Application of Controllability in Management of Public Secondary Schools, Kenya

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Abstract
Kenyan secondary schools in rural areas are geographically and socially isolated. Rural Kenyan secondary schools face a number of problems including poor management, ways in getting learning materials, as well as inadequacy in qualified teachers. The impact of these problems is poor performance in National Examinations. This poor performance however is highly noted in science and mathematics subjects. The problem of managing and getting learning materials can be reduced by employing controllability in secondary school education system. This paper develops a theory based on control systems to be used in management of Kenyan secondary schools. The paper is aiming to support management, teaching and learning functions in secondary schools by developing mathematical theory. Kenya has only one curriculum for all secondary schools registered under the Ministry of Education. Controllability is concerned with whether one can design control input to steer the state to desired values.

Keywords: Controllability, Management, secondary schools, kenya

1. Introduction
Teachers teach and work in schools that are usually administered by managers, often known as headmaster or principals. School administration is itself often part of larger administration units. The conditions of teachers' working life are influenced by the administration and leadership provided by principals, and it is widely assumed that school leadership directly influences the effectiveness of teachers and the achievement outcomes of students (OECD, 2008). In Kenya as elsewhere in the world, school management face challenges due to rising expectations for schools and schooling in a century characterized by technological innovation, globalization and migration. The country aims to transform its educational systems to prepare all young people with the skills and knowledge needed in this changing world, the roles of school management and related expectations have changed radically. School leaders are no longer expected merely to be good managers; effective school leadership is increasingly viewed as key to large-scale education reform and to improved educational outcomes. As the country increasingly turn to improve education to address an ever more complex world, the government gives school management more responsibility for managing and implementing significantly more demanding education programs. Globalization and widespread immigration mean that families, youth and children represent an increasingly challenging clientele for schools in the country. Also, the standards to which schools must perform and the accountability required of management raise expectations regarding school leadership to an unprecedented level.

According to Ikeanyionwu (2013) the need for reliable control of secondary school management systems with inherent uncertainties affecting their behavior has led to rapid developments of different theories. Such theories include control theory. Various mathematical models have appeared to model such uncertainties, and they range from stochastic models (diffusions, jump processes, Markovian switching, etc) to deterministic but uncertain models (interval uncertainties, bounded norm uncertainties, etc). This has led to novel mathematical tools being applied to solve the corresponding control problems and at the same time new mathematics is being developed motivated by the various challenging control problems. A secondary school is more likely to use access controls in specialized areas, such as laboratories, computer facilities, libraries and athletic facilities than for general academic buildings, at least during
hours of operation. Residence halls and other housing facilities are another area where control theory may be required. Matching the available security options with each specific application is easier with a decision-making framework. However, management function of schools can as well use controls the same way is used in specialized areas.

The importance of school control systems is evidenced by the large number of papers published in recent years. Despite the extensive literature certain fundamental matters are not well understood. This is confirmed by numerous inaccurate stability analyses, erroneous statements about the existence of stable control, and overly severe constraints on compensator characteristics. The basic difficulty has been a failure to account properly for all dynamic modes of management system response. This failure is attributable to a limitation of the transfer-function matrix—which can fully describes a secondary school system if and only if the system is controllable and observable.

The concepts of controllability were introduced by Kalman, (1961) and have been employed primarily in the study of optimal control. In this paper, the primary objective is to determine the controllability of secondary school management systems which are formed by the interconnection of several multivariable subsystems in schools. Throughout, emphasis is on the fundamental aspects of describing secondary school management control systems. Mathematical, details, designs and procedures are beyond the scope of this paper.

2. Definitions and notation
Let a secondary school management system \( S \) be represented by
\[
    x(k + 1) = Ax(k) + Bu(k). \tag{1.1}
\]

Where \( u(k) \) is a \( p \)-dimensional input vector, \( x(k) \) \( n \)-dimensional state vector at time \( k \), \( x(k + 1) \) is the state at time \( k + 1 \), while \( A \) and \( B \) are constant matrices.

Controllability of a system can roughly be defined as the ability to transfer a system from any initial state \( x(0) = x_0 \) to any desired final state \( x(k_f) = x_f \) in a finite time \( k_f < \infty \).

