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of Erasmus University Rotterdam

**MSc Programme in Urban Management and  
Development**

Rotterdam, The Netherlands

September 2011

**Thesis**

Title: Educational Infrastructure: enhancing the quality and  
sustainability through an integrated approach to design,  
finance, and function

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UMD 7



## Summary

The provision of educational infrastructure around the world is generally deemed as the responsibility of the respective governments. It is widely acknowledged that investments in educational infrastructure yield sustainable economic development of any urban region. It is, therefore, imperative that the educational infrastructure, particularly in developing countries, is capable of meeting modern day educational requirements and is result-oriented in terms of physical, curricular, and managerial aspects. However, in practice, most developing countries continue to follow conventional methods for the delivery of educational infrastructure, which are either too rigid, unsustainable, or bear no relation to the economic development requirements of modern times. In the context of the prevailing economic recessionary pressures, it has become all the more important that we ensure that the educational infrastructure is optimally efficient and efficacious in educating the present (and future) generations of students capable of meeting the challenging demands of the 21<sup>st</sup> Century. This warrants a critical look at the current public schools system, and re-think its design, financing mechanisms, and functionality in order to improve the overall quality and provision of education. This thesis seeks to address this dire need and proposes an alternative integrated approach to better design, sustainable financing and optimal functioning of educational infrastructure, including the possibilities of public-private partnerships, with a particular emphasis on education in developing countries.

This thesis research reviews the prevailing models of educational infrastructure with a view to identifying the underlying challenges and results in finding ways to strengthen the sustainable functioning and output of public school systems. Through an objective evaluation of existing models focused on two case studies, one in a developed country (USA) and the other developing country (Pakistan), this research determines that an integrated approach to design, finance and function can help achieve better results and also bring all stakeholders into a durable and mutually beneficial arrangement for successful delivery of education. An integrated approach to design, finance and functionality, has a clear edge over the standardized approach, which is followed in most developing societies. Through better use of public-private partnerships, and with greater private sector involvement, governments can burden-share their responsibility of providing quality education. By combining efficiency with welfare, it is possible to achieve optimal results.

## **Acknowledgements**

This paper was made possible by Huygens scholarship I received for my study here in the Netherlands. This thesis research builds on earlier work done by various scholars and academicians on education. It broadens the discussion both in scope and in depth on some of the key aspects of educational infrastructure in the case of development countries.

I am thankful to many colleagues who have contributed valuable comments and feedback to make this thesis study as comprehensive as needed. On a personal note, I am particularly grateful to my father's unfaltering support and sound advice, time and again.

I would also like to acknowledge the love and support of my grandparents, my parents and family, and to those few friends I made back in Pakistan, all of whom inspired me in their own way. They have rekindled my hope for a better Pakistan and made me feel at home after my decade long return from New York.

I also admire and respect the individuals who I spent time and learnt with here at IHS. Last but not least, I would like to acknowledge the support and guidance of my supervisor, Mr. Aloys Bongwa. All of you have made writing of this thesis a pleasant experience.

## Abbreviations

AEPAM	Academy of Educational Planning and Management
DHA	Defence Housing Authority
ECE	Early Childhood Education
GDP	Gross Domestic Product
GPI	Gender Parity Index
IRR	Internal Rate of Return
LDA	Lahore Development Authority
MDG	Millennium Development Goals
MIRR	Modified Internal Rate of Return
MoE	Pakistan Ministry of Education
NER	Net Enrollment Rate
NPV	Net Present Value
NYCDE	New York City Department of Education
NYSED	New York State Education Department
PFI	Public Finance Initiatives
PPP	Public Private Partnership
PRSP	Poverty Reduction Strategy Paper (Pakistan)
PSLM	Pakistan Social and Living Standards Measurement
RfP	Request for Proposal
RfQ	Request for Qualification
UN	United Nations
UNDG	United Nations Development Group
UNDP	United Nations Development Programme
UNESCO	United Nations Education Social Cultural Organization
VfM	Value for Money
VGF	Value Gap Funding

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## List of Key Terms and Definitions

*This section briefly highlights a few of key terms and definitions discussed in regards to the provision of educational infrastructure. . The following text in Literature Review (Chapter 2) elaborates on these theories and underlines possible alternatives for more efficiency and effectiveness.*

**Educational Infrastructure** For the purpose of this paper, I have sought to define educational infrastructure as the school system in all its aspects, mainly the structures, funding mechanisms, and management, in order to provide for the education needs of a given locality. The overall canvas for us is to seek better ways of ensuring quality and excellence of sustainable education for all members of the population.

**Design of Educational Infrastructure** A desirable and comprehensive approach requires that we look at this issue not only from the perspective of urbanism, utility, technology, and physical design, but also a host of other factors that have increasingly become important in today's world. The following discussion would help elaborate the centrality and relevance of design to effective educational infrastructure.

**Educational Infrastructure Financing** In the context of educational infrastructure, three significant financial arrangements are employed by most developed and developing countries: public ownership and public operation; Public ownership but private operation; and Private owned and run.

