and Unintended use of data. Finally, themes on promoting and hindering factors were coded under categories of data characteristics, with sub categories of accessibility and quality; School organisational characteristics with sub categories of school leadership, teacher collaboration, vision, norms and goals for data use, as well as support for data use. The support for data use was also sub-coded with time to use data, training, data expert and pressure and support. Finally, the user characteristics had sub-categories like data literacy, and attitude, the latter with sub codes in buy-in belief, teacher autonomy, and locus of control (see Appendix C).

### **3.6.2 Reliability and Validity**

The researcher conducted a pilot study in two schools in Dodoma region before the actual data collection commenced. The pilot study ensured context reliability and validity of the instruments, and enabled the researcher to familiarize and improve the interviews guide. Six participants, three from each school (one head of school and two teachers) were involved in the pilot. From this pilot, the researcher made some adjustments in terms of language of different concepts, commonly used in Tanzania. For instance the use of 'head master/mistress' or 'head of school' was suggested instead of 'school leader' or 'principal'; 'annual school programmes of events' was changed to annual school calendar; focus groups to meetings, etc for more clarity and fit with the situation in Tanzanian schools.

Furthermore, during data collection, the researcher ensured internal validity by member-checks (Denzin, 1970) at the end of each interview session; the researcher restated or summarized information and then questioned the participant to determine accuracy. All the participants affirmed that the summaries reflected their views, feelings, and experiences. Furthermore, triangulation was conducted, whereby the responses from multiple sources, i.e. respondents, were compared to determine the accuracy of the gathered information (Yin, 1994). The construct validity through triangulation determined the accuracy of the gathered information (Yin, 1994). Finally, audio taped and transcribed descriptions and quotation from interviewee scripts were included to ensure the external validity (Yin, 1994).

In addition to the above, two researchers participated in the inter-rater reliability check before the commencement of analysis of the interview data. Both researchers analyzing two full interviews (14% of the data) did this. To avoid differences resulting from researchers' variability, the researcher prepared a common coding rubric (Creswell, 2005) which was agreed upon by all the researchers. The two researchers were given parts of transcribed interview data matching to the research questions to check off the categories relevant to the presented observations in interview scripts. The rates of the two coders were calculated from 34 codes and 205 responses to give up an agreement of 84% (Kappa coefficient of .84). This suggested that the categories were appropriate for the responses collected in the interviews (see Appendix C).

### **3.7 Ethical Considerations**

The researcher submitted a request and received approval from the University of Twente Research Ethical Committee before embarking in data collection to home country. In the home country, ethical issues taken into consideration were respecting the right of participants, honoring research sites, and reporting research fully and honestly (Creswell, 2005). First, in honoring the research site, the researcher asked permission from the Regional Administrative Secretary (RAS) in Dodoma to conduct the research in the region.

Secondly, to ensure the right of participation, all the respondents got clear explanation of the study and the right to remain anonymous before they participated in the study. On top of that, they were free to decide time and place for the interview and asked for their consent before audio tapes were used. Lastly, to ensure that the results will be reported fully and honestly, the researcher made clear that personal details like names were not to be shown in the research report, which was to be prepared accurately and honestly. These are presented in the next chapter.

## CHAPTER FOUR

### 4.0 RESULTS

*This chapter presents the study findings from interviews about data-based decision making in Tanzanian secondary schools. The chapter begins with within-case analysis of the kinds of data available in schools, purposes for which data is used and variables (factors) promoting and hindering data in the two low data use schools followed by the two high data use schools. This will be followed by the cross-case analysis of the low and high-data use schools.*

Interviews about the kinds of the data currently available in each low data use and high data use schools were collected, and analysed. The results of the analysis were categorized into three categories of data use as pre-determined by the Theoretical framework, namely kinds of data, purpose of data use and factors promoting and hindering data use. Note that, for the entire presentation of results, the first and second schools which have high data use will be termed as school H1 and school H2, and the first and second schools from low data use schools will be termed as School L1 and L2. In addition, the head of schools for the H1, H2, L1, and L2 are referred to HH1, HH2, HL1, and HL2 respectively. This is important to ensure anonymity of the respondents. Furthermore, for the same reason, all teachers will be termed using the school letter (H1, H2, L1, L2), followed by the teacher (T), with the serial number of the teacher interviewed. For instance, H1T2 represents a teacher number 2 interviewed in schools H1 and L1T3 is a teacher number 3 from school L1. Table 4 summarises the terms used, and the results of within case analysis and cross case analysis of the two groups of schools results in the paragraphs that follow.

Table 4: Letters used to represent head of schools and teachers

Labels	High data use school 1	High data use school 2	Low data use school 1	Low data use school 2
School	H1	H2	L1	L2
Head of school	HH1	HH2	HL1	HL2
Teacher 1	H1T1	H2T1	L1T1	L2T1
Teacher 2	H1T2	H2T2	L1T2	L2T2
Teacher 3	-	H2T3	-	L2T3

#### 4.1 Kinds of data available in schools (Research question 1)

The analysis of interview data regarding kinds of data in schools involved within-case analysis per kinds of schools, low data user and high data user, followed by cross-case analysis. The descriptions related to kinds of data available and used, grouped into input, process, context, and output data in high data and low data use schools are summarised in table 5 below.

##### 4.1.1 Within-case analysis results of kinds of data available in schools

Within-case analysis was used with the two groups of schools under study. The researcher studied each group's interview data responses regarding the kinds of data as a separate case to identify unique patterns within the data for that single group. The interview data were examined for within group similarities and differences, and the main observations are presented in the following paragraphs.

##### *Kinds of data in high data use schools*

###### *i) Input data*

The input data commonly used in the two high data use schools were similar. In addition, TSD return /Teacher management data were not common in the two schools. However, the two schools differed in that, while school H2, a boarding school had special needs data of admitted students, it did not have data on distance from home; and school H1, which was a day school, used data on students' distance from home but missed data on special need of students.

Table 5: Summary of results for kinds of data in schools

	High data use schools		Low data use schools	
	H1	H2	L1	L2
<i>Input Data</i>				
Student admission	✓	✓	✓	✓
Student demographic	✓	✓	✓	✓
TSD return /Teacher management data	✖	✖	✖	✖
Fees payment	✓	✓	✓	✓
Parents data (income, address, status)	✓	✓	✖	✖
Special needs data of admitted students	✖	✓	✖	✖
TSM 9 (Primary school results & other data)	✓	✓	✖	✖
Distance from home	✓	✖	✓	✓
Number of students and ratios of allocation & availability	✓	✓	✖	✓
<i>Process Data</i>				
Clubs activities e.g. Scouting & subject clubs	✖	✓	✖	✖
Schemes of work	✓	✓	✓	✓
Log book (records of work covered)	✓	✓	✖	✖
Lesson plans	✓	✓	✓	✓
Teacher's lesson notes	✓	✓	✓	✓
Student notes	✓	✓	✓	✓
Annual policy plan of the school	✖	✖	✖	✖
Teachers daily attendance	✓	✓	✓	✓
Teacher lesson attendance	✓	✓	✖	✖
Student daily attendance	✓	✓	✓	✓
Student discipline/behaviour	✖	✓	✖	✖
Time spend on subjects/Time tables	✓	✓	✓	✓
Self-evaluation/internal evaluation	✖	✖	✖	✖
Staff data, such as availability, qualification, age	✓	✖	✖	✖
Government policies & guidelines e.g. (BRN)	✓	✓	✓	✓
Health data	✓	✓	✖	✖
Financial operations	✓	✓	✓	✓
Pass mark for internal examinations	✖	✓	✖	✖
<i>Outcome Data</i>				
Final exam results & Analysis (NECTA)	✓	✓	✓	✓
Student Assessment / progress results	✓	✓	✓	✓
Weekly tests results	✓	✓	✓	✖
Student drop-out data	✓	✓	✓	✓
School leavers' data (after NECTA)	✓	✓	✓	✖
School inspection report	✖	✖	✖	✖
Teacher performance data/Annual staff appraisals	✓	✓	✖	✖
Weekly-based internal school inspection data	✖	✓	✖	✖
<i>Context Data</i>				
Student questionnaires	✖	✖	✖	✖
Student class minutes	✓	✓	✓	✓
Teacher management questionnaires	✖	✖	✖	✖
Staff minutes	✓	✓	✓	✓
Examination calendars (from NECTA)	✓	✓	✓	✓
School program of events/School calendar	✓	✓	✓	✓
Parent questionnaires	✖	✖	✖	✖
Parent minutes	✓	✖	✓	✓
Data on vulnerable (needy)students	✓	✓	✖	✖
External evaluations	✓	✓	✓	✓
Transfer data	✓	✓	✓	✓
School infrastructure	✓	✓	✖	✖

TSD=Teachers Service Department. TSM 9= Takwimu za Shule za Msingi (Primary schools Statistics)

*ii) Process data*

This category had the most data types available in high data use schools. The two schools showed similarities in the process data available, both not using data on self-evaluation/internal evaluation of the

schools and they did not have the annual policy plan of the schools. However, input data in the two high data use schools differed in the sense that, while school H2 used data on student discipline or behavior, clubs activities e.g. scouting & subject clubs, and pass mark for internal examinations, school H1 lacked these data. Generally, school H2 used more process data than was the case in school H1.

*iii) Outcome data*

The data types available in the high data use schools under this category relate to external and internal examinations and assessment results. Only one kind of outcome data, school inspection report were not used by both schools H1 and H2. However, school H2 seemed to have weekly school inspection data, while this kind of data were not used by school H1.

*iv) Context data*

There was a similarity in the context data types used by school H1 and school H2. Three types of data that were supposed to tap views and ideas from different stakeholders in the schools were missing in both schools. The only data that could collect opinions from people that available in school H1 was minutes from parents meetings. These were not available in school H2.

***Kinds of data available in low data use schools***

*i) Input data*

The two low data use schools L1 and L2 showed a striking similarity in the kinds of input data used in the schools. Schools used only a half of the input data commonly used in Tanzanian schools. These data were similar. In addition, some data were either incompletely recorded or not used. For example, teachers from both schools revealed that that they recorded only age and sex of students in the demographic data, and the data were not used except in time of student enrollment. On the other hand, similar input data were missing in both schools L1 and L2.

*ii) Process data*

The two low data use schools showed another striking similarity in the process data found in their environments. Only a half of process data common in Tanzanian schools were used in these two low data use schools. Another half existed, but not used by teachers and heads of schools in both school L1 and L2.

*iii) Outcome data*

All the data used base on examinations and assessment in the schools. However, results showed that school L1 used more of the outcome data that was the case in school L2. It was noted that the two schools differed in the use of non-examination data.

*iv).Context data*

The most observed similarity in context data used by low data use schools was that the two schools had both the same kinds of context data in use. In a similar way, both schools did not use the same kind of context data.

**4.1.2 Cross-case analysis of kinds of data available in schools**

The previous section presented within-case analysis results from the high data use and low data use schools. This section presents descriptions of cros-case analysis of the same results found in the Table 5.

*i) Input data in high data use and low data use schools*

From the analysis, results showed that high data schools used more input data that those used by low data use schools. The high data use schools used data on parents, where the school recorded whether a student have both parents, single parent or orphaned, while low data use schools did not. In addition the high data use schools used students personal data form primary schools where students were admitted from, including photo, age, sex, height, physical disability in TSM 9 forms. Although these data ensured authenticity of the student enrolled in secondary school, they were not used in low data use schools. However, both high data use schools and low data schools did not mention data on managing teachers' professional practice from the Teacher Services Department (TSD). The Tanzanian Government Public Service Act no. 8 of 2002 established the department to monitor appointment, promotion, discipline, and

registration of teachers. Generally, the most used input data by all schools were fee payment, student admission, and demographic data.

*ii) Process data in high data use and low data use schools*

This category had the longest list of data found in use in both high data use and low data use schools. The most striking result was that the most used data were those in the hand of normal classroom teachers like lesson plans, scheme of work, teacher lesson notes, student attendance and time spend on subjects. On the other hand, like the annual policy plan of the schools, self-evaluation or internal evaluation of the schools, and staff data such as availability, qualification, and age were not found in use in both groups of schools. However, the schools showed differences in the amount of data used where school H1 and H2 showed a general high process data use compared to the process data used in school L1 and L2. Within the high data use group, there were a notable number of process data in hands of classroom teachers, which were found in use in school H2 but were not used by school H1. Suprisingly, these data were also not mentioned all low data use schools e.g. data on activities of cclubs such as scouting and subject clubs, students discipline or behavior, and pass mark for internal examinations. In addition, the high data use schools mentioned some unique kinds of data like health data on students and teachers, especially in diseases like malaria and HIV/AIDS, as well as physical impairments, while low data use schools respondents did not mention these data.

*iii) Outcome data in high data use and low data use schools*

Data in this category were the least kind used by both groups of schools. Most of the used data came from NECTA, or from internal tests and assessments. Strikingly, although both the groups of schools claimed to have accountability role to inspectorate division, the schools did not mention any school inspection data. However, data on teachers' annual performance or appraisals and weekly based inspection data were not found in low data use schools. Therefore, respondents from high data use schools mentioned more outcome data than respondents from the low data use schools.

*iv. Context data*

This category of kinds of data showed many similarities than differences between two groups of schools. First, except for a few, context data that were used by high data use schools were almost similar to what were used by low data use school. In a similar way, both groups of schools missed the same kinds of context data, notably, the data for tapping views, opinions, and ideas from students, parents, and teachers were not mentioned by both groups of schools.

#### **4.1.3 Summary of results of kinds of data available in schools**

In order to answer question 1 about the kinds of data available in schools, it can be concluded that the two groups of schools showed differences in the kinds of data available. Input data were used more in high data use schools than were in low data use schools. In fact, some important input data that were supposed to be in use by the schools were not found in low data use schools. Furthermore, although the process data were the most available data in used in both groups, the data were mentioned by high data use schools than low data use schools. In addition, high data use schools used some unique data sets such as health data and physical impairments and needs of students than in low data use schools did. The outcome data on the other hand, were the least used data in both groups of schools, mentioned more by high data use schools, while low data schools used only some data related to examinations only. However, similar data were not mentioned by the two groups of schools.

#### **4.2. Purpose of data use in schools (Research question 2)**

The interview data were analysed in the individual groups of schools, followed by cross-case analysis. The descriptions related to the purpose of data use by the schools were grouped into data use for accountability, for instruction, and for school development. Results of these school aspects are summarized in Table 6, 7 and 8, followed by a short description after the results in each table.



#### 4.2.1 Data use for accountability purpose in schools

An analysis was conducted in the interview data of heads of schools and teachers the two groups of schools under study. The responses regarding the data use for accountability were scrutinized for unique patterns within the data for the two groups separately. Table 6 presents a summary of the observations in relation to data use for accountability to parents, NECTA, inspectorate division, as well as the district and ministry level offices, followed by descriptions of within case and cross-case analyses.

Table 6: Summary of results for data use for accountability in schools

Data use for accountability to:	Results in high data use schools							Results in low data use schools						
	HH1	H1 H1T1	H1T2	HH2	H2T1	H2T2	H2T3	HL1	L1 L1T1	L1T2	HL2	L2 L2T1	L2T2	L2T3
parents	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	X	✓	✓
NECTA	✓	✓	X	✓	✓	✓	X	✓	X	X	✓	✓	X	✓
Inspectorate division	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Ministry, district & TSD	✓	X	X	✓	X	✓	✓	✓	X	X	✓	X	✓	✓

**Key:** -Mentioned data use for the category of purpose; X=data use for the category of purpose not mentioned; H/master =Head of school. H1, & H2=high data use school 1 & 2. L1, & L2= low data use school 1 & 2. HH\_=headmaster in high data use school. HL-=headmaster in low data use school. H-T-=teacher in H\_ (high data use school). L-T-=teacher in L-(low data use school) - (*Please refer to Table 4*). NECTA -National Examination Council of Tanzania. TSD -Teachers Service Department. Others- refer to Table 4

##### i) Within-case analysis results of data use for accountability in high data use schools

The results of the analysis in Table 6 showed that both heads of schools and teachers in the two high data use schools had similar purposes for data use. Respondents claimed to have used data such as students' examination results and assessment data more for preparing reports to parents. Both heads of schools and teachers used data for communicating with NECTA, especially in data related to the continuous assessment of the students and final examinations. In addition, all heads of schools and a few teachers used data such as number of students, teacher data, school infrastructure and the like for complying for the accountability demands from the ministry and other organs in the national and district levels such as TSD. The most notable similarity was that no respondents mentioned any data used for inspectorate division. One head of school explained that 'nowadays we do not have school inspection underway, we don't see them to visit our school' (HL2).