In secondary school management system, the management function can be expressed the same way, where
\[
    P = E + L \tag{1.2}
\]

\( P \) is the performance of the school = character of the student after school + performance in national examination + teachers motivation
\( E \) is Entry behavior of the students = Character of the student during admission + Marks during admission.
\( L \) is leadership of school principal which is an input determined by = ability of the principle + style of leadership

Changes in school management over recent decades are part of a larger trend in the management of public service organizations that can be characterized as the decline of older public administrative models and the rise of a new public management (NPM) model. The ideas and research findings behind the NPM model in public services – flatter management structures, market-like mechanisms, decentralization, customer orientation and evidence-based improvement of services – have significantly changed the approach to organizational management (Pushpanadham, 2011)

**Purpose of the Study**
This study aims at the following:
- To explore the salient dimensions of the management behavior and style of secondary school principals.
- To promote mutual respect and good management of secondary schools.
- To establish the degree to which theory of control system be applied in secondary school education.

**Statement of the problem**
Due to rampant disunity and lack of co-operation in management of secondary schools, the attainment of the school goals has become very difficult. Again, deficiencies in school management also bring
set-back in upward progress of the schools. The proponents of the control system theory generally insist that controllability in a system can bring harmony and lead to better result. This then aims at assessing the extent to which the principle of controllability influence work environment in order to bring about the desired result.

**Study Questions**

1. In an era of accountability and devolution of authority in education, what are the salient dimensions of the management behavior and style of secondary school principals?
2. Can theory of controllability be applied in secondary school management system?

**Significance of the Study**

The outcomes of this study will be useful to establish extent to which controllability theories can be applied to secondary school management system. Moreover, this study will open gates for more research on the application of mathematical modeling in education.

### 3. Literature Review

#### 3.1 Controllability in secondary school management system

In school situation, effectiveness of an administration aims at the achievement of organization goals. As such school administration could therefore be said to be the extent to which the goals of the school system are accomplished by the principals, teachers, students and others within the school community (Mingaine, 2013). Thus, the framework within which the people and environment interact should be considered. According to Mayo Elton (1945) pointed out some degree of human relations after carrying out an experiment in U.S.A titled Hawthorne Experiment which included informal group, communication and effective collaboration of employees through cooperation and understanding. Both the male and female in an organization never act in isolation but as members of a group which is influenced by their feelings towards each other. It is these interactions and reactions which result into such feelings of friendship, reserve, collaboration, discontent and even hostility.

#### 3.2 Management styles in secondary schools and their applications

Management practices in Kenyan Secondary schools have come under scrutiny following the wave of student strikes that swept across the country in recent years. Over the past decade strikes in schools have been increasing phenomenally. Several reasons have been advanced by different stakeholders as the underlying root causes: overloaded curriculum; autocratic school administration; drug and substance abuse; poor living conditions in schools; excessive use of corporal punishment; lack of an effective school guidance and counseling services among others.

##### 3.2.1 Autocratic Management Style

An autocratic leader makes decisions without the consultation of others, instead serving as a dictator type in communicating orders because they like to be in control of situations. This style of management leads to work getting done on time because there are less people involved in the decision making process (Mingaine, 2013). The problem with this type of management style is that the staff are going to eventually lose motivation working in an environment where they have no say and employee turnover is likely to run high as they move on to other opportunities where they can have an impact. For situations or events where an on the spot decision needs to be made, this type of leadership can serve a purpose, but trying to have an autocratic style of management in place for long periods of time is just going to lead to headaches for all involved. This style of leadership is more suited for a prison setting or in the military and not so much for secondary school management.

##### 3.2.2 Democratic Management Style

A democratic leader is willing to share work with his staff by delegating it to get the job done. You are banking on the competency of your team to get the job done on time and to have it done correctly. Teachers like this type of management style because they feel involved and part of the process. Their job performance is likely to be better than in an autocratic setting, though giving them the authority to do the work may lead some to rely on other to bear the brunt of the work on the project. Also, depending on what type of work it is, employees may feel like the work is being pushed off on them because you as a manager don’t feel like doing it.
Getting too many people involved in the project or process could slow the work down. It could also mean less time for you to concentrate on your work as your team asks questions and waits on your answers before proceeding to the next steps.

3.2.3 Participative Management Style

Also sometimes known as consultative management style, this decision-making style in management revolves around getting lots of feedback from staff before coming to a conclusion and making a decision. This means that the process can take a bit longer as there are more voices to be heard, but getting a consensus on major decisions can lead to buy-in from those who might otherwise have been opposed to the implementation of such changes. The downside to this style of management and leadership is that employees may feel that you don’t value their opinion or are too stubborn if after all of the feedback is received you go off and make the decision in your own without incorporating any of their feedback.