Additionally, there are several options common to most financing mechanisms. In most cases, governments provide the basic finance. Private sector chips in wherever government financed and run schools do not deliver the utility or relative satisfaction. Most local governments seek cost-effective methods to deliver public education and tend to incorporate private sector providers, wherever possible. Financing mechanisms can also incorporate participation of various stakeholders in planning, providing, and monitoring of educational infrastructure services. Improved financial viability of educational infrastructure projects is achieved through not only adjustments in policy, but also through fundamental institutional changes to streamline it with the business aspect of infrastructure.

**Functionality of Educational Infrastructure** To greatly strengthen and effectively manage schools, it is important to integrate the design and financial arrangements with the institutional capacity of the educational infrastructure. Functionality and improvements in educational effectiveness in developed as well as developing countries requires considerable effort on three critical factors: school governance, organizational structuring, and teacher pedagogical skills.

**Urbanism** Urbanism illustrates the role of educational planning in relation to its attention towards community, serving as a link between educational and broader urban activities. Urbanism calls for planning of educational infrastructure to be responsive to the social, cultural, political, economic, and environmental concerns of urban regions.

**Utility and Technology** Utility implies three fundamental characteristics: the expression of preference, possible alternatives, and appropriate allocation. In essence,

the term implies a measure of “relative satisfaction” (Page, 1968).

### **Private Finance Initiatives**

Private Finance Initiatives are a similar manifestation of the public-private partnerships, under which governments engage contracts with the private contractors/companies in order to procure urban social infrastructure projects, from the financing and designing, to construction and operation.



# Chapter 1: Introduction

## 1.1 Introduction

The provision of educational infrastructure around the world is generally the responsibility of the respective governments. It is widely acknowledged that investments in educational infrastructure yield sustainable economic development of any urban region. It is, therefore, imperative that the educational infrastructure, particularly in developing countries, is capable of meeting modern day educational requirements and is result-oriented in terms of physical, curricular, and managerial aspects. However, in practice, most developing countries continue to follow conventional methods for the delivery of education infrastructure, which are either too rigid, unsustainable, or bear no relation to the economic development requirements of the modern times. In the context of the prevailing economic recessionary pressures, it has become all the more important that we ensure that the educational infrastructure is optimally efficient and efficacious in educating the current (and future) generations of students capable of meeting the challenging demands of the 21<sup>st</sup> Century. These warrant a critical look at the current public schools system, and re-think its design, financing mechanisms, and functionality in order to improve the overall quality and provision of education. This thesis seeks to address this dire need and proposes alternatives in terms of better design, sustainable financing and optimal functioning of educational infrastructure, including the possibilities of public-private partnerships, with a particular emphasis on education in developing countries.

Access to primary education is a basic human right -- it is both transformative and an empowering driver for societies around the world for realizing their economic growth, social and cultural development. Countries have been able to ascend the human development ladder and have realized sustainable development broadly through sound investment in education<sup>1</sup>. Beyond this intrinsic significance, the Millennium Development Goals (MDGs) considers access to education as an indispensable means of benefitting from other human rights. Education contributes to strengthening more societies through poverty alleviation and inequality reduction<sup>2</sup>. It is imperative that the aim of the provision of tomorrow's education infrastructure be to synthesize current students with the cultural identity of the context in which the schools and facilities are situated, and be interconnected with the increasingly globalized world. The provision of educational infrastructure in cities around the world is generally the responsibility of the respective national and local governments. However, in practice, most educational facilities in the developing countries have adapted a customary approach to the delivery of education infrastructure which is hampering the sustainable economic development of the country and of its citizens (Colclough C, Fennel S 2004). The MDGs has established a target that hopes to ensure that children throughout the world (boys and girls) will be able to complete full course of primary school by the year 2015 (UNDG 2008). Consequently, various nations undertook efforts to reach these targets, and aimed to enroll all children of official entry age for primary schooling by 2009. Enrolment in primary education rose to almost ninety percent in developing countries by year 2008. According to UN report<sup>3</sup>, enrolment increased by 11 percent in Southern Asia between the years 1999 to

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<sup>1</sup> United Nations. *Millennium Development Goals Report 2010*. United Nations Department of Economic and Social Affairs (DESA) — June 2010

<sup>2</sup> United Nations Development Group (UNDG): Working Group on MD/MDGs. 2008. “*Good practice to scaling up MDG achievement*”, UNDG Policy Network for MDGs.

<sup>3</sup> Ibid.

2008. However, despite great efforts, the goal to achieve targets by the year 2015 at current pace seems unfeasible, as it required that children all around the world have had been enrolled in primary school by 2009 education (MDG Report 2010).. At present, more than 69 million school-age children were not enrolled in any school in 2008, and almost 18 million children are still not enrolled in schools in Southern Asia today<sup>4</sup>. The figures illustrate the wide discrepancy and show that the progress has not been universal. Therefore, comprehensive and more efficient actions need to be taken in order to make the vision a reality. Because the provision of today’s educational infrastructure is based on an out-dated and traditional system, there is a pressing need to ensure that the capacity of current education infrastructure appropriately prepares and educates the future generation of students. The challenge today is how to adapt the present educational infrastructure to the requirements of modern times while we struggle to cope with the current global economic recessionary trends. The objective is to seek improvements in the educational infrastructure such that the provision of educational facilities garners local participation, is financially sustainable, and operationally viable.