##### Within-case analysis results of data use for accountability in low data use schools

From the summary of results presented in Table 6, respondents from the two low data use also showed similar trends of purpose of data use. There was no difference both between the two schools and within teachers and heads of schools in the same schools. In this, all respondents to use assessment data for communicating with parents, followed by use of data for NECTA-related activities. One teacher claimed "the NECTA regulations need schools to sent continuous assessment data of students in the final year that can determine the effort of students over time and for final examination" (L2T3). In addition, a few teachers and heads of schools mentioned data use such as school evaluation results for district and national level offices.

##### ii) Cross-case analysis results of data use for accountability in high data use and low data use schools

Results showed that the two groups of schools have similar purpose of data use, which is mostly for preparing reports of students to parents, followed by data use for communicating with NECTA. The least data use mentioned by both the respondents in the two groups was accountability to the ministry, districts, and other organs. The most striking similarity was that most data mentioned to be in use were from

NECTA examination or internal school tests results. There was no mention of other kinds of data used for accountability purpose. In addition, no respondent mentioned data use related to inspectorate division.

iii) *Summary of results on data use for accountability in schools*

The above analysis results showed that there is no difference between the purposes of data used all respondents in the schools. All data are used for the same purpose in the same trends of significance, the most being for communicating with parents and the least being for ministry or other responsible organs. No data were found to be used for inspectorate division. All the data used relates to either external or internal examination results, with no data from other types

#### 4.2.2 Data use for instruction in schools

The interview data from both heads of schools and teachers in the two groups of schools, were analysed for similarities and differences in the data use for instruction. The summary of responses from all respondents related to monitoring of student progress, instructional changes, curriculum development, rewarding and motivating students, as well as data use for school self-evaluation from the two groups are presented in Table 7, followed by descriptions of within-case and cross-case analyses.

Table 7: Summary of results for data use for instruction in schools

Data use for Instruction	High data use schools							Low data use schools						
	H1			H2				L1			L2			
	HH1	H1T1	H1T2	HH2	H2T1	H2T2	H2T3	HL1	L1T1	L1T2	HL2	L2T1	L2T2	L2T3
Monitoring student progress	✓	✓	✓	✓	✓	✓	✓	✓	X	✓	X	X	✓	✓
Instructional changes	X	✓	✓	X	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Curriculum development	✓	X	X	✓	X	X	X	✓	X	X	✓	X	X	X
Reward & motivate students	X	✓	✓	X	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
School self-evaluation	✓	X	X	✓	X	X	X	✓	X	X	✓	X	X	X

**Key:**  
✓ =Mentioned data use for the category of purpose; X=data use for the category of purpose not mentioned; H/master =Head of school. H1, & H2=high data use school 1 & 2. L1, & L2= low data use school 1 & 2. HH\_=headmaster in high data use school. HL- =headmaster in low data use school. H-T- =teacher in H- (high data use school). L-T- =teacher in L- (low data use school). *Please refer to Table 4.*

i) *Within-case analysis of data use for instruction in high data use schools*

Results of the interview analysis in Table 7 showed that both heads of schools and teachers in the two data use schools mentioned data use for monitoring student progress. However, there were notable differences in the responses from within this group. First, whereas school H2 claimed to use data to motivate and reward teachers after the final NECTA examinations, however, school H1 did not use data for that purpose. Second, there were differences in responses between the heads of schools and teachers on data use within the same school. For example, heads of schools did not mention any data use for instructional changes and for rewarding and motivating students, while all teachers did. One head of school argued *“we do not have the ability to motivate and reward students here, my school is not good financially...” (HH1)*. In contrast, teachers gave examples of the rewards they provide such as verbal praises (H1T1, H2T1), acknowledging specific students efforts in front of others (H2T3, H1T2), and monetary offers (H2T2). About data use for instruction, another head of school claimed *“my teachers do not use data for improving their instruction, actually that is one of the area which needs intervention in my school” (HH2)*. Surprisingly, all teachers in the two schools claimed to have used data for instruction. Another notable difference within the schools was that while all heads of schools mentioned data use for school self evaluation, and curriculum development not a single teacher in these two schools mentioned those data use. One of the teachers offered that *“we, normal teachers we concentrate to what happens with the students, usually in classrooms, and not school level data” (H1T1)*. Teachers also suggested that some data are like fee payments, student intake data, financial operations and some data used to allocate

resources are mainly for the school's top management's use and not for 'normal teacher' like me'' (H2T3).

ii) *Within-case analysis of data use for instruction in low data use schools*

Results in Table 7 revealed that all heads of schools and teachers mentioned some aspects of data use for instructional changes, rewarding and motivating students in their schools. These respondents mentioned that they used assessment and self-evaluation data to improve the way they teach in class after identifying problems. NECTA examination data were used to award students who had shown outstanding performance. However, while there were no differences observed between the two schools, differences were noted in responses between heads of schools and classroom teachers within the schools. First, all heads of schools mentioned aspects of data use under curriculum development and school self evaluation. No teacher mention such uses. When asked about the use of assessment data and student results, one teacher said "we compare the results of students for deciding who should be rewarded what at the end of the year. That is the only way results are used here" (L2T2).

iii) *Cross-case analysis of data use for instruction for high data use and low data use schools*

The results showed that in both groups of schools, heads of schools and teachers differed in purposes of which they used data in their schools. For example, all heads of schools mentioned to have used data for curriculum development and schools self-evaluation, while none of teachers mentioned these uses. In addition, all teachers in both groups claimed to use data to adjust instruction and rewarding students, but only some heads of schools agreed about that. In addition, while in high data use schools headmasters differed with their teachers in data use for instruction and for rewarding and motivating students, in low data use schools such differences were not observed.

*Summary of results for data use for instruction in schools*

From the within-case and cross-case analysis of data use for instruction in high data use and low data use schools, it was observed that there was no significant difference in data use for instruction between high data use schools and low data use schools. However, there were differences between data use for instruction by heads of schools and teachers within the same schools. For example, whereas heads of schools used data for curriculum development and for schools self-evaluation, classroom teachers used data more for adjusting instructions and for motivating and rewarding their students.

### 4.2.3 Data use for school development

Table 8 presents a summary of data use for policy development, school improvement planning, teacher development, grouping students, and goals or target setting and monitoring for departments and school. This section presents descriptions of within-case and cross-case analyses.

Table 8: Summary of results for data use for school development in schools

Data use for School development	High data use schools								Low data use schools					
	H1			H2				L1			L2			L2T3
	HH1	H1T1	H1T2	HH2	H2T1	H2T2	H2T3	HL1	L1T1	L1T2	HL2	L2T1	L2T2	
Policy development	X	X	X	X	X	X	X	X	X	X	X	X	X	X
School plans	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	X	X	X
Teacher development	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Placement of students	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Setting goals and targets	X	X	X	✓	✓	✓	✓	X	X	X	X	X	X	X

**Key:**  
✓ =Mentioned data use for the category of purpose; X=data use for the category of purpose not mentioned; H/master =Head of school. H1, & H2=high data use school 1 & 2. L1, & L2= low data use school 1 & 2. HH\_=headmaster in high data use school. HL\_=headmaster in low data use school. H-T-=teacher in H\_ (high data use school). L-T-=teacher in L\_ (low data use school). Refer to Table 4

i) *Within-case analysis of data use for school development in high data use schools*

The revealed the following. First, all respondents mentioned data use for school improvement plans, especially NECTA result to plan strategies for improving student performance in future examinations. One head of schools said that *"we look at the position of our school in the NECTA examination to decide ways of improving the performance, for example by extra teaching or extra student exercises"* (HH2). Second, all respondents in high data use schools mentioned the use of data for placement or grouping of students according to sex when they join the school and also according to 'academic ability'. In this, one teacher said that *"we arrange students according to their ability, bright students into science and less bright into arts"* (H2T2). Third, none of the respondents in all schools mentioned any data use for teacher development. They claimed that their main focus was to make students achieve in their studies and it was not easy to establish what teachers need or do not need. One respondent said *"it is like no one cares about what challenges teachers face in schools. The government has no more interest in the professional development of teachers, therefore using data to identify the need for teacher development is a waste of time"* (H1T2). In addition to the above, none of the respondents mentioned any data use for policy development. They argued that the ministry and other organs brought ready-made activities in schools, so there was *"no need to use data to develop our policies"* (H1T3). However, while school H2 mentioned data use for setting goals and targets in the departments and school, school H1 did not use data for that purpose. One respondent in school H2 confirmed that *"last year we set a target of no 'F' in form four final NECTA examination in our department, and we succeeded in that"* (H1T2).

ii) *Within-case analysis of data use for school development in low data use schools*

From the analysis in Table 8, the following were revealed. First, all the respondents used intake and demographic data especially grouping of students in classes. Second, none of the respondents mentioned data use for policy development. One teacher argued *"the policies and guidelines we use from the government are always changing, so it is hard to use our own data for such purpose"* (HL2). Third, all respondents showed that they don't use data for teacher development because nothing will be implemented anymore due to lack of funds, and less emphasis of in-service teacher professional development plans in the country. One head of school commented this *"we use data to plan things which we know that they are feasible and implementable in our school environment, such as using data to allocate the meagre resources, to plan for extra teaching, to motivate teachers and students and the like"* (HL1). In addition to the above, none of the respondents mentioned to have used data for setting goals and targets for their department or schools. When asked more about this most of teachers gave no explanations or just said *"we just don't do that"* (HL1, L2T1), or *"that is not a normal practice in this school"* (L1T3, L2T1) and *"we use data for other things but not setting targets or goals"* (HL2). However, the two schools in this group showed some notable differences. First, while all respondents in L1 mentioned data use for school improvement plans, only the head of school in L2 mentioned data use for that purpose. Further results revealed that it was not easy for the staff in L2 to agree on what to do in their school. One teacher pointed out *"we work as strangers here; there is no solidarity you expect to find in a school like this. Everyone works alone, so it is very difficult to have plans for school improvements here, let alone using data to arrive to such plans"* (L2T2).

iii) *Cross-case analysis of data use for school development in high data use and low data use schools*

The cross-case analysis of the two groups of schools, revealed that, first, respondents in both groups had mentioned data use for placing and grouping students in different streams. The kinds of data mentioned were assessment data, intake data, demographic data, and examination data. In addition, none of the respondents mentioned data use for either policy development or for teacher development. This was attributed to the fact that so long as schools are government-owned, the ministry was more responsible for that. However, whereas all the schools in low data use group did not mention data use for setting goals and targets, it was only one school, H1 in high data use group which revealed similar results, with other school, H2 respondents mentioning to have used data for goal settings. In addition, all respondents in high

data use schools mentioned data use for school improvement plans, with similar observation from only one low data use school L1. In school L2 however, only the head of school of L2 mentioned data use for school improvement plans, while all the teachers did not mention that purpose. and through probing for further evidence, they revealed to have no practice of collective decision making in their school.

#### *Summary of results of data use for school development*

The results of data use for school development showed that respondents from high data use schools mentioned only slightly more data use for school development than they did in low data use schools. The results revealed that most of the time all the respondents mentioned data use for policy development, teacher development, as well as grouping of students in a similar way. In addition, no differences were observed between what heads of schools and classroom teachers mentioned. However, a slightly within-group difference was observed when one head of low data use school differed from his teachers in mentioning data use for school improvement plans.

#### **4.2.4 Unintended use of data**

Results of the interviews with all heads of schools and classroom teachers in the two groups of schools mention data use falling under one or more unintended use or negative use. The summary are provided in Table 9 and details follow.

Table 9: Results for negative or unintended purpose for data use in schools

<b>High data use schools</b>		<b>Low data use schools</b>	
<b>School H1</b>	<b>School H2</b>	<b>School L1</b>	<b>School L2</b>
Scheme & Lesson plans to show or submit to authorities, not used by teachers (HH1, H1T1, H1T2)	-Scheme of work & lesson plans to submit to head master's office but not used (HH2,H2T1, H2T3)	Scheme of work & lesson plans to submit to head master's office but not used (HL1, L1T1, L1T2)	Scheme of work & lesson plans to submit to head master's office but not used (HL1, L2T1, L2T2, L2T3)
Test results to group students according to their abilities (HH1, H1T1, H1T2)	Test results to group students according to their abilities (HH2, H2T1, H2T2)	Test results to group students according to their abilities (HL1, L1T1, L1T2)	Test results to group students according to their abilities (HL1, L2T1, L2T2, L2T3)
Weekly tests data used to pay teachers (HH1, H1T1, H1T2)	Weekly tests data used to pay teachers (HH2, H2T1, H2T2, H2T3)	Weekly tests data used to pay teachers (HL1, L1T1, L1T2)	
Internal test results used to identify low performing students for punishments, (H1T1, H1T2)	Internal test results used to identify low performing students for punishments (HH2, H2T3, H2T1)	Internal test results used to identify low performing students for punishments (HL1, L1T1, L1T2)	Internal test results used to identify low performing students for punishments (L2T1, L2T2, L2T3)
	internal exam results used to expel low performing students from school (HH2, H2T1, H2T2, H2T3)		

**Key:** H1, & H2=high data use school 1 & 2. L1, & L2= Low data use school 1 & 2. HH\_=headmaster in high data use school. HL-=Headmaster in low data use school. H-T=teacher in H- (high data use school). L-T=teacher in L-(low data use school).

#### ***Results of analysis of unintended use of data in schools***

It was mentioned that teachers in schools prepared scheme of works, lesson plans and other documents to submit to the head of school or academic offices as evidence that they are using the data, while in reality they are not. This practice was reported in all the four schools in the study. One head of school had this to say *“schemes of work and lesson plans are submitted to my office and academic office every Friday, but they are not used”* (HL1). Another head of school added *“It is easy to demand data from teachers, they will just prepare and give you, but the data are not accurate, or not used at all”* (HH2). Even teachers themselves acknowledge the existence of this practice. One of them claimed *“my colleagues do not use*

*schemes of work and lesson during teaching.*” All the teachers said that this was not something new, because *“the practice is now common to all government secondary schools”* (H2T2).

Secondly, results showed that teachers were paid for every weekly test they administered to their students. These payments were outside the normal salary of the teachers. Further results showed that some teachers prepared test items that were below standards just to get paid. In this, one teacher said *“the tests do not aim for assessing and improving their students”* (L2T3).

In addition to the above, more results show that all schools used examination data to separate bright students from slow learners. Students are grouped into different streams according to ability. One teacher explained that *“we have three to four streams per class(A, B, C, and/or D), where brightest students are in stream A, and the least bright are in C or D* (H2T1) . Another added *“this help teachers prepare well before teaching a specific class”* (HL1). Bright students were also grouped into science streams and less bright students in arts streams as reported in H2 and L1 schools .

Furthermore, unintended use of data mentioned by all respondents involved punishments for low performing students. All the schools had either pass mark set in the school for all students to meet in internal examinations (H2) or they set a pass mark for each internal test in the school (H1, L1, L2). In both cases the students who failed to reach the set mark were punished by the teachers. The kinds of punishment included corporal punishments (6 strokes maximum per each subject failed). One teacher claimed that *“ we complained when the government forbid us to canning of students because the performance of students dropped drastically when they knew that there is no more strokes. You know, after we were re- allowed to use sticks, they are more serious now and are performing better”* L1T2. Some schools retained students after class hours for sweeping classes or gardening flower beds as punishments for poor performing in classes or tests. Noticeably, in school H2 low performing students were given a ‘ grace period’ to change or else the school advises the parent to *“seek alternative school for his or her child”* (HH2).

#### **4.2.5 Summary of results for purpose of data use in schools**

In order to answer research question 2 in about the purposes of data use in secondary schools, it can be concluded that there were no differences between purpose of data use in high data use school and low data use schools. First, all respondents mentioned almost similar data use for accountability, instruction, and school development purposes. In addition, all schools showed almost similar trends in the amount of data used. Data were used by all mainly for school development activities, followed by for instruction purposes, and even fewer data were used for accountability purposes. Suprisingly, although data were mentioned to be used for other aspects of school development, none of it was mentioned as used for teacher development decisions and actions. In addition, the fewest data were used for accountability purpose with parents and ministries but not for inspectorate related activities. In addition, unintended practices were mentioned almost the same in all groups of schools. Examples of unintended practices mentioned were students according to ability and teach them differently, punishing low performing students, paying teachers for administering weekly tests to students, and preparing or collecting data without using them. Lastly, results show reliance of NECTA results data, and internal school tests for all activities in schools, with a very few data from other sources used. However, there were differences observed within groups, especially between heads of schools and teachers of the same schools especially purposes of data. For example, the same data may be used by teachers to monitor students progress while the head of school use tha data for school-level management purposes.