3.2.4 Laissez Faire Management Style

In this leadership management style, the team is given the freedom to complete the job or tasks in any way they deem it should be done. It is hands off approach at the management level in terms of direction, but the manager is there to answer questions and provide guidance as needed. This is a good way to help develop individual contributors into leaders which is only going to serve to make your team stronger on the long run. On the flip side, it can lead to conflict on the team if some employees try to assume the role as a leader in the interim or to dictate to others how their work should be done.

4. Management of Education in Kenya

Management is the art of getting people together to accomplish desired goals through planning, organizing, sourcing, leading or directing, and controlling an organization or effort for the purpose of accomplishing a goal. Education Management focuses attention on strategies for keeping education resources current, up to date, and accessible. It is ensuring that people have the most recent and suitable education to do their work.

The Education Act, 1968 defines a manager as any person or body of persons responsible for the management and conduct of a school, and includes a Board. The Act, read together with the Teachers Service Commission Act, Cap. 212, confers extensive powers on the Minister of Education over the management and regulation of education in Kenya. The two acts give the minister extensive latitude to delegate his powers to local authorities, District Education Boards or Boards of Governors. Public secondary schools are administered by Boards of Governors appointed by the Minister whereas Primary schools are managed by School Committees appointed by local authorities. The boards and committees are responsible for the hire and remuneration of support and subordinate staff in public schools. The boards also act as the custodians and trustees of the movable and immovable property of their respective schools. The principals and headmasters of these institutions serve as the secretaries and executive officers to the boards of governors or school committees as the case may be.

The Public Procurement and Disposal Act, 2005 has granted teachers the power to control the tendering and procurement process in public schools. The Teachers Service Commission Act allows the Teachers Service Commission to delegate its powers relating to the hiring, control and discipline of teachers to Boards of Governors inter alia. The disbursement and utilization of government funds under the Free Primary Education (FPE) and Free Secondary Education (FSE) programs is subject to the provisions of the Government Financial Management Act, 2004. The boards of governors are mandated by the Education Act to audit and regulate expenditure by the administration to ensure that all the income received by the school is applied for the promotion of the objects of the school. These statutes presume that members of the Boards of Governors and teachers are knowledgeable in Law, Human Resources Management, Supply Chain Management, Accounting and Project management. That is where the main problem in the management in public schools lies.

The Ministry of Education continues to employ archaic techniques in the administration of education institutions. The tools for the management and evaluation of public education institutions have
remained static for a long time despite the rapid technological, socio-cultural and economic changes in the country.

There are no set criteria enumerating the skills a person should possess to qualify for appointment into a board. Service in School Boards is not remunerated and consequently most professionals opt to stay away from it. The result is that most public schools are managed by old and unenergetic retirees, semi-literate business people or other semi-skilled non-professionals. This has created a managerial gap in most public schools in rural Kenya. The old managers cannot cope up with the rapid social, technological, economic and cultural changes in our country. The managers are more often than not erudite in elementary law and cannot readily grasp the provisions of the Education Act or the basic concepts in management of public finance, human resource management and organizational management. The Education Act is also inexplicably lenient on imprudent school boards. Suspension and forced resignation are the only penalties the minister can impose on an errant board.

School boards composed of members who do not possess managerial skills; expertise and experience are a major source of discontent among students and parents. Parents typically oppose a school administration if they perceive it to be incompetent, opaque or unaccountable. Students on the other hand engage in insidious conduct to protest against such managers. Initially it was possible to “cover-up” such managerial ineptitudes through authoritarian leadership. Before the enactment of the Children’s Act, 2001, school heads would use actual or threats of corporal punishment to forestall complaints from students. This explains why the protests have become more pronounced and dangerous since the use of corporal punishment in schools was abolished and replaced with guidance and counseling.

5. Conceptual Framework

Conceptual framework refers to how a researcher conceptualizes relationship between variables in a study and shows them graphically or diagrammatically. It shows independent variables and dependent variables and how they are related or influences one another Mugenda (2003). This paper adopted a conceptual framework important in identifying application of control theory in management of secondary schools. Principal abilities and leadership style are identified as input in school system. Students performance in National examination, discipline and teachers motivation are identified as output of the secondary school management system as shown by the figure 1.

![Fig.1: Secondary school management system](image)

Key: L = leadership of school principal, E = Entry behavior of the students and P = the performance of the school.