This thesis thus calls on rethinking the process of the design and structure of current public schooling, to strengthening the operation and financing of schools in urban cities, and serves as a guideline in proposing alternatives to improving the provision of public schools in terms of design, financing, and operational functionality. It takes an honest view of the current learning spaces in cities of the developing countries against the vision of learning taking place in cities of developed countries – essentially to enhance these performance criteria, inquire on what it means to be “well-educated” and how does the education infrastructure facilitate this notion.

## **1.2 Defining Educational Infrastructure**

Infrastructure is a broad term; various definitions and interpretations of the word constitute different meanings at national, sub-national, and organizational levels. In most cases, infrastructure consists of physical structures, networks and facilities that provide and support various public services (World Bank GMP 2009). For the purpose of this paper, we have sought to define educational infrastructure as the school system in all its aspects, mainly the structures, funding mechanisms, and management, in order to provide for the education needs of a given locality. The overall canvas for us is to seek better ways of ensuring quality and excellence of sustainable education for all members of the population.

## **1.3 Problem statement**

Children throughout the world deserve the same quality and level of education regardless of where they live. Yet certain schools perform better than others. The reasons for this discrepancy vary from country to country. In most cases, the quality of education has become a function how well the educational infrastructure is funded. This is a myopic view of the problem. For every educational infrastructure, design, financing mechanisms, and management systems are equally important and inter-dependent components of one whole.

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<sup>4</sup> United Nations. Millennium Development Goals Report 2010. United Nations Department of Economic and Social Affairs (DESA) — June 2010

The difference in quality of education arises when less attention is paid to one factor or the other. An integrated approach to the maintenance of educational infrastructure is missing.

The United Nations has established what is popularly called Millennium Development Goals (MDGs), which require that “by 2015, children everywhere, boys and girls will be able to complete a full course of primary schooling”. The MDG Report 2010 indicates that although enrolment in primary education continues to rise, “the progress is insufficient”. It further iterates that “to meet the goal, countries will also need to ensure that there are enough teachers and classrooms to meet the demand”.

The above speaks of only primary education. It is not difficult to imagine the scale of challenge when we take into account secondary and tertiary education, where the need for a better educational infrastructure in terms of campuses, teachers and funds is far more acute. It is in this context that we must evolve new, more creative, and innovative solutions to address the specific education needs of societies, particularly in developing countries, in a sustainable and context-specific manner.

## **1.4 Research Objectives**

The objective of this research is to closely study the prevailing models of educational infrastructure with a view to identifying the underlying challenges and finding ways to strengthen the sustainable functioning and output of public school systems. The research relies on an objective evaluation of existing models, and focuses on two case studies, one in a developed country (USA) and the other developing country (Pakistan).

The paper’s objective is to determine the most appropriate strategy in terms of design, financing, and operational functionality in order to enhance the functionality of public education. The research will evaluate whether an integrated approach to design, finance and function can help achieve better results and also bring all stakeholders into a durable and mutually beneficial arrangement for successful delivery of education.

## **1.5 Significance of the study**

The world today is fast globalizing. Interdependencies have increased, yielding huge economic benefits through mutual complementarities but at the same time exposing us to enormous risks. The recent economic downturn in the USA and Europe and the Eurozone crises illustrate the point. The demands of 21<sup>st</sup> Century require better coordinated, coherent and innovative approaches to deal with economic challenges, particularly in least developed societies, where economic development is under profound stress. Central to this is the need for a robust educational infrastructure, which can produce necessary human resource capable of meeting the challenges of today and tomorrow. While countries are at different levels of success in providing educational infrastructure, many, particularly the developing countries, are still struggling to create sustainable educational infrastructure in terms of design, finance, and functionality.

Case studies indicate that all three pillars of educational infrastructure require focused attention in order to achieve desired levels of education. The case studies also indicate that better designs of structures can help lower financial requirements and improve teachers performance and vice versa. This interdependence of all three factors underscores the need to approach them in an integrated fashion to not only maximize output but also ensure

sustainability of educational infrastructure. An integrated approach to design, finance and function can thus help us produce the education youth which can meet the interdependent economic challenges of today's globalizing world and successfully shoulder the responsibilities of tomorrow. This study seeks to contribute to underscore this important message.

## 1.6 Main Research Question

What are the factors that can enhance the performance of provision and delivery of educational infrastructure?

### 1.6.1 Sub-questions

Additional inquiries regarding educational infrastructure relates to the challenges and opportunities in how to improve the development and operational arrangements of the educational infrastructure such that the provision of educational facilities garners local participation, is financially sustainable and operationally viable – shielded from turbulent economic variances that affect the allocation of resources available to education infrastructure. Sub questions asked:

- Can there be an “appropriate” strategy/model developed to increase the effectiveness of provision of educational infrastructure by public sector?
- Can a condition be developed such that can enable private/public partnership process and streamline efforts of various stakeholders into a durable and mutually beneficial arrangement for successful delivery of education infrastructure?
- Based on models utilized in developed countries, can the arrangement and process of education services be informed through design and structure of schooling?
- What are the key factors and impediments that greatly strengthen, or hamper the operation and financing of schools in developing countries?