#### **4.3 Factors promoting or hindering data use in schools (Research question 3)**

The analysis of interview data from all schools were analysed in terms of factors promoting or hindering data use presented in our Theoretical framework. These are grouped into data characteristics, school organisational characteristics and user characteristics. Tables 10, 11, and 12 presents the results per



school in the high data use groups and low data use groups. In the tables, it is indicated whether a factor enabled (+) or hindered (-) the use of data according to the respondents. For example, when the respondents in a particular school did not mention a certain factor, the cell is left empty.

#### 4.3.1 Data characteristics in high data use and low data use schools

This entails *accessibility*, and *quality* of data. The results from low data use schools in the three categories of data characteristics are presented in Table 10.

##### a. Accessibility of data

*Accessibility* to data in schools may hinder or promote its use in schools. Table 10 presented results on accessibility of data from high data use schools and low data use schools. This section describes the within-case and cross-case analysis.

Table 10: Summary of results for data characteristics in schools

Status	High data use schools							Low data use schools						
School	H1			H2				L1			L2			
Characteristic	HH1	H1T1	H1T2	HH2	H2T1	H2T2	H2T3	HL1	L1T1	L1T2	HL2	L2T1	L2T2	L3T3
Accessibility	+	+	+	+	+	+	+	+	-	-	+	-	-	-
Quality														
-usability	+/-	+/-	+/-	+/-	+	+/-	+/-	+/-	+/-	-	+/-	-	-	+/-
-timeliness & accuracy	+	+	-	+	+/-	+	+	+/-	-	-	-	-	+/-	-

(+)=mentioned as promoting factor. (-)=mentioned as hindering factor. (+/-)=mentioned both as promoting and hindering factor. ( ) not mentioned. H1, & H2=high data use school 1 & 2. L1, & L2= Low data use school 1 & 2. HH\_=headmaster in high data use school. HL-=Headmaster in low data use school. H-T=teacher in H- (high data use school). L-T=teacher in L-(low data use school).

##### i) Within case analysis of accessibility of data in high data use schools

All respondents from high data use schools showed that data was accessible to their schools. Study results revealed that school H1 had a practice of keeping the same kinds of data in different offices. For instance, ‘administrative data’ in the schools are in the head of school’s office, with copies of the same data in academic office. The data mentioned here are admission data, school policy and goals data, demographic data, fee payment data, and school facilities. Then, in the same school (H1) data for daily teachers’ use like schemes of work, lesson plans, attendance data, students’ assessment data are in teachers’ offices, with copies in academic office too. The head of school said *“only when data need special care or confidential, then copies are kept in my office and academic masters office, but the rest are in hands of the teachers”* HH1. However all respondents claimed that all data are accessible in their schools, not all data are used by all teachers e.g. fee payment data, financial operations, data on health of students.

##### i) Within case analysis of accessibility of data in low data use schools

Results showed that data are not equally accessible to all the respondents. For example most of the data in school L1 and L2 are under custody of the head of school or academic office e.g. NECTA results, school calendar, demographic data, fee payment, student progress, scheme of work, lesson plans, test results, school leavers, student enrollment. Results shows only a few data in the hands of teachers e.g. student attendance, and weekly tests results. Additionally, while the HL1 claimed to have allowed all teachers to access the data, however, the interviewed teachers did not confirm this statement. One teacher said *“some data that are confidential to only the top school management team, like data on financial operations and fee payment data can sometimes be useful to me to understand my students better, but I cannot access them”* (L1T2). In a similar way, the head of School L2 suggested that all data are readily available to teachers, although as it was in School L1, no teachers agreed to that statement, and even one of them suggested that the teachers do not need all the data *“I don’t even think of trying to access them, what for?”* L2T2.

ii) *Cross-case analysis of accessibility of data in high data use and low data use schools*

Results show that while in low data use schools only a few teachers can access data available in their schools, in high data use schools all data found in head of school offices had copies in academic offices and individual teachers' offices. Therefore, more teachers in high data use schools had access to all the data available in their schools than they do in low data use schools.

a. **Quality of data**

This is another factor in data characteristics for promoting or hindering data use in schools. It involved usability, timeliness and accuracy of data. This part presents descriptions of the within-case and cross-case analysis of results from high data use and low data use schools presented in Table 10.

i) *Within-case analysis of quality of data in high data use schools*

From table 10, heads of schools and all teachers in the high data use schools H1 and H2 claimed that all data used were reliable and important for the users. Examples of the mentioned data were internal examination results, student assessment, student progress, attendance, school policy and goals, parents' data, and NECTA results data. However, all heads of schools in high data use schools and almost all classroom teachers in this group revealed that some data are either not relevant to teachers work, or some data less used by teachers. Examples of the data from this group were fee payment data, demographic data, financial operations, and school leavers/drop out of students. One teacher said *"I am not using all the data because I don't need them in my job, for example, am a classroom teacher, what do I need fee payment data for?"* (H2T2). Furthermore, results revealed that most of the respondents claimed that the data they used are accurate and timely. However, some respondents mentioned a few data which were not usually timely. One head of school explained *"we usually get feedback after NECTA results and use to identify weak and strong areas for improvement. Unfortunately this feedback is always very late, coming almost mid-year or later and therefore less useful to us"* (HH2). Finally, both schools reported poor storage of data, due to lack of information system in their schools. One teacher said *"we use hard copy filed here, it is not easy to retrieve data from those files if the data you need are little bit older, and you have a pile of files to search from"* (H2T1).

ii. *Within-case analysis of quality of data in low data use schools*

Respondents from schools L1 and L2 claimed that most data in their schools were reliable and important for the users. The mentioned examples were internal examination results, student assessment, student progress, attendance, and NECTA results data. However, respondents claimed that some data were not important to classroom teachers. They give examples of such data as demographic, fee payment, and financial operations. One head of school argued that *"there are data for the head of school, and other data for teachers and even some data for accountants, not all data are equally important for all, and not all staff need the same data"* (HL1). Furthermore they mentioned poor storage of data, as one head of school put it *"believe me, we don't even have good hard-copy files and folders to keep our data"* (HL2). Another one attributed this to lack of electricity and information technology facilities. One head of school said *"we do not have computers and other modern devices in which to store our data, in that way, most of the data are lost or not accurately stored"* (HL1). Further results from school L2 showed that sometimes internal data were late due to the attitude and interests of office bearer, especially when such data are considered as confidential, e.g. fee payment data. In addition, most of the data from outside such as NECTA data were usually late. Finally, it was observed that in some cases, data were not accurate because they were prepared in haste, especially those needed to be submitted to the head of schools, like lesson plans, and scheme of work, where a teacher *"may 'copy' and 'paste' a previous years' scheme of work or lesson plans, just to meet the set deadline"* (HL2).

iii. *Cross-case analysis of quality of data in high data use and low data use schools*

Results of the study showed similarity between the two groups, that all data that were used in the two groups of schools were considered as reliable and important for all the teachers. Mentioned examples of



the data include examination results, student assessment, student progress, attendance, and NECTA results. In addition, the two groups of schools claimed that not all data are relevant to teachers' work, for example, fee payment data, financial data, school admission data, turnover rate, dropout were claimed not relevant to classroom teachers. Further results showed that the some data that are considered 'not relevant to teachers' job were readily available in school environment but not commonly used by teachers. Furthermore, both groups of schools reported poor storage of data, due to either lack of electricity, storage facilities like the information system in their schools. However, there were notable differences in quality of data between high data use and low data use schools. First, results showed that most of the data available in high data use schools were more accurate compared to those used by low data use schools. In addition, results showed that except for data from outside the school, most of data collected and stored in high data use schools were timelier than those used by teachers in low data use schools.

#### 4.3.2 User Characteristics in schools

Data user characteristics constitute of *data literacy* and *attitude of the user*. The attitude of the user can be further categorized into buy-in belief, locus of control, and teacher autonomy. From the results of the study, the researcher added another new aspect of attitude of the user, labeled as 'teacher's personal attributes' to capture all behaviours not represented in these other aspects. This will be discussed with other 'new promoting and hindering factors' later in the presentation of results. The results of these aspects from the Theoretical framework are presented in Table 11, followed by descriptions of within-case analysis and cross case analysis of each.

Table 11: Summary of results for user characteristics in schools

Status	High data use schools							Low data use schools						
School Respondents	H1			H2				L1			L2			
	HH1	H1T1	H1T2	HH2	H2T1	H2T2	H2T3	HL1	L1T1	L1T2	HL2	L2T1	L2T2	L3T3
a. Data literacy	-	-	-	-	-	-	-	-	-	-	-	-	-	-
b. Attitude of the user:														
-Buy-in belief	+	+	+	+	+	+	+	+	+	+	+	+	+	+
-Locus of control											-	-	-	
-Teacher autonomy	+	+	+	+	+	+	+	-	-	-	-	-	-	-

(+)=mentioned as promoting factor. (-)=mentioned as hindering factor. (+/-)=mentioned both as promoting and hindering factor. ( ) not mentioned. H1, & H2=high data use school 1 & 2. L1, & L2= Low data use school 1 & 2. HH\_=headmaster in high data use school. HL\_=Headmaster in low data use school. H-T=teacher in H- (high data use school). L-T=teacher in L-(low data use school).

##### a. Data literacy in schools

Data literacy is the ability of teachers to make meaning of data, by being able to collect, analyse, interpret and use data available in their schools. Table 10 presents a summary of the within-case and cross case analysis for results of data literacy.

##### i) Within-case analysis of data literacy in high data use schools

Results presented in Table 11 revealed lack data literacy to all respondents in schools H1 and H2. They revealed that there did not have knowledge and skills needed for collection, analysis, interpretation, and use of data in their schools. One teacher commented 'how can we claim that we are using or not using data while we don't know even how to identify and use the available data?' (H1T3). Another simply added 'I don't know what data use means, and am sure all teachers around here do not know either' (H2T1). Results also showed that the concept of data use is not only still new for many teachers and even heads of schools, but also many teachers thought that the topic was for the ICT people, statisticians or mathematicians, and have nothing to do with teachers. To confirm lack of data literacy, one head of school confessed 'through this discussion I now know a bit about what data and data use is, and have

*realised that there are other kinds of data which I thought they are not data, or not useful, or not important...it seems we usually do very big mistakes here'' (HH2).* All respondents in the high data use schools showed the need for knowledge and skills for data use, and they attributed the lack of it as one among the reasons for them not collecting, analyzing and using data in schools. However, the two schools claimed that they use some of the available data in their schools but not in the formal analysis and interpretation suggested by the concept of data use to plan teaching and identify students' needs. One head of school said *'we use data in our own crude and local ways'' (HH1),* without giving examples of the local ways used. The most used data through the crude ways mentioned are examination data, student progress data and attendance data.

*ii) Within case analysis of data literacy in low data use schools*

From the results presented in Table 11, all respondents from low data use schools L1 and L2 lack data literacy. They showed the need for training for data use, in identification of data, collection, analysis, interpretation and its general usage. One head of school had this to say *'we do not use all kinds of data as it may be expected due to our lack of knowledge'' (HL1).* Teachers suggested that even the head of school and academic master lack the knowledge and skills for data use.

*iii) Cross-case analysis of data literacy in high data use and low data use schools*

Results from the cross case analysis of the two groups of schools showed similarity in data literacy among all teachers. Generally, all heads of schools and classroom teachers in all schools lacked data literacy (Table 11). All respondents showed a need for training for data identification, collection, storage, analysis, interpretation and use. Further results showed that the concept of 'data use' was still new to most teachers in both groups of schools and others claimed to have heard this term during the current study. However, the high data use schools suggested that they analysed and interpret data in their own 'crude' ways although they knew through this study that data-based decisions in schools is more than that. These attempts were not reported from the low data use schools.

**b. Attitude of the users**

This is another aspect in the user characteristics. It comprises of *buy-in belief*, which means the extent to which teachers accept and believe on data, *perceived ownership*, or *teacher autonomy* which entails the extent to which teachers participate in data use procedure and processes that lead to feeling of ownership and responsibilities. In addition, it involves *Locus of control* as a personality trait referring to the extent to which individuals believe that they can control events that affect them. This section presents the within-case and cross-case descriptions of the results from both high data use and low data use schools as shown in Table 11.

*i) Within-case analysis of attitude of the users in high data use schools*

The results revealed that majority of teachers in high data use schools claimed to believe on data, and accept that data is important to show evidence, justification, and reference to actions and practice in their schools. One head of school argued that *'I am sure data use is important, not only to show evidence of activities in school, but also we can use data for persuasive and advocacy functions especially when we communicate with stakeholders outside our schools'' (HH1).* In support of this, another teacher added that *'...even in justification of any argument with other staff, most of the time the one with data wins, because we have something to rely on, rather than guess work'' (H2T3).* In addition, most teachers in these schools also showed more acceptance of the fact that most of school-base activities came from the government offices outside the school. The respondents claimed that used the government policies as guidelines to plan, implement and evaluate activities as seem fit in the school environment. However, these respondents commented that although sometimes the policies and guidelines they get from the government were not compatible in their schools, they *'re-plan and prepare our own goals and activities to meet the targets ordered from the government'' (HH).* Lastly, results from high data use schools did not reveal any situation where respondents blamed others for problems in their schools.

ii) *Within-case analysis of attitude of the users in low data use schools*

From the results, all respondents from low data use schools accepted and believed that data are important. One of the head of schools for example said that *“data is important because they give evidence and show direction of my actions”* (HL1). Another head of school added *“all data are useful in my teaching as well as administrative job because they enable me to plan and evaluate my efforts”* (HL2). Teachers also claimed to believe in data, as revealed by some of them who said that *“without data we cannot decide what areas to focus in our activities and we may end up setting priorities in unnecessary areas”* (L1T2); and *“I become more confident when I use data in every planning and execution of my duties”* (L2T3). However, majority of respondents perceived data use as not their responsibility, because most of school activities are directed by the government. One of head of school had this to say *“there is no need to use data to direct our decisions because everything comes from the government”* (HL1). Others claimed that there are frequent changes from the government in terms of the curriculum, examination formats, pass rates, and enrollment criteria, and those discourage them from using data in their schools. Lastly, a few teachers blamed the frequent changes as a reason for mass failure of their students. One of the respondents said *“I am sorry to say this, but the government itself is a source of drastic mass failure of students observed in recent years”* (HL1). Another one added *“some NECTA examinations are too difficult to be valid for our students here. As a result the majority of our students fail in the final examinations”* (L2T2). Noticeably, this last claim was not mentioned by any respondent from school L1.

iii) *Cross-case analysis of attitude of the users in high data use and low data use schools*

Results from the two groups of schools showed that there were similarities in teachers’ belief on data. All respondents in the two groups of schools believed on data, and accepted the importance of data in their teaching duties (buy-in belief). They reasoned that data is important as references of their previous work, evidence of their actions. However, some respondents from one of low data use schools, L2 blamed others for problems in their school (external locus of control). This was not noticed in the rest of schools. In addition to the above, differences were also observed in the way the two groups perceived the ownership of different activities in their school. In this, respondents from low data use schools considered certain activities proposed by the government through policies, programmes and guidelines as not their responsibility, and that the ‘planners’ were responsible to evaluate if the goals of ‘their’ programme have been achieved or not. On the other hand, respondents from high data used the same government policies to plan goals, targets and activities that fitted to their school contexts.

***Summary of the results on user characteristics in high data use and low data use schools***

The two groups of schools showed more similarities than differences in the way user characteristics affected their data use. All the schools showed lack of data literacy and were eager to have knowledge and skills for data use. In addition all respondents showed the same amount of belief on data, and suggested that they rely on decisions and activities that are backed up by data more than when there is no data. However, there were some differences worth mentioning. The teachers in high data use schools showed more perceived autonomy in the activities from outside the schools through flexibility and willingness than what was shown by teachers in low data use schools. In addition to the above difference, schools from the low data use groups blamed others for failure of their students, while high data school teachers did not.