6. Methodology

Orodho (2008) defines research methodology as the framework within which facts are placed so that meaning can be extracted from them. It gives the direction that a researcher must follow in order to get the answers to issues with which he or she is concerned. This study employed a literature review methodology. According to Mugenda (2003) literature review methodology is useful not only in securing evidence concerning an existing situation or current conditions but also identifies standards or norms with which to compare present conditions in order to plan the next step. Mugenda (2003) notes that survey research methodology is intended to produce statistical information about aspects of study that interest policy makers and researchers.

7. Rationale of the methodology used in the study

A review of the literature was adapted for this study. Review of the Literature was appropriate for the study since as Mingaine, (2013) observed, ‘Literature review were conducted to determine the status
given and were concerned with the gathering of facts rather than the manipulation of variables’. In the study the research was interested in getting facts from literature on the application of controllability management of secondary schools.

Furthermore, according to Mingaine (2013) a literature review was useful in that it not only secures evidence concerning existing situations or current conditions but also identifies standards or norms with which to compare present conditions in order to plan the next step. Studies were identified through an electronic search of the databases such as Science Direct, Web of Science, library files and reference list. In addition, the literature review was extended to the Internet, by use of Google, Yahoo, Baidu, and other internet search engines. Initially 66 articles were identified as potentially relevant for study, of these, 27 articles were excluded based on title and abstract that did not match the requirements of this study. 39 articles were retrieved for more detailed evaluation, 18 articles were further excluded because they did not meet inclusion criteria. Only 21 articles were reviewed in this study. The diagram 1 below shows Systematic review flow diagram for the articles reviewed in the study.

![Diagram 1: Systematic review flow diagram for the articles reviewed in the study](image)

**Diagram 1:** Systematic review flow diagram for the articles reviewed in the study

### 8. Discussion, Summary and Applicability of controllability in management of schools

Control Theory is the theory of motivation which contends that behavior is never caused by a response to an outside stimulus. Instead, the control theory states that behavior is inspired by what a person wants most at any given time: survival, love, power, freedom, or any other basic human need. Control theorists generally argue that there is no problem explaining why people do what they do since all human beings suffer from innate human weaknesses which make them unable to resist temptation. They focus on restraining or "controlling" factors that are broken or missing inside the people. If these restraining factors are thought to involve society in some way, as with the sociological notion that norms are internalized, then the theory is said to be a "social" control theory, and is most probably a social bond theory. Most control theories, however, are a blend of psychiatric,
psychological, and sociological ideas. However, these theories can be applicable in secondary school management system.

According to Darling, (2012) management is a basic activity of selecting from among two or more available options that can lead to a desired state of affairs. It is the management function that pervades the entire task of the administrator. The administrator cannot make all the decisions alone. He needs to engage others so as to realize the goal of the organization. It is not therefore an overstatement, that in any organization, including school, the staff will feel more involved and put in their best when they are carried along or are informed about the workings of organization. According to Ivibhogbe (2011) management is seen as actual sharing in the making of decisions. It means a constant enlargement of the area of common. Ikeanyionwu (2013) argues that in a democratic administration, “participation” is “a positive act intended to achieve desired outcome”. This means that actions, which are not the outcome of some management, are usually irrational and achieve nothing useful. Therefore, the actions of principals and teachers for the business of educating the young must depend much on good management, which they make daily. This will help the staff develop trust in the principal. This is why Grey (2008) contended that, the key to organizational learning include structures that allow for staff interaction and participatory management.

9. Conclusion and Recommendations
There is no gain saying the fact that management anywhere in the world remains a veritable tool for development. Society itself is development-inherent, the school is no exemption. The principal should identify areas he/she is more effective and employ such areas to management of school. Proper work scheduling and design by administrators should be the focus of all principals with the aim of proper delegation of duties. This should d be done by drawing a workable time table for all staff. Principals should be assigned with manageable workload which should be clearly drawn in a workable time table. This is to make sure that work load is equitably distributed. The use of instructional leadership by principals is associated with aspects of the management of instruction that is in line with recent research and policy recommendations for developing teachers in schools. Supportive appraisals and feedback from which teachers can judge and improve their professional practices is a crucial part of effective teacher management. Similarly, aligning teacher appraisals with student achievement outcomes is a sound managerial practice to focus teachers’ efforts on what really counts in the educational process. The same is true for recognizing the use of professional development of teachers in the appraisal of teachers’ work. Finally, school leadership that develops professional development plans to fit individual teachers’ needs, as assessed by appraisals, completes the managerial process for supporting effective teachers. It as shown that controllability theory can be applied in school management system. More research should be done to align control theory with management of school.

10. References

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