## 1.7 Research Structure

### Thesis Structure

#### *Research Structure*

- |   |   |
|---|---|
| <b>Chapter 1 Introduction</b>                             | <ul style="list-style-type: none"><li>• Introduces the concept of infrastructure, and the role of education in social infrastructure</li><li>• Introduces the limitations and opportunities in provision of infrastructure pertaining to education.</li></ul>                                   |
| <b>Chapter 2 Literature Review: Concepts and Theories</b> | <ul style="list-style-type: none"><li>• Provides the description of the area of study: Developing country of Pakistan, the City of Lahore</li><li>• Project scope and requirements.</li><li>• Explains the research type, strategy, and the problem statement and research objectives</li></ul> |
| <b>Chapter 3 Research Design and Methodology</b>          | <ul style="list-style-type: none"><li>• Design of educational infrastructure, with concepts relating to urbanism, utility and technology, and physical planning.</li><li>• Chapter elaborates on the key financing mechanism relating to</li></ul>  |



educational infrastructure. Financing arrangements, sources of finance, and private finance initiatives are discussed.

- Concepts relating to the functionality of schools. Factors of school governance, centralized versus decentralized control, organizational structuring, and pedagogy.

**Chapter 4 Research Findings and Lessons Learnt: Case Studies of Developed and Developing Country**

- Case Study of provision of education infrastructure in developed countries. Example of the State of New York, United States
- Case Study of provision of education infrastructure in developing countries. Example of the City of Lahore, Pakistan
- Presents data collected on the provision of education infrastructure in New York and Lahore. The approach to development of educational infrastructure in the context of concepts and theories identified in Chapter 3.

**Chapter 5 Research Analysis and Recommendations for Educational Infrastructure**

- Relates and suggests an inclusive approach to design, finance, and function of educational infrastructure. Recommendations are in accordance with the theories identified in Chapter 2. Integration of design, finance and function factors are suggested for the provision of education infrastructure in developing countries.

**Conclusion**

**Table 1.7: Research Structure**

**1.8 Selecting Projects**

Two projects have been selected which bear direct relevance to the objective of this research, one in a developed country (New York city) and the other in a developing country (Lahore city). The projects enabled us to test the theories and concepts relating to design, finance and function of educational infrastructure and provide useful lessons for the way forward. A strong case seems to emerge for pursuing an integrated approach evolving, maintaining and improving educational infrastructure for optimal results.

## **Chapter 2: Literature Review: Concepts and Theories**

*This chapter addresses the conceptual and theoretical framework, and options available for three components pertaining to educational infrastructure. Enhancing the performance of educational infrastructure requires focus on design, finance, and function of schools. The following text elaborates on the theories and underline possible alternatives for more efficiency and effectiveness.*

### **2.1 Introduction**

Enhancing the performance of educational infrastructure requires integrated focus on the three components: design, finance, and function. For each of these components, this chapter seeks to focus in terms of concepts and theories that underline possible alternatives for more efficiency and effectiveness. The world has come a long way in terms of designing schools that take into account specific climatic and weather requirements of a given area, its cultural peculiarities, and the technologies available in that area. Likewise, funding of educational infrastructure is no longer the sole prerogative of the local governments. In many cases, private sector has come forward to forge public-private-partnerships through different models of interaction for achieving better results. In terms of functionality, training and re-training needs of teachers, and better management techniques of vertical and horizontal linkages of management systems have been evolved. A successful educational infrastructure remains flexible and open to new and innovative approaches in the theoretical and conceptual underpinning of design, financing, and functionality. This chapter addresses the conceptual and theoretical framework, and options available for each of the three components.

### **2.2 Design of Educational Infrastructure**

Designing and planning of educational infrastructure is central to providing a well-integrated education system. A better design provides the durable foundation on which we can build an educational infrastructure that meets the peculiar educational needs of a given society. Planning of educational infrastructure like much of the architectural design involves comprehensive thought, interdisciplinary knowledge, and technical expertise. The enormous technological innovation and population growth throughout the world have created a number of possibilities in the philosophy of designing educational infrastructure. First and foremost, it is important to remain relevant to the specific needs of the community. In many cases, educational infrastructure is built without sufficient regard to the surroundings. Students are divided numerically among teachers. And governance of schools is un-related to the requirements of the society as a whole. What is being done is based on what “can” be done, and not on what “ought” to be done. A desirable and comprehensive approach requires that we look at this issue not only from the perspective of urbanism, utility, technology, and physical design, but also a host of other factors that have increasingly become important in today’s world. The following discussion would help elaborate the centrality and relevance of design to effective educational infrastructure.

#### **2.2.1 Urbanism**

Urbanism illustrates the role of educational planning in relation to its attention towards community, serving as a link between educational and broader urban activities. Urbanism

calls for planning of educational infrastructure to be responsive to the social, cultural, political, economic, and environmental concerns of urban regions. (Chapin 1965). This means that we must keep the schools specialized enough for the needs of that particular urban region while maintaining sufficient flexibility to accommodate, adapt, and expand with changing times. Therefore, educators and citizens need to maintain a continual dialogue in the refining of educational infrastructure objectives and implementation.