**4.3.4 School Organisational characteristics**

School organisational characteristics involve a group of variables like school leadership, teacher collaboration, vision, norms and goals of schools towards data use, as well as the support teachers get in using the data. Table 12 present summaries of results from the schools, followed by descriptions both of within-case and cross case analyses.

Table 12: Summary of results for school organisational characteristics in schools

Status	High data use schools								Low data use schools							
School Factors	H1			H2				L1			L2					
	HH1	H1T1	H1T2	HH2	H2T1	H2T2	H2T3	HL1	L1T1	L1T2	HL2	L2T1	L2T2	L3T3		
a. Leadership	+	+	+	+	+	+	+	+	+	+/-	+	-	-	-		
b. Collaboration	+	+	+	+	+	+	+	+	+	+/-	+	-	-	-		
c. Vision, norms & goals	+	+	+	+	+	+	+	-	-	-	-	-	-	-		
d. Support:																
-time for data use	+/-	-	-	+/-	+	+	-	+/-	+/-	+/-	+/-	+/-	+/-	+/-		
-data use	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
-training	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
-data expert	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
-pressure & support	+/-	+/-	+/-	+/-	+/-	+/-	+/-									

(+)=mentioned as promoting factor. (-)=mentioned as hindering factor. (+/-)=mentioned both as promoting and hindering factor. ( ) not mentioned. H1, & H2=high data use school 1 & 2. L1, & L2= Low data use school 1 & 2. HH\_=headmaster in high data use school. HL-=Headmaster in low data use school. H-T=teacher in H- (high data use school). L-T=teacher in L-(low data use school).

### a. School leadership

The way heads of schools lead their schools may have a huge impact on the way teachers in their schools use data. This is due to the different leadership styles used by the heads of schools. Table 12 presents results of school leadership from School H1 and H2 explained in terms of within-case analysis and cross-case analysis for the two groups of schools.

#### i) Within-case analysis of the school leadership in high data use schools

From the results, all teachers agreed that their heads of schools encourage the use of data in various situations to justify or propose any activity in the schools. One teacher claimed that *‘we make sure that all data are up to date and accurate because that is what our head of school advises us to do, he always relies on data for planning, and as a proof of almost all actions in our school’* (H2T2). From the results, decision making in the two schools seemed to be participatory, involving data from all teacher at different levels of authorities through formal meetings. In this aspect, one respondents said *‘in my school, we have a hierarchy of meetings where data from all stakeholders in the schools are used in coming to the decisions’* HH2. Of the good leadership that encourages participation another teacher commented that *‘our head master encourages us to work hard despite the hardships in the teaching job, I really appreciates him’* (H2T3). Finally, heads of both schools were reported to show some leadership attributes like good communication with staff. One teacher claimed that *‘our headmaster has very good interaction skills with us’* (H2T2). Finally, some respondents in the two high schools mentioned attributes like delegation of duties, giving frequent feedback to teachers, supervising role, and teachers living like family members. Respondents argued that with those leadership attributes, teachers were encouraged to work hard in using data, although without the sophisticated ways suggested by this study.

#### ii) Within-case analysis of school leadership in low data use schools

Results revealed that there is a difference in leaderships between schools L1 and L2. Although all heads of schools claimed to encourage data use, teachers revealed the opposite. In School L1 for example, only one teacher confirmed while the other doubted that claim, with a suggestion that if the head os school was doing that, it might be with *‘only a few teachers that are close to him, but not all’* (L1T2). However, these teachers revealed that headmaster in School L1 had leadership attributes such as collective decision-making, but not encouraging data use. In school L2, the head of school also claimed to have always encouraged his teachers to use data, but none of the teachers confirmed that claim. One teacher argued *‘how can someone encourage using something he doesn’t know?’* (L1T3). In addition, while both heads

of schools claimed to involve all teachers in decisions and activities, only teachers from school L1 confirmed that, while there was no confirmation from teachers in school L2. One teacher from school 2 claimed that *'our head of school have a few people in trust, these are the ones making decisions for all of us...anyway, so long as the decisions are ok, there is no problem, we agree''* (L2T2).

iii) *Cross-case analysis of school leadership in high data use and low data use schools*

The results of this analysis showed that there were differences in the school leadership between the two groups. Although in all the schools leaders were labeled as 'good leaders', by their teachers, results indicated that heads of schools in high data use schools encouraged their staff to use data more than what the heads of schools on low data use group did. In addition, the heads of schools in high data use group showed more leadership attributes such as participating with their staff, role models, supervising roles, delegation of duties, good communication and interactive skills, frequent feedback giving, and as team leaders. These were not reported from the low data use schools. In addition, while all teachers from high data use schools confirmed all leadership practice forwarded by their heads of schools, most of the claims by heads of schools in low data use schools were not confirmed by the teachers.

**b. Teacher collaboration**

It is believed that the way teachers collaborate in different school activities have an effect on data use in schools. Therefore, the practice of data use may be reduced in schools where teachers work isolately, and fostered in schools with teachers working in teams. Results on this aspect presented in Table 12 are described in the form of within-case analysis and cross-case analysis in the section that follows.

i) *Within-case analysis of teacher collaboration in high data use schools*

Results showed high collaboration among teachers and between teachers and heads of schools. Major activities regarding data use in school, for example examination data, in schools are done by all teachers in collective agreements. One teacher said *'we share a lot of activities involving data in our school, no one works alone here'* (H2T2). Another teacher added *'we plan a lot of things and execute the planned activities as a team'* (H2T3). Another teacher claimed *'we are just like one big team, helping each other and cooperate in all activities'* (H2T1). Further analyses of interview data from respondents suggested that the high collaboration among teachers were a result of leadership styles which allowed information sharing and good interaction among members in the staff. One teacher hold that *'our head of school uses frequent staff meetings to discuss and solve our personal problems, as a result, we have a high collaborative team of staff here'* (H1T2).

ii) *Within-case analysis of teacher collaboration in low data use schools*

The analysis within the low data use group revealed some differences in collaborations between teachers in the two schools. Only one teacher in school L1 confirmed the claim by the head of school that there was a high collaboration among teachers in the school. The other teacher had reservations in that statement, claiming that only a few teachers collaborates, with the rest living and working isolately. In the same way, when the head of school L2 claimed to have teachers with collaboration in his staff, all the teachers interviewed disagreed to the claim. One teacher said *'we belong to the same staff but the way we are treated cause more separation than togetherness, not only in school activities but also in our personal lives'* (L2T2). Further analysis of interview data suggested that teachers complained about appointing staff to external duties that involved payments like invigilation and marking of NECTA examinations, and allocation of duties inside the school. In addition, further results revealed little information sharing and there was lack of trust between teachers and even between some offices in the schools. One of the teachers said *'it is not easy to trust your fellow teachers on matters related to student data, because not all teachers are honest and trustworthy'* (L2T3).

iii) *Cross-case analysis of teacher collaboration in high data use and low data use schools*

The results showed significance differences between the two groups. First, while the high data use schools showed high collaboration among teachers there was reverse practices in low data use schools. The high data use schools reported collective planning, and high information sharing than what was reported by low data use schools. Further teachers from high data use school worked together and had trust among themselves more than teachers in low data use schools were. Generally, teachers from low data use schools reported isolation, discrimination and working independently. All these practices were attributed to the way schools were managed by the school leaders.

**c. School's vision, norms and goals for data use**

It is believed lack or presence of school's clear vision, norms, and goals for data use may have an effect on the way data use takes place in schools. In this part, the study results from the within-case and cross-case analysis in two groups of schools presented in Table 12 are described.

*i) Within-case analysis of results of school vision, norms and goals in high data use schools*

All respondents from this group suggested that their schools had school vision and school goals for different activities. They claimed to have used government policies to prepare goals and vision fitting to their contexts. One head of school said they used guidelines and policies from the top government to set our school vision and goals "*which fit to our school context*" (HH1). One classroom teacher claimed that "*we use data to identify our weakness, and plan for better actions* (H2T3). However, further analysis of interview results showed although the respondents from this group claimed to have visions and goals, however, not all visions and goals were about data use. In addition, results showed that not all activities in these schools used data. One teacher had this to say "*it is easy to say that we are using data than to actually use data*" (H2T2). However, respondents from the two schools agreed that they did not have norms regarding data use in their schools. One head of school argued "*it is hard to arrive at the norms in this situation where you do not know much about data use*" (HH1).

*ii) Within-case analysis of results of school vision, norms and goals in low data use schools*

The results from school L1 and L2 revealed that all respondents agreed that their schools lacked vision, norms, and goals. Most of the respondents claimed that they saw no need to have school- based visions and goals because their schools received orders and 'ready- made' goals from the government through its ministries and other organs. In this aspect one head of school had this to say, "*it is usually not easy to have school related visions and goals, or prepare norms because of the top down decisions imposed on us, while our data are bottom up*" (HL1). This claim was supported by the second head of school who argued about the frequent changes in our education system. "*therefore, we don't have our own long term goals*" (HL2). All teachers supported this, arguing that because their schools are government-owned, there is no need to prepare the school-based vision and goals. Other teachers claimed that they do not prepare the school based visions and goals for fear that will contradict to what the government orders through its policies and guidelines.

*iii) Cross-case analysis of results of school vision, norms and goals in high data use and low data use schools*

The results of this analysis showed differences across the two groups of schools, regarding school vision and school goals. Generally, results suggested that the high data use schools had school visions and school goals. The respondents claimed to have prepared these visions and goals from the wide government vision and goals. On the other hand, results indicated that low data use schools lacked clear vision and clear goals in their schools. The reasons given were related to the fact that their schools were supervised by the government, and so, they expected everything to come from it. However, all the schools under study lacked school norms about data use, with no common structured method to analyse and interpret data.

#### **d. Support for data use in schools**

Support comprises of *time for data use, training for data management and use, data experts in schools, and pressure and support* in the use of data. Presence of these can enhance data use in schools and their absence may hinder effective data use. This section describes the study results on the state of support in the two groups of schools presented in Table 12.

##### *i) Within-case analysis of results for support in high data use schools*

Results from high data use schools in Table 12 revealed that not all the teachers in the two schools have time available for data use, because as majority of them agreed to have time for data use however, teachers specialized in science and mathematics claimed that they have little time for effective data use. In support of this, all the heads of schools argued that although most of the teachers have time for using data, the situation might be quite different for science and mathematics teachers. These teachers were the fewest in schools and they could have no sufficient time for effective data use. One of the head of schools argued that *‘I have only one physics teacher and only two chemistry teachers, the teaching loads allocated to these teachers are too high, and may be a hindrance for them if they need time for data use’* (HH1). Another head of school added that *‘Most of my teachers have time available for data use, but am not sure about my mathematics and science teachers, we have too few teachers in those specialisations compared to what the school needs’* (HH2). Results showed that all respondents in this group of schools have never attended any training on management and use of data, and they showed their need for professional development programme in the area of data use. It was showed further that all schools lacked a data expert and teachers were in need of knowledge and skills of collecting, analysing, and interpreting and use data. In these aspects one head of school commented *‘I have never attended any professional training since I was employed as a teacher for the past 11 years, let alone trainings related to data use’* (HH2). Most of the teachers revealed that they needed professional development in various areas although the practice is no longer considered important by the government *‘for whatever reasons may be’* (H2T1). Another teacher argued that Another teacher commented that *‘am sure not only teachers that need this training for data use, but also our head of schools and other leaders in the district level and even ministry level too’* (H2T2).

Furthermore, most of the respondents held that not all data use need money because some data use may incur no expenses at all but some data may need money to identify, collect, analyse and use data. Finally, results of the interview data of the high data use schools revealed that these schools had facilities like computers and electricity which teachers use. Results also showed that although these schools have office buildings, and other storage facilities to enable the schools to collect, store and use data effectively, but not all teachers use the facilities for data use. Results showed that although these facilities were not sufficient in school H2, school H1 had more than sufficient facilities but teachers didn’t use them properly. The head master in this school said *‘we have reliable electricity and more than 100 computers, 50 of them recently installed, but no teacher uses the computers for activities related to data use’* (HH2). From the other school, the head master said *‘we have only two computers and we depend power from school generators and small solar power sources, it is a challenging situation when I encourage my teachers to use data effectively’* (HH1).

##### *ii) Within-case analysis of results for support in low data use schools*

Results from table 12 revealed that most of teachers and heads of schools in the two low data use schools have time available for data use. However, time was a problem for some science and mathematics teachers, which, they suggested, are very few and therefore some of them have too much teaching load. One head of school offered this *‘we have insufficient science teachers, but more than necessary History teachers, therefore I know time will be a problem for science teachers’* (HL2). Another head of school gave a live example of situations facing science teachers in his school, he said *‘...a good example here is our Biology teacher who teaches all streams from Form I to Form IV. He cannot prepare even lesson plans’* (HL1). Furthermore, results showed that all heads of schools and teachers in the low data use

schools have never attended any training on management and use of data. Some of them claimed that even the regular professional development in terms of in-service seminars, workshops and courses from the government are now scarce. One head of school said this *‘‘if those programmes were still conducted, it would have been very easy for us to update ourselves in different emerging fields like this (data use)...we need it’’ (HL1)*. They also added that they do not have any data experts in schools. Some even doubted if such experts are in place in their education systems of the country. In addition to that, all teachers and heads in the two low data use schools claimed that money is very important for effective data use. They said that money is needed for collection, analysis, interpretation and use of data. Some of them offered that government schools have very difficult times financially, so it is very difficult to do any activities effectively. One head of school for example, claimed that *‘‘we have insufficient funding sources to run school activities properly, let alone data use’’ (HL2)*. Finally, results showed that all respondents in both the schools mentioned the need for support in terms of ICT facilities (computers), reliable electricity, office building, storage facilities, and others to enable the schools to collect, store and use data effectively.

### *iii) Cross-case analysis of results for Support from high data use and low data use schools*

From the results schools from both the two groups claimed that most of their teachers had sufficient time for data use except for science and mathematics teachers as a result of their scarcity that lead to very high teaching loads. In addition, all respondents in the two groups of schools never had any professional training on management and use of data. Further results showed that all respondents were eager to have professional development programme in not only the area of data use, but also other areas necessary for their jobs as teachers. In data use, they mentioned skills for identifying, collecting, storing, analysing, interpreting, and use of data. In addition to the above similarities, all the schools in the two groups had no data experts in their schools, and respondents proposed that it was not easy to get such a person anywhere in the region and anywhere in government-owned schools across the country. Furthermore results show that all respondents mentioned the need to have funds for identifying, collecting, storage, analysis and the use of data. There were a few counter arguments were revealed from the results, however, with claims that not all data need money, and that some data use processes can use money only once, and after that no more money would be needed.

However, results showed that the low data use schools did not have facilities altogether, which are necessary to foster data use. Facilities mentioned to lack from these schools were computers, electricity, and good office buildings or storage rooms for data use. On the other hand, high data use schools claimed to have either more than sufficient facilities, or some of the facilities to help data use activities in their school.

### ***Summary of results on organisational characteristics in high data use and low data use schools***

From the results presented, there are differences between the high data use schools and low data use schools in terms of schools leadership, collaboration and schools visions and goals. However, some similarities were observed in support for data use in schools. In general, the heads of schools from high data use schools have more good leadership attributes than what heads of schools in low data use schools possessed. The mentioned attributes were participating skills, supervising skills, high delegation of duties, fair treatments of different teachers, good communication and interactive skills, as well as good team-leading skills. Furthermore, teachers in high data use schools showed more collaboration than those in low data use schools. They all attributed the trend in collaboration with the kind of leadership they had.. In addition, all high data use schools reported to have prepared their school-based vision and yearly goals basing on what was suggested by the government policies. On the other hand, the low data use schools believed that there was no need to have school-based goals and visions because the government was doing everything for them. In addition, although all the heads of school claimed to encourage hard work including the use of data, the low data use schools had fewer facilities in place than what the high data use schools had. Examples of facilities were presence of electricity and Information technology facilities like computers in high data use, and lack of them in low data use schools. However, both the two groups



lacked school norms because they generally considered norms as not important so long as they do their job effectively. Lastly, some similarities were observed in terms of time for data use, with all teachers agreeing to have sufficient time, except for science and mathematics teachers. Again, all teachers in the school reported that they have not ever received any professional training on data use and they showed the need for such trainings. The schools also lacked data experts which could have helped them in the data use.

#### 4.3.5 New Promoting or Hindering factors in data use

Apart from factors that promote or hinder data use in schools which were discussed in detail in our Theoretical frame work, study results revealed a new set of factors in all schools under study. These were mentioned too frequently by almost all respondents to be ignored. The researcher decided to present these factors separately, and labeled the groups as ‘*Government policies and programmes*’ and ‘*Personal teacher attributes*’. The summary of results under these new sets of factors in Table 13 is accompanied by within-case and cross-case analysis descriptions of findings.

Table 13: Summary of results for new promoting and hindering factors in schools

Status	High data use schools							Low data use schools						
School Factors	H1 HH1	H1T1	H1T2	H2 HH2	H2T1	H2T2	H2T3	L1 HL1	L1T1	L1T2	L2 HL2	L2T1	L2T2	L3T3
a. Government policies & programmes:														
-School facilities	+/-	+/-	+/-	+	+	+	+	-	-	-	-	-	-	-
-Programmes & Projects	+/-	+/-	+/-	+/-	+/-	+/-	+/-	-	-	-	-	-	-	-
-Quality of teachers	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-Compensational policies	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Teacher motivation & satisfaction	-	-	-	-	-	-	-	-	-	-	-	-	-	-
b. Personal teacher attributes:														
-negligence	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-low commitments	-	-	-	-	-	-	-	-	-	-	-	-	-	-

(+)=mentioned as promoting factor. (-)=mentioned as hindering factor. (+/-)=mentioned both as promoting and hindering factor. ( ) not mentioned. H1, & H2=high data use school 1 & 2. L1, & L2= Low data use school 1 & 2. HH\_=headmaster in high data use school. HL-=Headmaster in low data use school. H-T=teacher in H- (high data use school). L-T-=teacher in L-(low data use school).

##### i) Within-case analysis of the results on new factors in high data use schools

Results from Table 13 showed that respondents in this group claimed to have facilities like laboratories, library, and electricity, although the quality and quantity of the facilities differed. For example, while respondents from school H2 claimed to have full science laboratories, those from school H1 claimed to have improvised one of their classrooms into a *science room*. This was used as a laboratory where important experiments and science practical were conducted. The head of school explained that ‘*we cannot wait until the government build us laboratories for our students to get the basic scientific experiments and the associated skills, so we converted these rooms*’ (HH1). The science room was reported to help a lot of students and teachers, as one of teachers said ‘*this science room, it has done an amazing job to our students, had joined High schools with Science combinations, which was impossible when there was no science room*’ (H1T1). Furthermore, while school H2 respondents reported that they had a library, school H2 again reported to have improvised one of its classrooms into a *reading room* where all text books and reference books collected by the school were kept, and students and teachers borrowed or used the books for their own readings. In addition, both the two schools in this group reported that they receive frequent programmes and projects from the government, but as already explained in previous sections, instead of adopting them as they were received, the adapt, adjust, re-plan

the activities to suit their school contexts. This practice was decided to avoid *‘misunderstandings, misconceptions and incompatibilities’* (HH2) that could have appeared through the imposed policies.

Further results showed that all respondents from high data use schools mentioned poor teacher compensational policy as one of the factors affecting teachers’ activities. Unattractive teacher salaries and unreliable or late pay days were claimed to be common to all teachers interviewed. The poor state of teachers in terms of low motivation and poor working conditions such as lack of teachers’ houses, poor social services like roads, water supply, and medical services in the areas where schools are located. One of the teachers said *‘although our school is located in a better place, I know of many schools where there is completely not even a single teacher house and all teachers have to rent houses around the villages’* (H2T3). One of the teachers added that considering the low salaries offered to teachers, scarcity of teachers houses contributes to low motivation in work because sometimes *‘they are forced to rent very poor houses, sometimes poorer than a house where an ordinary villager lives’* (H1T2). In the aspects of poor social services, respondents mentioned challenges resulting from the distance teachers needed to cover to reach medical services like dispensaries and hospitals; using very poor roads or transport facilities, sometimes forced to walk on foot.

An interesting finding about this was that most of the respondents in both schools commented that although there were a lot of challenges in the living conditions of teachers across the country, these challenges should not be a justification for people not doing their jobs effectively. One head of school argued *‘many teachers just use these challenges as an excuse of neglecting their jobs, and sometimes what they practice is not directly correlated to the challenges’* (HH2). Another head of school gave an example of a teacher living in a rented ‘traditional house’ in a remote village school, but using that as an excuse of not preparing or using lesson plans *‘where is the correlation?’* (HH1) he asked. However, although all respondents agreed that these factors may cause teachers to under-perform in One teacher said *‘some teachers use these as an excuse of low commitments, negligence or misbehaviour in teaching’* (HH2). Another one asked *‘how can a teacher not use a lesson plan or scheme of work just because he is lowly paid... where is the relationship?’* (HH1). One teacher reasoned that *‘I think some teachers forget that rights and responsibilities go hand in hand’* (H2T2).

Instead, most of the respondents in this group observed that the low commitments and other complains are a results of teaching profession attracting people who are either not qualified or with very poor qualifications. The respondents suggested that people who are not real teachers have intruded teaching profession. One of them claimed *‘the teaching profession has been hijacked by people who are after money and not real teachers’* (HH2). They argued that all those reasons mentioned to cause their underperformance are possibly not the real ones for their under-performance One of them offered that *‘all those reasons offered for low motivations and underperformance are cosmetic reasons’* (H2T2). They blamed the poor teacher training programmes and corruptions as causes for under qualified and unqualified teachers respectively. One of the teachers said *‘I sometime looked at a particular teacher and wondered how come such a person became a teacher in the first place’?* (H1T2). Another one added *‘the teacher training and induction system is wrong somewhere, if you look at kinds of teachers posted in our schools nowadays you cannot believe that teacher has passed through all the necessary stages’* (H1T1).

#### ii) *Within-case analysis of the results on new promoting and hindering factors in low data use schools*

Results of the study in Table 13 suggested that almost all respondents in low data use schools mentioned aspects that fell under this group of factors. They mentioned lack of facilities like libraries, classrooms, furniture, laboratories and electricity, which they claimed to have hindered them from doing their activities effectively. The schools were eagerly waiting for the government to bring the facilities to them, because, as one of the head of schools claimed *‘this is a government owned school, so we expect everything to come from it’* (HL2). Another teacher in this school added *‘we don’t have electricity, no*

*computers, no laboratories, no library, no sufficient books, how can we use data to improve our school? It is not our fault” (L2T2).*

In addition to that, results revealed that schools complained about frequent programmes and projects from the government, which always disturbed their plans and activities, as well as not allowing flexibility. They gave examples of SEDP I & II, and the most recent BRN (Big Results Now). One head of school had this to say, *‘the projects do not allow any flexibility, so we are forced to plan our activities according to the need of the policy, which sometimes do not fit to our context” (HL1).* All respondents complained that the programmes denied them any chance to use the school environment effectively. They gave examples of the guidelines which were associated with the programmes that explicitly explain even teaching activities to be conducted, time frame, teaching aids and even the pace of covering those teaching activities. One teacher said *‘some time the suggested speed of covering a certain topic does not fit to my class, it is usually too much for my students” (L2T1).* Some teachers argued that the guidelines were sometimes confusing or they are not followed preparation of examinations. In this, one teacher emphasised *‘with BRN guidelines, we are required to cover certain topics mentioned in the guidelines in the provided time. However, the examinations they bring us to administer to our students are always beyond the limit they told us previously...it is full of confusions now” (L2T3).* They argued that the situation had left them undecided to what to do, considering that even the examinations they offered to their students were prepared by the BRN authorities.

Poor teacher compensational policy was also mentioned as a factor affecting the teachers’ activities. All respondents lamented about unattractive salary packages for teachers and unreliable or late paydays. Regarding this, one teacher said *‘I know the students are just innocent children, but the government forgets that I am a father too, I have my own kids at home, how could they pay me so low compared to other government workers, and expecting me to work effectively?” (L1T2).* They all commented that low teacher motivation and satisfaction were reasons for failure to work as expected. Respondents also reported poor working conditions like lack of staff houses, poor social services e.g. hospitals, roads, water, etc to have demoralised teachers especially in rural secondary schools. One teacher asked this *‘if the government does not care about me, why should I bother doing things for the students”?* (L2T1). Another one added *‘if the ministry wants me to be so committed at work why don’t they care about my family welfare?” (L1T1).*

In addition, most of the respondents agreed that some personal attributes were also common in schools. The mentioned low commitments, laziness and negligence of some of the teachers as reasons for low performance in schools. One respondent offered that *‘some teachers are just lazy, so they always neglect their duties and are not committed at all” (HL1).* Another one added *‘You know, some teachers are naturally not committed to their work, it is their personal behavior and it doesn’t matter how well they live or how much they are paid, they will not always do what they are expected to do” (HL2).* Not only that, results showed that there is a problem of teacher qualification in the low data use schools. All the respondents revealed that some teachers either are under qualified to teach or are unqualified altogether. They suggested reasons for having unqualified teachers being corruption and poor teacher induction system in the country. In this, one head of school said *‘some teachers are not qualified to teach. In 2010 there was a verification of certificates of all public servants including teachers. Many of unqualified teachers run away overnight because they either didn’t have the certificates, or they had forged ones. I think these are the ones bringing flaws to teaching profession” (HL1).* Other reasons for under qualified teachers mentioned were the policy of induction of non-teacher trained people to teach under license. One of the mentioned poor teacher training programmes was the one which prepared teachers in haste, e.g. one nick-named as ‘Voda-Fasta’ in which form six leavers who had low qualifications to join higher learning institutions were given one-month training and posted to teach. One teacher argued *‘how can a person who failed in most of subjects in final NECTA examinations be trained in only one month and teach effectively in schools”?* (L2T3). Another one claimed *‘it was a miracle to expect a person to have only*

*one –month training to behave like a professional teacher, this was a very poor teacher training curriculum” (L1T1).* Some respondents also reported about the teaching profession attracting people who wouldn’t have dreamed to be teachers in their life. They attributed this to quick loans from the Higher Education Students Loan Board (HESLB) which favours students in only few sectors including education. One head of school added “*you know, teaching is among very few jobs in Tanzania where students are sure to get immediate employment posts after graduation, and immediate salaries after post, so teaching attracts even non-committed people because it is the only way they can study at universities and get employment” (L1T2).* Another one added that “*some teachers are not committed to teaching job. They just enter teaching because they needed the salary” (L2T3).*

*iii) Cross-case analysis of the results on new promoting and hindering factors in high data use and low data use schools*

Results from the analysis showed that all respondents reported the presence of some unqualified and under qualified teachers in schools resulting from the way teachers were trained in the teachers training colleges (poor teacher curriculum), corruption and people who were not originally committed to teach. The results revealed that poor teacher compensational policy was reported as one of the reasons for teachers not to work effectively, probably including not using data. Further observations from respondents showed that teachers are among the least paid cadre in Tanzania, and their salaries are both unreliable in terms of amount paid per month and pay dates. In addition, all respondents observed that teachers had low motivation and low satisfaction towards the teaching job due to difficult conditions in areas where their schools are located. They mentioned teachers working under poor conditions, with no staff houses, and poor social services like roads, water and hospitals. However, while both low data use and high data use agreed on the above three aspects, these groups differed in the way they judged and reasoned about the situations. Generally, respondents in low data use schools commented that the government was responsible to rectify the situation to enable teachers work effectively. However, almost all respondents in the high data use schools reasoned that it was not only those factors which might cause teachers to work effectively or not, but it was more of how committed teachers were in the teaching job, as well as their qualifications. They pointed that some teachers used these poor conditions to justify the unprofessional practices in schools. They therefore proposed that the allegations were just superficial explanations, but there were laziness, negligence, and low teacher quality deep down into play.

Lastly, results revealed that schools in high data use group reported to either have more facilities or more creative and improvising than schools in low data use groups. As previously reported, while low data use schools had no electricity, no computers, no library, and no laboratories, the high data use schools under high data use were different. For instance, one of the schools (school H2) had all the facilities mentioned: electricity, laboratories, library, as well as more than 50 working computers. The other high data use school, H1 however, had unreliable solar powered and fuel generators for electricity and with only two computers in school. In addition, despite the fact that the school had no library, it had improvised one of its classrooms into a *reading room* where different books were kept and used by students and teachers. Again, results showed that although the school had no Laboratories, it also had improvised one of its classrooms into a *science room*, and collected and kept materials, chemicals, and apparatuses for usage during science practical. This was reported to help much the students in the present studies as well as future specialisations in science subjects. These improvising were not reported in low data use schools.

***Summary of results on factors for promoting or hindering data use in schools***

The main factors under consideration were divided into three main categories: data characteristics (accessibility and quality); user characteristics (data literacy and attitude of the user, i.e. buy-in belief, autonomy, and locus of control); and school organisational characteristics (leadership, collaboration, vision, norms and goals, and support, i.e. time for data use, training on data use, and pressure and support). However, study results revealed two other new groups of factor labeled as ‘government policies and programmes’ which comprised of government projects and guidelines, compensational policies,

quality of teachers, school facilities, teacher motivation and satisfaction, and 'teachers' personal attributes' that comprised of negligence and low commitments of teachers. The main findings suggested that the schools differed significantly in the way these factors acted upon them. The main differences were in data user characteristics and school organisational characteristics, with similarities in the user characteristics. Looking at each aspect within the three broad groups, the two schools differed in accessibility of data, quality of data, locus of control, and perceived ownership of activities in schools, where the factors were mentioned more in high data use schools than in low data use schools. Other differences revealed were in terms of school leadership, teacher collaboration, visions and goals of the schools as well as pressure and support which were mentioned to support school activities including data use more in high data use than they did in low data use schools. Furthermore, the two groups differed in the new promoting factors such as more presence of school facilities in high data use than low data use; and more acceptance and adjustments of government projects and programmes in high data use than low data use schools. On the other hand, individual aspects which were observed to be similar in both high data use schools and low data use schools include usability of data, lack of data literacy, and buy-in-belief of teachers in data use. Other similarities were availability of time for data use, lack of training for management and use of data, as well as lack of data experts in schools. In addition, all respondents complained about the poor quality of teachers, poor teachers' compensational policies, and poor living conditions of teachers. Lastly all the schools mentioned various teachers' personal attributes such as negligence, laziness, lack of commitments as reasons for poor performance of teachers in their work, including not using data properly.

This chapter presented factors promoting and hindering data use in schools. The study findings revealed some new factors in that had impact in the normal school activities, including data use. It is now time to shift our focus to discussions of major findings of the study presented in the next chapter.

## CHAPTER FIVE

### 5.0 DISCUSSION AND CONCLUSION

*In this chapter the study results are discussed, explained and associated with other literature findings. Conclusions are made and recommendations presented based on the Tanzanian Context.*

**5.1** This study focused on exploring data use in Tanzanian secondary schools. It used a multiple case study approach to explore kinds of data, purpose of data and the promoting and hindering factors in the schools. Based on the analysis of results presented in the previous chapter, this part presents the discussion of major findings of the study, backed by literature findings whenever possible.

#### **5.2 Kinds of data available in schools**

The results of this study showed the following key findings related to kinds of data available in schools. First, there were more kinds of data available in both low data use and high data use schools than what teachers referred to as 'data'. To the teachers in schools under study, data was something to do with numbers or figures, but not information and other documents. They had difficulties in identifying the kinds of data available in their context. They also had a notion that data related only to examination, assessment, and progress data despite the fact that they mentioned various input, process, and context data available in their schools throughout the interview. In addition, although the respondents failed to identify some kinds of data, findings revealed that process data were the most available data schools. The process data mentioned were schemes of work, lesson plans, teachers lesson notes, students notes, time tables, student assessment and teachers attendance data. From these, it can be concluded that the data which were commonly used were those in the hands of teachers or those which had something to do with teachers' work in classrooms. This is contrary to Bernhardt (2009) findings about outcome data being the most used data in schools, and also contradict with Shen, et al., (2010) who indicated the dominance of output data in schools. However, the predominantly focusing on only one kind of data in schools is similar to what Schildkamp, Karbautzki & Vanhoof (2014) observed in their study to identify enablers and barriers of data use practices around Europe. In this study, the researchers revealed a narrow form of data-based decision making focusing predominantly on cognitive outcomes. However, the phenomenon in the current study can be attributed to teachers' lack of data literacy in terms of knowledge and skills (Goren, 2012; Kerr, et al, 2006), which could have helped them in identifying, collecting, interpreting and using the available data in schools as well as to other characteristics of users (Kerr, et al., 2006; Mingchu, 2008; Wohlstetter, Datnow & Park, 2008). In addition, previous studies on data use also shows that despite the available data in schools teachers continued to use data improperly or did not use data at all to guide their practices, (Schildkamp & Teddlie, 2008; Wohlstetter, Datnow & Park, 2008). In these situations, teachers argued that their experience was enough for them to use data (Ingram, et al 2004; Schildkamp & Kuiper, 2010). However, the tendency of identifying or using only some types of data available in schools is detrimental to school achievement strategies. This is because the school may have a narrow focus of data in use, which rely only on one aspect of students or schools, while neglecting other forms of data available. Previous mentioned finding that teachers were unable to identify some other types of data available in schools suggests a narrow focus of data in these schools. In this end teachers' capacity building programmes on the use of data through professional development is the only way data use can be fostered. However, the tendency of identifying or using only some types of data available in schools is detrimental to school achievement strategies. This is because the school may have a narrow focus of data in use, which rely only on one aspect of students or schools, while neglecting other forms of data available. Previous mentioned finding that teachers were unable to identify some other types of data available in schools suggests a narrow focus of data in these schools.