### **2.2.2 Utility and Technology**

Design of educational infrastructure involves the concept of utility, which implies three fundamental characteristics: the expression of preference, possible alternatives, and appropriate allocation. In essence, the term implies a measure of “relative satisfaction” (Page, 1968). The relative satisfaction factor in turn determines the effectiveness of the output of a school. A school employing the state-of-the-art technology may not necessarily have a higher utility or relative satisfaction. What is needed is the appropriate technology that can maximize the output of the school. For instance, usage of net book computers may be relevant and useful for schools in Bethesda Maryland, but not necessarily in the inner city schools of Lahore where computer literacy is low and power outages are high.

### **2.2.3 Physical Planning**

Most schools particularly in developing countries are operating under unfavorable conditions: rundown structure with inadequate resources, insufficient ventilation and poor lighting. Such structural issues need to be addressed through comprehensive physical planning. Physical planning is the art of modeling and developing physical arrangements in accordance with programmatic, social, and structural needs. The medium of physical planning is spatial design, where every plan is able to accomplish the objective through integration of all elements in a natural order, resulting in a systematic coordinated planning process. In addition to physical planning concerning itself with just the erection of structure, there are two activities that need to be followed simultaneously in the planning of educational infrastructure. First, we look at the space required and the space available on site. Second, the programmatic requirements are to be analyzed and reconciled with parameters, linkages, site conditions, capacity, and potential growth factors. A plan that best fits the activity patterns of the users within the school needs to address the habitable requirements (mechanical, electrical, and structural) and linked cost considerations. Physical planning collates the existing programmatic requirements of educational infrastructure and allocates a formal distribution pattern. At this stage, conflicts in planning become apparent, and the need arises to address them through design adaptation and modification keeping in view the economic feasibility, legal and construction standards, and the alternatives available. From this, the one selected delivers the most effective and functional in provision of education, and most economical in land-use.

## **2.3 Financing Mechanisms**

The need to find the most appropriate and sustainable financing mechanism for educational infrastructure can hardly be over-emphasized. There are several options common to most financing mechanisms. In most cases, governments provide the basic finance. Private sector chips in wherever government financed and run schools do not deliver the utility or relative satisfaction. Most local governments seek cost-effective methods to deliver public education and tend to incorporate private sector providers, wherever possible. However, focusing only on the cost factor can sometime reduce the functionality and effectiveness of the education

provided. It is therefore important that the financial resources available are in sync with the most optimal design and vice versa.

Financing mechanisms can also incorporate participation of various stakeholders in planning, providing, and monitoring of educational infrastructure services. Improved financial viability of educational infrastructure projects is achieved through not only adjustments in policy, but also through fundamental institutional changes to streamline it with the business aspect of infrastructure. In the context of educational infrastructure, three significant financial arrangements are employed by most developed and developing countries: public ownership and public operation; Public ownership but private operation; and Private owned and run. From a purely theoretical perspective, all these alternative options have the potential to improve infrastructure and performance, as discussed below.

### **2.3.1 Financing Arrangements**

#### **Public Owned and Operated**

In educational infrastructure projects, the most common means for ownership and operation is through a public entity that is owned and controlled by the national or local government (public sector). The delivery of educational infrastructure is carried out by public sector and is subject to government budget, civil service procedures and normal codes and regulations. Both ownership and operation by the public sector evokes little competition with private run schools. Thus, incentive for improving performance and functionality of schools are also limited. The most common complaint of public schools is inefficiency.

#### **Privately Owned and Operated**

Private ownership and private operation is the most attractive and prevalent arrangement for private sector. Private ownership and operation enables higher potential of generating revenues from fees and related costs to students and community, especially when commercial and political risks are lower. This financial arrangement is mostly guided by profits for the owners. Only in some rare cases, like cadet colleges, the primary focus is to maintain a certain high standard of education. For the vast majority of private educational institutions, profit is the only criteria. This leads to adverse compromises on quality of education. In some cases, private institutions have evolved mechanisms of community participation through boards of governors. This has helped maintain some standard to some extent. These arrangements are context specific; they have to be selected, designed, and implemented as per local conditions, and are generally not fully regulated by governments.

#### **Public Private Partnership**

In this mode of financing, the public sector delegates some operations of educational infrastructure to private sector. Leases and concessions allow for private sector participation in educational infrastructure without changing the nature of existing institutions or crafting any new regulatory framework. The public private participation in educational infrastructure takes different forms. The most common form is when the public owned institutions outsource some of its requirements to a more efficient private sector, such as cleaning, maintenance, computer labs, sports facilities, etc. This allows the public sector educational institutions to make savings and use the limited resources for other functions. In some cases, some private sector firms have also voluntarily made philanthropic contributions to public sector institutions. However, involving private sector without sufficient checks and balance

system sometimes leads to corruption cases, which brings the public sector school system into disrepute.

### **2.3.2 Sources of Finance**

#### **Property taxes**

School funding and property taxation are closely linked as a source of financing in many of developed countries today. Generally, nearly half of all revenues generated from property taxes are designated for public elementary and secondary education (K-12 school). Taxes are levied on economic activities that increase financial resources for governments. Land is considered as a special asset whose value is unaffected by the tax. Taxes on land are efficient because it entails lesser unintentional costs. Funding educational infrastructure through property taxes is considered a viable option.