In addition to the above, the study findings showed differences between kinds of data available in high data use schools and low data use schools. In this aspect, high data use schools had more varieties of data available than low data use schools. The respondents from high data use schools mentioned a range of input, process and outcome data more than respondents in low data use schools. This was somehow

expected because of the previous analysis conducted earlier that led to the selection of the high data use and low data use schools for the study. Although the respondents from low data use schools did not mention many data sources available in their schools, it was not clear whether these other sources existed, or respondents did not know they exist. This is because further findings from the respondents in the low data use schools revealed poor data accessibility, most data being under custody of the heads of schools and academic masters' offices while very small amount of data were on the hands of the classroom teachers. Again, although lack of data literacy was mentioned by both teachers in low data schools and high data schools, the factor could have been more pronounced in low data use schools where there was poor data accessibility than in high data use schools where data were accessible to all. The findings concur with observations in the study by Schildkamp, Karbautzki & Vanhoof (2014), where German and Lithuanian respondents were found to have the least amount of data sources, but it was not clear to whether the practice was due to the problem of existence, accessibility or knowledge, although the respondents from German reported strict data policy that limited data accessibility in the contexts. As Breiter and Light (2006) argued, the broader institutional contexts of high data use schools as revealed from the study could have shaped what data teachers and heads of schools from the high data use group noticed, made meanings from and used. Through findings of the study, broader institutional context was what seemed to lack in low data use schools, leading to low data mentioned to be in use. This lead us to the conclusion that the factors that promote or hinder data use in schools do not work independently or in isolation, but need a balanced emphasis where they can support each other to foster data use. For example, despite the fact that teachers in high data use schools lacked data literacy, however, they appear to have good teaching practices due to good school organisational arrangements in terms of accessibility of data, collaboration, leadership and some forms of support as revealed from other parts of the study. There fore, as Schildkamp Karbautzki & Vanhoof (2014, p.21) concluded, *'all factors (data use, organisational characteristics, data characteristics, user characteristics) are interlinked and can influence each other'*.

### **5.3 Purpose of data use in schools**

Findings of the study showed that all the schools use data for accountability, for instruction, and for school development. In addition, the extents to which the schools in high data use group and low data group use data for these purposes were similar, suggesting that there were no big differences between purpose of data use in high data use schools and low data use schools. In addition, findings showed most data used for school development activities, followed by data use for instruction purposes, and even fewer were mentioned to be used for accountability purposes. Findings showed that all schools lacked clear visions and norms towards data use. This, coupled with the reported data illiteracy in schools brings us to the conclusion that the schools used data randomly and superficially. These may have caused schools to use data more for school development than other purpose without even teachers being aware that they are overdoing or neglecting other purposes. Infact, there was lack of clear explanations of how data have been used to reach some decisions for school development than for instructional improvement and accountability purpose is not healthy for school improvement. This is because in doing so data will be used superficially, or not all data will be used. Therefore, for data to be used effectively in schools all the three aspects of purpose for data use should be considered. Although previous studies on data use proposed that data can be used for instruction (e.g. Cawelti & Pretheroe, 2001; Datnow & Hubbard, 2014; Datnow, Park & Kennedy-Lewis, 2012); accountability purpose (e.g. Coburn & Talbert, 2006; Douglas & Julie, 2002) and school development actions (Coburn & Talbert, 2006; Diamond & Spillane, 2004); but these studies did not imply that these three aspects should work separately. Actually, more studies on data use have suggested the combination of all purpose of data for the whole school improvement (Schildkamp & Kuipers, 2010). In their data use study in five European countries, Schildkamp, Karbautzki & Vanhoof (2014) for example, suggested that all purpose of data are equally important, with neither being the sole nor the most important aspect of data use but the the focus should be on the use of data for whole school improvement. This consideration was not observed in the schools under study. One of the possible way to

solve that is for teachers and heads of schools to have knowledge and skills about data and data use which could provided them ability to reach informed decisions to what data to use, when and for what purpose.

Further observations from the study showed that although data were observed to be used for school development other than other purposes, the aspects of school development mentioned by the respondents were only a few. These included data from schools internal evaluation data (e.g. from internal and external examinations) used for grouping and placement of students into streams or classes and very few data for target setting and monitoring for departments in high data use schools. However, there were no data used for school policy development and for teacher development activities. This is strange considering the various data available such as assessment data, lesson observations, performance data, achievement data as well as intake, transfer and school leavers' data which could have been used for policy and teacher development purposes. The findings revealed that the practice was related to schools overreliance to the government in terms of policies and activities. This was a wrong practice for the schools because the broad government policies aimed at the country's levels goals and targets were far different from what the schools could have in place. Again, lack of data use for policy and teacher development was related to inadequacy of government-wide teacher professional development programme. This is also another wrong practice because identifying gaps in teachers knowledge, skills and practice at the school level is important in making desicions which can help the teachers to change their practice within schools. Studies (e.g Timberley, Wilson, Barrar, & Fung, 2007) have shown the importance of professional development in improving student learning. However, even though the heads of schools can use data available in their school environment to shape professional development needs requiring the attention of the government; this should not be the only purpose. Instead, as Van den Hurk, Houtveen, Van de Grift, & Cras, (2014) suggested in their studies, the schools can use data to plan for school-level teacher development activities. For example, the head of school or department can observe a teacher during his or her teaching session and identify areas for improvements, and based on these, they can discuss the types of improvements and expectations to be followed by this particular teacher. From there, the role of the teacher would be to follow these suggestions for improvements and that of the head of school or head of department would be to re-evaluate the teacher and see what improvement have been reached. This is a typical school-level teacher development strategies were missing from all the schools in the two schools.

The above observations suggest two conclusions. First, because there were no school policies, teachers used intuitions in deciding what to focus in their schools. If this was the case, then it is not clear if the teachers used data at all in some other purposes previous mentioned, or if proper analysis and use of the data were conducted, or just teachers' intuitions were leading the decisions. Ingram et al., (2004) also found that not all decisions made by schools are data informed-decisions and that majority of decisions were based on intuition and on limited observations. Furthermore, further findings from the schools under study revealed that not only that some data were prepared just as a 'show off' to school authorities, but also some data were negatively used by all the schools. The second conclusion is that the schools were used to teacher professional development activities that originated from the top, (i.e ministry or district level), but not those originating within their schools. If this was the case, again, it is not clear if the government or districts introducing the activities really used the available school-based or teacher-related data to decide for what to focus and how in those activities. Whatever the case was, the practice left negative effects where schools overrely the government for the teacher development packages and do not use their available data for teacher development activities any more. This suggests a possibility of the schools to using data superficially, although they mentioned availability of a range of data they used for different purposes in schools. Similar findings were observed in the study by Schildkamp, Karbautzki & Vanhoof (2014) when respondents from only one country out of five were able to mention concrete examples of data use for policy and teacher development, while almost all respondents had successfully mentioned data use for these purposes. The practice of schools using intuitions for decision making and using data superficially can only be eliminated by providing knowledge and skills for handling data



available in their schools. In addition to that, there is a need to provide knowledge to teachers in schools of the importance and ways of making school policies that focus the school, as well as levels of teacher development. This might help schools to be more realistic in some beliefs, practices and habits they possess and increase the practice of data use equally for all purposes. As Schildkamp, Ehren and Lai (2012) advocated, data use in itself is an aspect which will help to shape the professional development for heads of schools and classroom teachers in these schools.

Another major finding from the study was that although data use for instruction was observed as the second in use for all schools under study, however, there were differences between data use for instruction by heads of schools and teachers within the same schools. Findings showed that the heads of schools used data more for curriculum development and for schools self-evaluation activities. On the other hand classroom teachers used data more for adjusting instructions and for motivating and rewarding their students. Although both purposes fall under data use for instruction, however, heads of schools used data more for the school management purposes while teachers used data more for activities directly related to students. These differences in data use between teacher and heads of schools are similar to (Schildkamp & Kuiper, 2010) who observed that heads of schools used data mainly for school level activities while teachers were more interested in classroom level data showing student achievements and how students perceived their lessons. However, differences in the use of data between heads of schools and teachers can be detrimental to effective data-based decision making in schools. This is because some of the data will be completely ignored by one group of staff just because the data do not directly lead to their perceived roles and responsibilities in schools. The practice can further lead to not only a narrow focus of data available in the schools, but it can also threaten collaboration among teachers and between teachers and heads of schools. Without this collaboration, more challenges will arise in the identification, collection, analysis and use of data in schools because effective data use needs staff working together in all aspects of data use. Having heads of schools and teachers with different purposes for data use in the same schools can also lead to poor support from the heads of schools, because the leaders might see more meanings to data related to them than any other data available in the schools. Knowledge on effective data based decision making to both heads of schools and teachers could be one of the proposed solutions to rectify this situation.

Another interesting finding from the study was about data use for accountability. Data uses for this purpose the least common in all the schools. This is contrary to other studies of data use for accountability (Ehren & Swanborn, 2012; Schildkamp, Karbautzki & Vanhoof, 2014), where the focus of data use appeared to be more on accountability than on school development and instructional improvement. This difference can be expected due to the different contexts of these studies and the current study in terms of amount of demands and exerted pressure for data use in schools. Various research on use of data for accountability purpose suggested that schools can use data both from inside and outside the school towards different stakeholders such as parents and school inspectors, as evidence of how they do things (Schildkamp & Kuiper, 2010; Schildkamp, Lai & Earl, 2012; Wohlstetter, Datnow & Park, 2008). As previously found by this study, all schools missed inspectorate and no other forms of data were used by the schools for communication with or complying with the demands from inspectorate department. All the data from these schools seemed to be used for accountability with parents, NECTA, as well as ministries or other district educational offices. This is strange considering the role of inspectorate division in running the schools as stipulated in the government policy documents (URT, 1995; URT, 2009). In these documents, the inspectorate division has the duty of providing professional support and guidance in schools as a means of assuring education quality in the country. In one of the documents, the meaning of school inspection is emphasized as ‘*the work of ensuring that a school complies with the education Act and of ascertaining whether the school is being properly and efficiently conducted*’ (URT, 2009, p.15). This implies that school inspection is a collaborative course of action where the inspector works with the head of school, the teachers, and other stakeholders while performing the inspection and making judgments on the quality based on the national minimum education standards indicators for basic

education of the country. Despite the stipulated role, findings revealed that schools did not get inspectorate visits as expected, except for a single observed visit when one of the schools under study had crisis. The lack of schools accountability towards inspectors has its negative impacts towards school achievements. As Ingram, Seashore, Louis & Schroeder (2004) advocated, to ensure effective accountability policies, it is important to use data to evaluate the standards and accomplishments as well as change practices and monitor the school effectiveness.

The missing link with inspectorate is worrisome, and it is not clear whether the schools had a set of standards to plan their targets on. This situation leads us to the conclusion that the country has a weak inspectorate division, so secondary schools have little accountability pressure and demands to comply with regulations from quality assurance inspectors as observed by (Coburn & Talbert, 2006). Whether this weakness can be explained with other reasons or evidence, one fact remain clear, that smooth-running schools can ignore the types of data for accountability to inspectors because they know they will not need inspection in the near future. The solution suggested here is to strengthen the inspectorate division and make sure that the inspectors do their work in schools. The move will stimulate data use not only for the inspectorate division but also for other accountability purposes like for NECTA, parents and other educational-related offices, and similar kinds of data (e.g. examination data from NECTA) can be used for variety of purposes in schools, thus promoting data use.

#### **5.4 Unintended use of data in schools**

Despite the use of data for genuine improvement purposes, however, the current study revealed some cases of unintended data use in both high data use and low data use schools. These were in form of strategic use, misuse, and abuse of data. The unintended use of data in schools have been found by former studies (Booher-Jennings, 2005; Diamond and Spillane, 2004). In these studies, the practice was attributed partly to the demands for high-stake accountability system posed by the government at the time. However, with low pressure accountability demands found in the schools under study, it is evident that the unintended uses of data resulted from far different reasons altogether. This can be explained as follows.

First, findings of the study showed that in the same way teachers used data for improvement purposes, they did data use practices that had negative uses. For example, the schools abused data when they used them for discriminating students according to academic performance, leading to different treatments between these groups. For example, one school grouped bright students into science streams and less bright students in arts streams. The rest of schools all bright students were put in the same streams and less bright or 'dull' students in different classes or streams. Although the schools claimed to have done this to help the less bright students to achieve, it was not clear how these 'special treatments' were planned and implemented. Instead, the situation suggested that the teachers focused on the bright students because they were easy to teach, and were highly expected to pass NECTA examinations. Generally, NECTA analysis was the only measure of high achievement of schools. After each NECTA results were released, schools were arranged according to the Gross Performance Average (GPA) of their students from the highest achieved to the lowest. These data are used by parents and other stakeholders in deciding which schools were better than others. Similar findings were reported by Diamond and Spillane (2004) in probation schools within high-stake accountability system, where under pressure and little support, the schools used data by narrowing their focus on policy demands and on improving the achievement of only a few selected students. Aligned study findings were also reported when schools tried to improve test scores by dividing their students into 'safe cases', 'suitable cases', and 'hopeless cases' commonly known as 'educational triage' (Booher-Jennings, 2005). In this example, teachers focused solely on safe cases or 'bubble kids' for the hope of increasing the schools achievement rating, while neglecting the 'hopeless cases' for the fear of decreasing their rank, but their attempt failed.

Secondly, findings showed that teachers used data ‘artificially’ by preparing schemes of work and lesson plans, or collected other student data as ‘show cases’ towards their heads of schools and other stakeholders. This was a strategic use of data because in so doing, teachers only prepared and selected data that were easy to use like teacher notes and students notes, because they were easy to prepare from text and reference books. The scheme of work which needed teachers to invest time and skills or lesson plans which were to be prepared each time before teaching were not used. Findings showed that the scheme of work and lesson plans submitted in the schools were of poor quality because teachers either prepared in haste or just copied and pasted previous lesson plans. The strategic use of data were also reported by Schildkamp and Kuiper, (2010) when they found that schools only selected data which were easy to use while ignoring that data which involved more complicated long term improvement trajectories. In addition, all the schools reported that they used student examination data to identify students who were performing poorly or below the set pass mark for special measures. Some of the examples of measures mentioned by the teachers were punishment and even expulsion from schools when after ‘grace period’ for student did not show any sign of improvement. The practice of punishing students is deep-rooted in the country’s culture. The type of punishment was banned in early 2000’s on grounds that it violated human rights (UNICEF, 2014), but, it was re-instituted in schools in the year (2013). This is because it was claimed that absence of corporal punishment contributed to the decline of discipline in schools, and consequently contributed to the ongoing drop in the examination performance. In this basis, many schools used strokes or canning to students who fail to reach a set pass mark of a school internal examination. Another practice was the tendency of using test results data for paying teachers for every weekly tests administered to their students. These payments were outside the normal salary that teachers received from the government and schools claimed that this was a way to ‘motivate’ teachers in their job. Further results showed that in some schools, teachers used this practice as a way of earning money and not for the aim of assessing their student achievements. They accused that teachers prepared poor test items or tests which are below the assessment standards.