#### **General sources grants and Ear-marked grants**

Financing for educational infrastructure is also possible through tapping into government's general revenue funds and earmarked grants (Earmarked grants are conditional grants where these funds are earmarked for special purposes only. The funds may be handled on a reimbursement basis, being given to the local government only after an approved expenditure is made). Choosing either of the two (or ratio of the two) entails certain conditions that need to be addressed. Earmarked grants from the local government's point of view means that the schools have less discretion on how those funds are used. General grants on the other hand provide greater leverage to schools on how to use the funds. Since earmarked grants are deemed more efficient, a school's total dependence on general grant could imply financial inefficiencies. The local government may then have to generate additional sources of funds. Additional funds are in the form of private engagement and funds raised from local sources. Should the general revenue reduce or the district face budget cuts, the school due to its inability to raise its revenue collection efficiency, creates a fiscal gap in its expenditure and revenue assignments.

Financial dependency is also a result of the governance system. Should the governance be heavily centralized, in which case fiscal decisions made by central government affect the overall financial support by the local governments. This could possibly lead to financial uncertainty for the educational infrastructure.

General revenue sources thus work ideally when the provisions of infrastructure falls under a decentralized system. In this event, the fiscal solutions of the central government (grants, inter-governmental transfers, etc) become proportional to the services rendered by the local government. In order for the financing to be successful under inter-governmental transfer, two steps need to be taken. First, central government which has currently transferred to local governments a number of spending powers, could instead curtail a few certain spending discretions to itself – hence, transferring only enough funds for the local governments to be able to carry out educational infrastructure services. Doing so eases up the local governments dependency on central governments sources of funds, and allows them to perform freely based on their particular needs and generate own sources of funds accordingly. Larger fiscal and service programmes and concurrent decisions can remain solely with the central governments. Second, while allocating funds to lower tiers of governments, central government must provide for general revenue grants which are both lump-sum and effort

related grants based on performance criteria. Lump-sum is money allocated to local governments that are not related to tax collection capabilities of the local government or other criteria of local performance. Effort related funds are given to the local governments according to their capability to collect their local taxes of other criteria of performance. They can be either open or closed ended general grants.

It may be useful to compare the utilization of unrestricted general purpose grants versus highly earmarked non-matching grants in the case of developing countries. When provincial government in a developing country allocates two-thirds of the total grants as unrestricted general purpose grants, it can be inferred that the remaining one-third are either matching or unmatching earmarked grants. Overall, the design of this inter-governmental transfer is a combination of two grants systems, and therefore in effect, this has implications on how the local government responds to and uses these grants. To illustrate the point, take for instance the case of sanitation, which is a major concern in most schools. The provincial or state government may allocate certain amount of funds for the development and operation of sanitary services to be managed by the local government. There are major reasons why the provincial governments would intervene and assist local governments through earmarked grants. As clean schools not only improve the school environment, they also improve the living conditions of communities and neighborhoods around the school, ultimately reducing the amounts of landfills outside the city, and incinerators causing pollution, etc – creating a socio-economic benefit. If these grants were not earmarked, the schools could have used them for other purposes and not for sanitation. Resultantly, earmarked inter-governmental transfers and related measures have a greater potential of creating effectiveness of capital expenditures, strengthening results based accountability to citizens, and advancing local governments' direct role in the development of educational infrastructure.

### **Capital Markets and Budgeting**

Capital Markets are debt or equity markets where public and private sectors can raise long-term funds. In educational infrastructure projects, public and private sectors in capital markets employ capital budgeting techniques to secure financing. Capital budgeting are investment appraisals that include the planning processes employed to determine whether a sector's (public or private owned and operated) long-term investments such as equipment, materials, and development projects are financially viable. Projects of educational infrastructure require major capital investments and entail high expenditure. Thus, the underlying rationale for public and private sector in financial viability of educational infrastructure projects is to first balance the expenditure and related capital outlays to the general revenue sources. Balancing requires that all assignments be identified, and the costs and benefits to government and society to be quantified. The costs and benefits in principle should be considered from a socio-economic perspective, and all assumptions made while placing value to the costs and benefits must also be clearly defined. In the event where benefits cannot be quantified, assumptions can be made. It is important to note that in order to address the over-optimism factor in capital markets by project sponsors, capital budgeting exercise should consider the rates of return of education. This would include making estimations on future cash flows, predicting future values and also the present values and internal rate of return. Certainly, following these methods would provide for a good indication of how well or poorly particular schools in districts may perform fiscally and would be beneficial. Hence, it is important to get accurate and reasonable values when doing the capital budgeting exercises.

Capital budgeting is organized solely as a bottom-up process. Bottom-up process can be utilized for projects for it provides a more in-depth scrutiny of the elements involved within a project – just like a capital budgeting exercise would determine the fiscal details of the elements involved. Processes and decisions are centered starting from the lowest levels and moved up. This requires rigorous analysis and homework. Quick fixes do not fix a problem in educational infrastructure projects where the rate of return is unlike other industries and infrastructure projects. Balancing the expenditure and revenues requires operating managers to refocus towards cost reduction and innovative budget structuring.