All the observed unintended practices presented above suggest that students, teachers and schools are denied the chance to improve. This is because, according to Schildkamp and Kuiper (2010) in all schools where there is abuse, misuse, or strategic use of data the school or teachers focus is not what is really needed for improvement actions. Further findings from the study showed that although all the unintended use of data were observed in both high data use and low data use schools, heads of schools and teachers were not even aware that what they were doing was harmful to educational practices, let alone to effective data use. The only practice that seemed negative to them was when teachers prepared lesson plans and schemes of work but did not use them in teaching. The rest of practices were justified by teachers as attempts to improve students and schools, as well as motivating staff. These observations lead to the conclusion that teachers in these schools did not understand the impacts of different educational practices they were doing to students, teachers and school improvement. They practicing the undesired actions for the hope of improving their practices while in reality they were not. In a similar way, they did not understand about effective data use in schools, and most of their actions were detrimental to data-based decision making. Again, providing them with data literacy as well as training on management and use of data might help in reducing the amount of unintended use of data in schools.

### **5.5 Factors that promote or hinder data use in schools**

The main findings of the study proposed that the schools differed significantly in the way these factors acted upon them. The main differences were in data user characteristics and school organisational characteristics, with similarities in the user characteristics. Starting with data characteristics, findings showed that high data use schools data were of more quality and were more accessible to classroom teachers than was the case in low data use schools. This could have helped teachers in these schools to be good data users as was observed during the selection of schools for this study. The observations coincide with studies on data use in schools which proposed that presence of access to accurate and timely data (Kerr, et al., 2006), reliable, valid and relevant data, (Kerr, et al., 2006; Mingchu, 2008; Schildkamp,

2007), and data that coincides with the needs of the user (Schildkamp, 2007; Visscher, 2002) may promote data use in organisations, while absence of these may hinder it. Good storage facilities such as information systems and technology were also advocated by several studies (e.g. Breiter & Light, 2006; Kerr, et al., 2006; and Wohlester, et al 2008). The accessibility of data in high data use schools was ensured by having copies in teachers' offices in high data use schools, with no such mechanisms in low data use schools. From these findings it is clear that for the data to be accessible, heads of schools and teachers should make sure that the available data are reachable to all as was the practice in high data use schools. In low data use schools the heads of schools showed that data were readily available for all teachers to use, although that fact was denied by all teachers. This suggests that either one group of respondents was not telling the truth, or there was no transparency and free information to where the data were kept and how to access them.

In addition, findings showed that high data use schools had practices that ensured more quality data in their schools. These involved accuracy and timeliness of data, as a result of good storage and facilities in the schools. The good storage facilities including computers and office files contributed to more reliable, accurate and timely data in high data use schools than in low data use schools. The above observations lead us to two conclusions. First, effective data systems enhance data use in schools because the collection become easier and good storage enable accurate and timely data in schools. Second, the kind of school leadership may be a factor that cuts across many facets of data characteristics and their uses in schools. For example, aspects like transparency of information about data, involvement of staff members as well as creativity helped high data use schools to have accessible and more quality data. Therefore, for the low data schools to have more accessible and quality data, they need not only good facilities for collecting and storing data, but also good heads of schools who are more transparent, involving, and creative to allow data use in their schools.

More findings from the study showed similarities in the way user characteristics affected data use in the high data use and low data use schools. Respondents from all the groups showed lack of data literacy. Studies on data use have advocated the importance for the user to have the needed skills for data use (e.g. Goren, 2012; Kerr, et al., 2006; Mingchu, 2008; Wohlster, Datnow & Park, 2008). They hold that data literacy enhances the ability of the user to collect, analyse and interpret data, thus promoting the practice of data use. In addition, study findings showed that all respondents had a belief on data. Studies on data use had proven that buy-in belief on data was important to enhance data use practice (Kerr, et al., 2006; Mingchu, 2008; Wohlster, Datnow & Park, 2008; Schildkamp, 2007). In addition, study findings showed that teachers from high data use claimed to have used their own 'local ways' of data use, confirming their lack of data literacy. Again, the concept of data use was still new to almost all teachers. Many confessed that it was from this study that they first heard the terms 'data' and 'data use' and its associated meanings. Some held that although they heard about it, they thought that data use is only relevant to ICT, statistics or mathematics people, and they never thought that it had something to do with other subject teachers like them. Further evidence for lack of literacy was the fact that these schools had negative practices or unintended use of data. Could have they known about data use and its principles, they could have at least identified the unintended practices during the study. Lastly, lack of data literacy was reflected by the eagerness expressed by the teachers to get the skills and knowledge for management and use of data in their schools. Generally speaking, lack of data literacy caused all respondents in the current study to either fail to identify some available data in schools or to consider some data as not relevant to their work as teachers. Further findings revealed high buy-in beliefs in data for all respondents, as they showed more confidence and choice for data-based justifications and propositions. However, what these teacher believed were not reflected in the amount of data they used, the purpose they used data for, and other data-related activities. This leads us to a conclusion that the teachers in all schools under study relied on their intuitions to plan and execute data-based activities, the practice which was far from effective data use advocated in the field of education. Therefore, it is possible that even the previous judgments that discriminated high data use schools from low data schools for this study based on these

informal data use or possibly negative practices. This means that buy-in belief on data alone might not help to improve data use in school, hence the suggestion for equipping heads of schools and teachers with knowledge and skills for data use holds. Many studies reached similar conclusions and suggested about improved data use in schools (Datnow, Park, & Kennedy-Lewis 2012; Schildkamp, Earl, & Lai, 2013), because it is the only way teachers and other stakeholders can enhance their understanding and use of data in schools.

However, although the similarities outweighed the differences in user characteristics observed between these two groups of schools, teachers in high data use schools showed more perceived autonomy in the activities from both within and outside the schools than what teachers in low data use schools did. In addition, teachers from low data use schools showed signs of external locus of control while this was not observed in high data use schools. From literature (Kerr, et al., 2006; Wohlstetter, Datnow & Park, 2008; Young, 2006), perceived ownership or teacher autonomy may promote or hinder data use in schools. This is because the way data and evidence is delivered to teachers and heads of schools in schools affect the way these people will notice and attend to data. The same literature suggest that when individuals or a group of people feel that the data being discussed lacked their blessing or participation during its formulation, they tend to be less concerned about it, viewing such data as not their responsibility but belonging to another person. In the current study, this was evident through the way teachers from high data use schools and low data use schools received and use the government policies and programmes. In general, teachers in high data use schools showed more flexibility, agreement and willingness than those from low data use schools. In addition to the above explanations, teachers from the low data use groups showed some elements of external locus of control, and the elements were not shown by the teachers from high data use schools. Tokar, Fischer, & Subich, (1998) argued that people with habits of attributing success or failure to themselves are having high internal locus of control, and these people tend to better in the process that are related to change. In schools, teachers with high internal locus of control will accept that they contributed to what caused problems or low achievement to their students. These teachers tend to perform better in educational change and may willingly and easily use data as a tool for improving the quality of education. On the other hand, teachers who have external locus of control will try to find other people or factors to blame rather than them (Kerr, et al., 2006; Schildkamp, 2007). In the current study findings, teachers from low data use schools blamed NECTA and the ministry for frequent curriculum changes and policies as the cause for mass failing of students in their schools. These claims were not shown in teachers from high data use schools.

The low perceived ownership and external locus of control is a threat to normal functioning of the schools and for effective data use. Schools do not exist in isolations, but interact with other schools and other offices in educational organisation. This means that the schools were in certain chain of command and had some accountability demands in place. With this expected, having external locus of control and low perceived ownership made teachers from the low data use schools complain about failure of their students instead of finding the cause of the failure, which could have been originating from their own contexts, and not willing to execute duties advised by the top offices. The teachers from high data use schools used their high perceived autonomy and internal locus of control to execute duties both from within and outside their schools. One conclusion is clear, teachers from low data use schools, not only used much time to complain about school activities, but also neglected their duties because they felt non-responsible to school activities from outside their schools. And this may be one of the reasons they were considered low data users than their counter high data use schools from the beginning of this study. Providing information and knowledge or reminding these teachers about the chain of commands in government-owned schools and what is expected from them will help them realize their position and responsibilities in the education system. In addition, the education offices outside the school need to think about proper ways of introducing new policies, programmes and projects in schools. They need to consider the different contexts in terms of for instance, the nature of teachers, qualifications and school leadership aspects, which may favour or hinder smooth reception of activities in the schools.

Furthermore, from the results on organisational characteristic presented above, there were differences between the high data use schools and low data use schools in terms of schools leadership, collaboration and schools visions and goals. In general findings showed that heads of schools from high data use schools have more good leadership attributes than what were possessed by heads of schools in low data use schools. The teachers from high data use schools were motivated to work by school leaders. On the other hand, teachers from the low data schools equally treated by their leaders when it comes to matters like decision making and allocation of duties. Closely related to the above findings, teachers in high data use schools showed more collaboration than those in low data use schools. They all attributed the trend in collaboration with the kind of leadership they had. Many studies had advocated the importance of good leadership in schools, and suggested that distributed leadership can be the best way to remove barriers to data usage in schools (Kerr, et al., 2006; Wohlstetter, Datnow & Park, 2008). As was observed by Schmidt & Datnow, (2005) and was the practice in high data use schools, decision making authority need to be spread over several levels and groups in the school. Unfortunately, this was not the case in low data use schools. Poor leadership is harmful to data use practices. This is because, as Young, (2006) observed, the heads of schools need to show the way, and be a model for data use. Heads of schools are also expected to plan and support teachers in learning about data use. In addition, collaboration among teachers is another way to increase teacher morale to work and also use data because teachers can work as a team in reviewing and planning about data (Wohlstetter, Datnow & Park, 2008; Young, 2006). It can therefore be concluded that good leaderships in high data use schools motivated their staff to work in collaboration and had a positive impact on the way these teachers used the available data in their schools, and poor leaderships in low data use schools was a challenge to teachers' activity, hence low motivation and poor collaboration and participation. It can therefore be suggested that heads of schools need to have good leadership attributes that promote working spirits of their teachers. These can be obtained through management training. The skills will help promotion of power relations in schools which can help negotiation of different meanings and actions including the use of data.

Not only that, but also findings of the study showed striking similarities in support for data use between high data use schools and low data use schools. For instance, similarities were observed in terms of time for data use, with all teachers agreeing to have sufficient time, except for science and mathematics teachers. Again, all teachers in the school reported that they did not ever get any professional training on data use and they showed the need for such trainings. All the schools also lacked data experts which could have helped them in the data use. Studies have shown that structuring time to use data enhances data use in organisations (Wohlstetter, Datnow & Park, 2008; Young, 2006) because teachers can work together in all activities that use data. Having all respondents agreeing to have time suggests that there was sufficient time for data use, and data use could have been enhanced in both high data use and low data use schools. If this was the case, then we could expect schools to have the same amount of data use considering that time was available. Unfortunately this was not the case due to the observed data illiteracy. Having no staff who had training on data management and use in schools can be dangerous to school activities that relied on data. This is because it is not only time and other mentioned aspects of good leadership alone that can promote data use in schools, but all teachers need to have the knowledge and skills to identify, collect, analyse, interpreted, and use data. Unfortunately, there were no support in terms of trainings about data use in both high data use and low data use schools. Further findings showed that all the schools had no data expert either. This is a challenge because as Schaffer, Stringfield, & Reynolds, (2001) suggested, data use activities can sometimes be too technical for all staff to manage. Hence data expert may be of help in places where teachers lacked the technical expertise, or with limited time to data use as advocated by previous studies (e.g. Kerr, et al., 2006, Young, 2006). From these observations, It is surprising that these schools were grouped in high data use and low data use, because if they all claimed that they are data illiterate, and they didn't have any training on data, it is doubtful even to what aspects could possibly judge the schools as high data users and low data users. This observation leads us to the following conclusions. First, considering to their completely lack of knowledge and skills about data and data use, all schools have the same amount of data use practices. Secondly, the differences observed in the two

groups of schools were possibly not directly to data use, but some other school contexts which caused different practices. It is therefore suggested that more studies are needed to identify the practices that differentiate these schools, and all staff need to have knowledge and skills about data and data use.

Finally, there is a need to discuss findings from the new promoting and hindering factors. Generally, there were very high similarities between high data use and low data use schools in terms of observations provided by the teachers. To start with, results from the analysis showed schools complained about frequent programmes and projects from the government, which usually disrupted their plans and activities, as well as not allowing flexibility. The examples given were SEDP I & II, and the most recent BRN (Big Results Now) programmes. These programmes and policies were claimed to deny them any chance to use the school environment effectively. However, it seems like there is a problem in the way those projects and policies were prepared or introduced to schools. There is a need for more participation and better ways of introducing the projects and programmes so that teachers may feel the ownership and be free to contextualize them.

In addition, findings showed poor state of teacher qualifications in some schools. The importance of teacher quality has been advocated in literature. For example, Harris & Sass (2010) shown that there was a relationship between teacher quality and student achievement especially in consideration of teacher effectiveness with the economic impact of higher achievement. In addition, more countries have realized the need for a balance between teacher quality and the expected student outcome through ensuring high quality of teachers. In the US for instance, leaders in every state were ordered to deliver to the Secretary of Education their plans for ensuring that low-income and minority students in their states are not taught disproportionately by inexperienced, out-of-field, or uncertified teachers (Peske & Haycock, 2006). These efforts indicate that for student achievement to be high, teacher quality need also to be high. Unfortunately, this was not observed in the study as issues of under qualified and unqualified teachers were reported. To rectify the situation, here is a need for the government to scrutinize its teacher training curriculum as well as its induction systems.

Findings also showed that teachers faced poor compensational policy, and they mentioned it as one of the reason for teachers not to work effectively, probably including not using data. The fact that good compensational policies motivate workers in the work place is not new. In Tanzania, there are growing concerns that teachers, as in other developing countries, are increasingly de-motivated due to low salary pay (URT, 2008). Findings of the current study showed that teachers are among the least paid cadre in Tanzania, and their salaries are both unreliable in terms of amount paid per month and unreliable pay dates. Even the 1995 Education and Training Policy noted that “in Tanzania, teachers have experienced low and irregular salary payments, lack of proper housing, inadequate teaching facilities, low status and limited opportunities for professional development” (URT, 1995 p.31). This mean the observations from study findings were really significant in the way teachers behave, and the amount of work they do in schools, and deteriorating teaching performance as well as students learning outcomes let alone using data. Closely related to the above are findings that teachers had low motivation and low satisfaction towards the teaching job due to difficult conditions in areas where their schools were located. Lack of staff houses, poor social services like roads, water and hospitals. With low salaries and poor incentives also mean that far too few qualified and experienced teachers want to work in schools in rural areas where the large majority of the population and the poor live and where the living conditions are relatively poor. With the reported unwilling people joining the teaching force, quality of schools become more challenging. The findings presented above indicated that the situations at schools are not very much supportive for teachers to work supportively, which brings doubts whether effective data use initiatives would be smoothly implemented as desired.

Lastly, as already presented elsewhere in this study, although all the schools had poor school infrastructure, however, schools in high data use group were reported to either have more facilities or

more improvising than schools in low data use groups. Findings showed that it was common for some teachers to use these poor conditions of school environments to justify the unprofessional practices in their schools. They also suggested that it was possible for teachers to give superficial reasons for their low performance but deep down there were lowly qualified, lazy, or negligent. This suggests more studies on the influence of teachers' personal attributes to data use in schools.

It should be recalled that these observations were from open questions posed to all the respondents, and they gave their views and knowledge about the issues and that does not necessarily mean that all the respondents had experienced the same. All the new factors were mentioned to affect school improvement, teacher welfare and performance as well as students' achievements. Because teachers are the main stakeholder of education in the school levels, they are directly involved in all school activities and all factors that have impact on them directly affect their performance in these activities.

## **5.6 Conclusion**

This study aimed to enhance understanding of the contexts of data use in developing countries. It utilized a multiple case study approach to identify the kinds, purpose and factors necessary for data use in two high data use and two low data use Tanzanian secondary schools.

One major conclusion based on the study results is that there are more kinds of data available in Tanzanian secondary schools what teachers referred to as 'data'. Data is considered as something to do with numbers or figures, but not information and other documents. The teachers show difficulties in identifying the kinds of data available in their context. They also have a notion that data relate only to examination, assessment and progress results. However, throughout the interviews, teachers mentioned a wide input, process and context data available in their schools. Process data were the most available data schools, and were mainly used by teachers in their daily work with students inside and outside the classrooms. This was followed by the context data, and the least kind of data were outcome data, which were mainly from NECTA or internal examination results.