### **Private Finance Initiatives**

Private Finance Initiatives are a similar manifestation of the public-private partnerships, under which governments engage contracts with the private contractors/companies in order to procure urban social infrastructure projects, from the financing and designing, to construction and operation. According to some experts, PFIs are increasingly effective for sanitation and transport infrastructure, but less so for social infrastructure (Savitch, 1990). However, a closer look indicates that many countries have now experimented with this source of financing educational infrastructure. The organizational structure of the PFIs can be developed in numerous ways, and multiple characteristics are similar to that of public-private-partnerships. The primary benefit of enabling PFIs for the provision of educational infrastructure would be that the government retains the possibility, the power and the authority of delivering the core services of curriculum/course content, teaching or simply of research. While the private sector partner concurrently can be trusted to operate the physical infrastructure for a longer-term contract (around 20-30 years). Upon completion of the contract, the service can be turned over to the government for further maintenance or operation. PFI contract can be bundled (much like other PPP contracts), where the private sector takes on a multitude of functions within the educational infrastructure. The PFI contract would also need to include a performance measurement factor, which would serve as the “competitive advantage” of public-private partnership social infrastructure financing. The performance measurement factor for instance would include holding private contractor accountable to the expenditures while concurrently subject to regulations and agreed-upon performance standards set by the government (or local governing body).

At this time, education and social infrastructure have only a handful of precedents, from which recommendations and opportunities can be derived from. Among the benefits of engaging a PFI model for education infrastructure, lies in the suggestion that PFI models can reduce costs and improve the timeliness and efficiency of infrastructure delivery in comparison to the traditional forms of such service procurement. Additionally, proponents assert that the PFI model allows private organizations to focus on core business essentials, overcome restrictions in operating such as inflexible salary scales, and facilitate in introducing innovative methods of delivering service.

On the other hand, critics to the PFI model argue that the high costs associated with the borrowing for the private sector, coupled with setup and contract monitoring expenditures translate into making PFIs ever more expensive in comparison to traditional forms of service procurement. This notion is especially true for smaller scale projects. Together with little or poor specifications of capital needs, unfeasible design of the contract, and weak monitoring of projects, such measures can also render significant financial and operational risks for the governments -- thereby negating the significance and the intended benefits of using PFI model for education infrastructure. An additional risk is that if necessary accountability mechanisms

are not instituted, corruption can occur. Nevertheless, in order to overcome such challenges, considerable resources in contracting processes and capacity building governments must invest considerable resources in developing standardized contracting processes and resources, as well as capacity building of staff.

## **2.4 Functionality**

To greatly strengthen and effectively manage schools, it is important to integrate the design and financial arrangements with the institutional capacity of the educational infrastructure. Functionality and improvements in educational effectiveness in developed as well as developing countries requires considerable effort on three critical factors: school governance, organizational structuring, and teacher pedagogical skills.

### **2.4.1 School Governance: centralized vs. decentralized control**

School governance does not conform to a single “best-practice” approach. Governance of schools in developed and developing countries consists of various methods which results in varying degrees of efficiency and functionality of schools. Whether governance of schools are centralized (where the decision making processes are concentrated within a particular location) or decentralized, with distinct social and political contexts in various urban regions, the relationship between educational infrastructure and governance system contributes significantly to the functionality of schools.

From a conceptual standpoint, school governance in a majority of developing and developing countries are based on four distinct governance models: managerial, corporatist, welfare, and pro-growth (Pierre 1999). In practice, however, different schools across urban regions manifest a metamorphosed version of these four models, varying accordingly to the composition of the societal concerns, the “overarching objectives” (Pierre 1999), and the capacity of the system in the provision of education. It is also argued that governance of schools is an agglomeration of the policies, cultural norms, values and practices of the political behaviors that are recurrent in urban regions (March and Olsen, 1989).

For instance, it is reasoned by certain scholars that school governance ought to be decentralized. For educational infrastructure, decentralization means delegating governance related decisions to the school administrators and communities. In this instance, it is maintained that a corporate governance model would then be the most appropriate school governance model for educational infrastructure. The set of processes and the manner in which corporations are administered are similar to how schools ought to be governed. The extent of accountability of administrators, equitable treatment, and transparency mechanisms within the schools would be greatly enhanced should such a model be implemented. On the other hand, it is acknowledged that regardless of the type of model used, there are various “patterns of dependencies” (Savitch 1990) which is a significant factor that affects the educational infrastructure “capacity to act” (Stone 1989) – something corporate governance model, or any other model leaves out independently (Warren, Rosentraub, and Weschler, 1992). Improving functionality of schools means tailoring existing organizational structure and diverse government system, and incorporating any of the four models independently is not an effective approach.



Efficiency of governance models depends, to varying degrees, upon different “agendas and problems” (Savitch 1990) formed in response to certain “pressures...and constituencies” (Savitch 1990). In educational infrastructure today, Lindblom argues that the issues that seem to be generated due to governance models are actually a result of “governance gaps”, created mainly due to highly centralized approaches. In an attempt to eradicate various administrative limitations, a “best-practice” approach is utilized by these societies which create further difficulties and inefficiencies in school governance (Warren, Rosentraub, and Weschler, 1992). Pierre (1999) elaborates that the “priorities, objectives, and strategies between different segments” (Pierce 1993) that have caused those organizational and coordination “gaps”, are because of attempts to implement managerial and welfare governance systems. He argues that because these models are forms of “market conforming” (Pierre 1999), pro-growth and corporatist governance will produce greater efficiency because of their nature of “containing market forces” (Pierre 1999).