Another related conclusion from the study is that although the four schools under study were previously grouped into high data use and low data use, findings revealed that all the schools had similar data use practices. In other words, both the high data use schools and low data use schools were either using data superficially, or not using data-based decision making at all in their schools. The study found that where the schools claimed to use data, they used more intuitions than proper analysis of data. Additionally, all the schools practiced negative uses of the available data. This conclusion is supported by the study findings that all heads of schools and teachers in both groups had no data literacy, never attended any formal or professional development training in data management and use, and their schools had no data experts. Moreover, the study found that the concept of data use was a very new to teachers in study schools, with some suggesting that it was through this study that they first heard of it. Therefore, although there may be a variety of data available in schools, teacher may fail to identify them, or where data are available; teachers may not use them in their work. With this in mind, it is very difficult to assume that where heads of schools and teachers in this study claimed to have used data they were actually doing so. Therefore, it is possible that the two groups of schools were differentiated by factors far from data use practices. This study revealed differences related to the school contexts (e.g. location of schools, availability of resources, leadership and collaboration) and kinds of teachers in terms of teaching qualification and nature of the teacher (e.g. level of commitments and motivation).

In addition, it can be concluded that this study is different in context from the Western based studies. Some of the factors that are in play in the education system of the country which the study was conducted (developing country) might be different from those observed from schools in developed countries. For instance, challenges resulting from poor teaching environment, teacher qualifications, compensational policies, and poor infrastructure in Tanzanian schools might be less pronounced in schools from western



countries. In addition, some of the kinds of data available and used in Tanzanian schools are different from those available or used in schools in Western countries. It is normal to find data on health of students and teachers due to frequent occurrences of diseases such as Malaria, HIV/AIDS, Cholera and others. The diseases not only affect attendance of teachers and students in schools, but they also affect efficiency of work done by the sick person. Health data are important to the head of schools for management purpose, to allocate resources and duties in the schools. Furthermore, student data like distance from home to school are common and important to the government -owned day secondary schools. In these schools, some students have to walk on foot for more than 10 kilometers daily to reach school. Therefore such data are also different from what we expect from western studies, can influence examples of different the kinds of data we expect to find in schools from developing countries.

Finally, it can be concluded from the study that there were challenges in the purposes to which data in schools are used, especially in the accountability system of the schools. The fact that Tanzania competes for strong positions within a competitive global market, good performance of all aspects of the country's education system has become increasingly important. However, this is possible where there are high levels of scrutiny concerning the quality of education provided in schools. In this focus, the information about how schools perform can only be addressed through the implementation of systematic accountability systems. Unfortunately such a system is poorly implemented in Tanzanian schools. Through the government documents, schools were supposed to comply with the accountability demands of the Inspectorate division, which in turn was expected to be the principal overseer of the day to day activities and performance of the schools. However, the schools were found to be in close contact with NECTA and other stakeholders like parents more than this department. In recent years, there were neither contacts nor visits from the inspectorate departments. There were no inspectorate documents in schools either. With this in mind, it is not clear what standards were targeted by the schools and who set those standards and who evaluated whether the targets have been met. With the observed tendency, it is concluded that there was a poor accountability system, which is detrimental to school improvement and education system as a whole.

### **5.7 Recommendations**

From the study findings, the main recommendations are as follows:

First, Tanzanian government need to invest in professional development of teachers and heads of schools in the use of data. This study proved the urgent need for professional development in the use of data by heads of schools and teachers in the study. These knowledge and skills are of paramount importance to school improvement and the quality of education in general. Findings from this study indicated that all heads of schools and teachers lacked data literacy and have never attended any training on data use. As results suggested, teachers ended up using data superficially or practicing unintended data use in their schools. The study proposes both short-term plans for trainings to be immediately decided and executed in schools through workshops, seminars, in-house training, cluster workshops and other forms of professional developments trainings possible in the country. However, the government needs to have long-term plan to adapt the concept of data use in its teacher training curriculum in order to raise awareness of data and data use in schools. This will help to make data and data-use concepts known to all prospective teachers, and makes it easily understood and practices in their future teaching jobs. However, both the programmes should take into consideration the differences in schools contexts as well as of teachers (e.g. school facilities, teacher qualifications). in order to minimise challenges in data use approach which could occur as a result of these differences.

Second, longer studies using other methods need to be conducted to obtain insights of data use in Tanzania schools. This is because this study aimed to enhance understanding of the contexts of data use in developing countries. However, the study observed differences between education system and its challenges in Tanzania (developing country), the different kinds of data, and new interrelated factors. In addition, data use is a new concept in Tanzania education system, and it is more challenging because the

data use itself is complex phenomenon needing more understanding of the underlying concepts. Therefore, because data use in developing countries and Africa in particular are scarce, and in consideration of the contextual differences between Tanzania and other developing countries, more research need to take consideration the unique kinds of data and the factors which have impacts to school activities and data use that were revealed through this study. In this end, the framework needs to include aspects like the teacher personal attributes and government policy and its role in teacher quality, provision of facilities, as well as teachers' motivation and satisfaction. This will result into a more rich results and sounder evidence of factors into play in the use of data in developing countries.

In addition, the government should revise its school accountability system through inspectorate division. In whatever circumstances the country's economy and its education system passes through, quality education is what every citizen needs for the better future. It is possible that the inspectorate division has challenges that limit its normal visits; nevertheless the country needs to have a systematic mechanism which will ensure that schools get standards set by inspectorate, set their own policies, and plan how to reach the targets. In addition, the country needs a mechanism where the inspectors can evaluate schools according to the previously inspectorate-set standards and school-based targets. Lack of this will cause lack of school-based policies, visions and goals, and even fewer school plans, which is harmful to the quality of education.

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## 7.0 APPENDICES

### Appendix A

#### *Interview schedule for Head of Schools (HM)*

I'm working on a master thesis concerning the use of data, such as assessment results and self-evaluation results, for school improvement. I would like to ask you a couple of questions concerning school improvement initiatives in your school and the use of data. When I talk about data I mean all the information that is available on the functioning of the school, including assessment data, self-evaluation results and inspection report. The goal of my study is to find out various ways in which the school uses data. This interview will take approximately one hour. Before we start this interview, do you have any questions? Do you mind if I audiotape this interview? The results will be treated anonymously.

1. Could you tell me something about recent curriculum or school improvement initiatives in your school?

*Let the respondent speak freely, but probe if the questions below are not addressed, and ask for examples and illustrations. Also, ask about the use of data to improve student outcomes.*

- a. What is your role in these initiatives?
- b. Does the school use data in these initiatives? If yes, which data?
- c. By whom are these data being used?
- d. How are these data being used?
- e. For which purposes are these data being used?

2. Which data do you use in your job and how do you use these data?

*Let the respondent speak freely, but probe if the questions below are not addressed for each data source mentioned by the respondents. Ask for examples and illustrations.*

- a. How are these data being used?
- b. How often do you use this type of data?
- c. For which purposes are these data being used?

3. a). I brought a list of different types of data (note: this list will be different for each of the countries), which might be available in your school. Can you tell me if these data are indeed available, if you have access, and if you use these data sources? *Some of the data sources may have already been addressed in question . You can skip these data sources. For the other data sources, ask if the respondents uses these. If the respondent uses the data, ask how, how often and for which purposes, if the respondent does not use the data, ask why not. Also, ask for examples and illustrations of use.*

- ☐ School inspection reports
- ☐ Student progress reports (offering an educational track of the student)
- ☐ Information in the annual school programme of events
- ☐ Information on the annual policy plan of the school
- ☐ School self-evaluation results, including teacher and management questionnaires
- ☐ Data on intake, student transfer/ turn over and school leavers
- ☐ Final examination results
- ☐ Assessment results
- ☐ Student demographic data
- ☐ Student questionnaire data and focus groups
- ☐ Parent questionnaire data and focus groups
- ☐ Fees payment data
- ☐ Schemes of work, records of work covered and lesson plans
- ☐ Student and teacher daily attendance data

b. Did I miss certain data sources either you or your colleagues use? If yes, which ones? How do you use these data, how often, and for what purposes?

4. a. For what purpose do you use the data? *Let the respondent speak freely. If the respondent is not able to answer this question, you can give some hints by asking if he or she uses data for improving his teachings, group students, evaluate efforts, etc*

b. For what purpose do other teachers use data?

5. Do you receive any support in the collection, analysis, interpretation and/or use of data? *If the respondent is not able to answer this question, you can give some hints by asking if the school board encourages the use of data, if data is discussed collectively in team meetings, if the respondent received any professional development in the use of data etc.*

b. If yes, how and is this sufficient?

c. If no, do you want support? If yes, what type of support?

6. a). Are there any barriers in the school that prevent the use of data? *If the respondent is not able to answer this question, you can give some hints by asking if the respondent thinks he or she has the knowledge and skills needed to analyze data, if he or she has enough time to use data, and if the respondent has sufficient access to data.*

b). If yes, what barriers and how do these barriers prevent data use?

c). Can you indicate whether or not you agree with the following statement and why:

- We have little money to use data effectively.
- I have little time to use data effectively.
- I don't have access to the all data I would like to use.
- We receive a lot of our data too late.
- A lot of data are not accurate.
- A lot of data are not relevant to my job.
- I don't think it is important to use data in my job.
- I need training in the use of data.
- We are capable of improving our school without the use of data.
- I encourage data use in my school.
- We collectively use data in this school.
- Our school has a clear vision and clear goals.
- We use data to check if we are reaching our goals.
- Our school has a data expert, which helps me in the use of data.
- I have the skills and knowledge needed to use data.

This was my last question. Thank you very much for your time. I am going to write a short report based on this interview. I will send this report to you for confirmation. Again, I want to stress that these results will be treated anonymously.

## Appendix B

### *Interview schedule for Classroom teachers (CT)*

I'm working on a master thesis concerning the use of data, such as assessment results and self-evaluation results, for school improvement. I would like to ask you a couple of questions concerning school improvement initiatives in your school and the use of data. When I talk about data I mean all the information that is available on the functioning of the school, including assessment data, self-evaluation results and inspection report. The goal of my study is to find out various ways in which the school uses data. This interview will take approximately one hour. Before we start this interview, do you have any questions? Do you mind if I audiotape this interview? The results will be treated anonymously.

1. Could you tell me something about recent curriculum or school improvement initiatives in your school?

*Let the respondent speak freely, but probe if the questions below are not addressed, and ask for examples and illustrations. Also, ask about the use of data to improve student outcomes.*

- a. What is your role in these initiatives?
- b. Does the school use data in these initiatives? If yes, which data?
- c. By whom are these data being used?
- d. How are these data being used?
- e. For which purposes are these data being used?

2. Which data do you use in your job and how do you use these data?

*Let the respondent speak freely, but probe if the questions below are not addressed for each data source mentioned by the respondents. Ask for examples and illustrations.*

- a. How are these data being used?
- b. How often do you use this type of data?
- c. For which purposes are these data being used?

3. a). I brought a list of different types of data (note: this list will be different for each of the countries), which might be available in your school. Can you tell me if these data are indeed available, if you have access, and if you use these data sources? *Some of the data sources may have already been addressed in question 2. You can skip these data sources. For the other data sources, ask if the respondents uses these. If the respondent uses the data, ask how, how often and for which purposes, if the respondent does not use the data, ask why not. Also, ask for examples and illustrations of use.*

- ☐ School inspection reports
- ☐ Student progress reports (offering an educational track of the student)
- ☐ Information in the annual school programme of events
- ☐ Information on the annual policy plan of the school
- ☐ School self-evaluation results, including teacher and management questionnaires
- ☐ Data on intake, student transfer/ turn over and school leavers
- ☐ Final examination results
- ☐ Assessment results
- ☐ Student demographic data
- ☐ Student questionnaire data and focus groups
- ☐ Parent questionnaire data and focus groups
- ☐ Fees payment data
- ☐ Schemes of work, records of work covered and lesson plans
- ☐ Student and teacher daily attendance data

b. Did I miss certain data sources either you or your colleagues use? If yes, which ones? How do you use these data, how often, and for what purposes?

4. For what purpose do you use the data? *Let the respondent speak freely. If the respondent is not able to answer this question, you can give some hints by asking if he or she uses data for improving his teachings, group students, evaluate efforts, etc*

b. For what purpose do other teachers use data?

5. Do you receive any support in the collection, analysis, interpretation and/or use of data? *If the respondent is not able to answer this question, you can give some hints by asking if the Head of school encourages the use of data, if data is discussed collectively in team meetings, if the respondent received any professional development in the use of data etc.*

b. If yes, how and is this sufficient?

c. If no, do you want support? If yes, what type of support?

6. a). Are there any barriers in the school that prevent the use of data? *If the respondent is not able to answer this question, you can give some hints by asking if the respondent thinks he or she has the knowledge and skills needed to analyze data, if he or she has enough time to use data, and if the respondent has sufficient access to data.*

b). If yes, what barriers and how do these barriers prevent data use?

c). Can you indicate whether or not you agree with the following statement and why:

- We have little money to use data effectively.
- I have little time to use data effectively.
- I don't have access to the all data I would like to use.
- We receive a lot of our data too late.
- A lot of data are not accurate.
- A lot of data are not relevant to my job.
- I don't think it is important to use data in my job.
- I need training in the use of data.
- We are capable of improving our school without the use of data.
- My head of school encourage me to use data
- We collectively use data in this school.
- Our school has a clear vision and clear goals.
- We use data to check if we are reaching our goals.
- Our school has a data expert, which helps me in the use of data.
- I have the skills and knowledge needed to use data.

This was my last question. Thank you very much for your time. I am going to write a short report based on this interview. I will send this report to you for confirmation. Again, I want to stress that these results will be treated anonymously.

## Appendix C

### CODE BOOK

KD-IN	type of data in input group e.g. demographic data, fee payment data, etc
KD-PR	type of data dealing with conditions that are under the control of the school's management and staff e.g. Scheme of work, lesson plans, time tables, etc
KD-OT	type of data give performance indicators measured at the end of the study period of schooling e.g. NECTA results, internal exams data, assessment data, etc
KD-CO	type of data from the school environment that are expected to stimulate school performance e.g. school facilities, school policy, etc
PD-AC-PA	data used for parent related activities e.g. prepare parent reports
PD-AC-NE	data used for NECTA-related activities e.g. student Continuous assessment data from school to NECTA
PD-AC-IN	data used for Inspectorate activities e.g. using inspection report
PD-AC-MI	data used for ministry or other offices e.g. using guidelines from ministry or district offices
PD-IN-MO	data used for monitoring student progress e.g. identifying problematic student etc
PD-IN-IC	data used for instructional changes e.g. teachers identify weak students, changing teaching techniques, etc.
PD-IN-CU	data used for curriculum development e.g. changing contents, setting goals etc
PD-IN-RM	data used for rewarding or motivating students e.g. student rewarded after outstanding performance in tests, etc
PD-IN-SE	data used for self/evaluation in the school e.g. determining achievement over time
PD-SD-PO	data used for school to develop its policies e.g. data use, examination policies, etc
PD-SD-SP	data used for planning school activities for improvement purposes
PD-SD-TD	data used to identify weaknesses in teaching and suggest improvement e.g. class observations by other members of staff, etc
PD-SD-PG	data used for grouping students e.g. Placing them into streams e.g. subject specialisations etc.
PD-SD-GT	data used for setting goals and targets for school or departments e.g. pass marks, etc.
PD-NE	data used for negative purposes e.g. discriminating students, punishing students, unjustifiable payments, & data prepared for 'show off' but not used, etc
FA-DC-AC	accessibility of data are influencing data use
FA-DC-US	relevancy of data influencing data use
FA-DC-AT	accuracy and timely data are influencing data use
FA-UC-LI	knowledge and skills about data and data use are influencing data use
FA-UC-AT/BY	Buy-in belief on data influencing data use e.g. belief that data is important, etc
FA-UC-AT/PA	degree of acceptance and involvement in data use activities (Perceived ownership or Teacher autonomy) are influencing data use
FA-UC-AT/LO	a tendency of blaming oneself or others about observed outcomes are influencing data use. e.g. blaming others for student problems
FA-SO-LE	head of school leadership styles are influencing data use
FA-SO-CO	Teacher collaboration in schools are influencing data use
FA-SO-VG	school vision, norms and goals are influencing data use
FA-SO-SU/TI	time availability is influencing data use
FA-SO-SU/TR	training for data management and use influencing data use
FA-SO-SU/DE	data expert is influencing data use
FA-SO-SU/PS	Pressure and support are influencing data use. e.g. school has facility for data use,
FA-NEW	Other factors not fitting to above influencing factors