There are certain advantages and disadvantages to educational infrastructure in each of the governance models, as indicated by various literary works. In planning of educational infrastructure, it is important to consider that while there is a degree of dependency factor in each model, various political and institutional arrangements can increase efficiency in schools by utilizing the concept of “contingencies” (Grant, 2006). Contingencies are resource, cognitive, and effectiveness factors that are present in school governance models. In a centralized system, there are instances when higher tiers of government may find it difficult to alleviate certain educational infrastructure related challenges more effectively than the local government. The notion of contingencies draws the element of integration of various stakeholders in the provision of educational infrastructure in terms of resource and capacity (cognitive) interdependency. Grant (2006) explains that when a participant or “actor” cannot influence a policy alone, it is the prerogative of all concerned members to reach consensus and behave collectively. This strengthens not only the school governance models, but also the relationships between governments and the society. The notion of contingencies further reasons that as the relationship of inter-government levels in developing countries is uneven, there is an almost “consistent” pattern of local governments being relatively weaker and highly dependent on central governments. Thus, contingency levels within school governance models significantly increase (or decrease) efficiency of educational infrastructure, regardless of whether the governance system is centralized or not. However, this must be done in intervals, ensuring that the problems are not simply magnified by “proposed solutions and intervention” (Daeman, Schaap 2000; Grant 2006). Thus, through greater diversity of elements and integration of contingencies lies the success of improving school functionality.

## **2.4.2 Organizational Structuring**

Functionality of schools requires suitable organizational structuring. Organizational structuring can facilitate effective management of schools and of its facilities, enhanced leadership, skilled human resources, and increased competence. Organizational structuring of educational infrastructure, however, is generally context-specific. It varies according to the local conditions, and in terms of the managerial and institutional capacities. In most developed countries, certain functions within the organization of educational infrastructure are centralized while some are decentralized. For instance, financial arrangements are generally the prerogative of the state government, while school administrators have the capacity to manage and regulate their own schools separately and according to their own respective needs. In other instances (commonly found in case of developing countries) schools are

centralized to financial and to organizational extents, depending extensively on central government policies and its structuring mechanisms. Both setups contribute to the effectiveness factor of the schools, ranging in levels of school's administrative capacity, information system, and managerial competence.

Administrative capacity of schools include functioning of centrally managed strategic matters pertaining to schools, including development of technical expertise and materials, monitoring and evaluation of performance, and provision of financial resources for execution of school's objectives. A well-functioning administrative structure of a school greatly enhances schools' performance, increases productivity, and boosts teacher motivation. Today, most schools in developed countries have adopted a standard of performance procedure monitored by the respective districts and states. In contrast, administrators of schools in a majority of developing countries face difficulty in increasing the performance of schools and related administration. Poor administrative capacity is a result of inflexible organizational structuring. In attempts to enhance school functionality, school administrators muddle through out-dated lengthy procedures, coordination between different ministries, and inadequately skilled staff (Noguera, 2003). Likewise, essential responsibilities of school administration become burdensome, like that of neighborhood and parent relations, supervision of teachers and staff, and maintenance of facilities. Unskilled staff and inadequate support mainly attributed to centrally appointed teachers and operating funds, further compound poor administrative capacity. All these factors are inter-linked, causing difficulty for administrators in day-to-day operation of schools. On the other hand, schools in developed countries are mainly decentralized in terms of operation and management. Administrators in these schools have been able to find improved instruction levels and the ability to mobilize local resources because of better school and community relations. Successful administrative capacity can facilitate strategic planning, performance monitoring, effective support services, and stimulating neighborhood involvement. Thus, administrative capacity is one of significant factors in organizational structuring of educational infrastructure. Improving administrative capacity of schools will yield to increased performance of educational infrastructure.

Success of organizational structuring is also a measure of the development of better information systems. Information system is directly linked to educational policies. Information systems assess achievement of student learning and are essential to improving the quality of educational infrastructure. Ministries of education in developed and developing countries periodically develop educational policies that are based on continual impact assessments of student learning programs in educational infrastructure throughout urban regions. Individual schools consequently play a critical role in providing reliable reporting of student and school performance. Timely assembly and comprehensive development of information system in schools is critical in monitoring and improving of school's functionality. This system also translates into an opportunity for schools to strive for improved performance (Savitch, 1990) and an effective educational infrastructure.

Developing managerial competence has been considered an important factor in realizing the success of functionality of schools in developed as well as developing countries (World Bank 1990). Managerial competence of educational infrastructure is essentially the administrative capacity of schools carrying forth objectives and delivering outcomes in an effective and timely manner, (Pollitt 1990). In the context of schools in urban regions, managerial competence establishes the importance of employing skilled management techniques to realize successes in fiscal challenges and declining performance. Certain scholars argue that increasing funding for educational infrastructure could alleviate some of the challenges schools face today. However, it is critical to ensure that the functionality of school does not

falter due to the shortcomings in its management team. Therefore, it is critical to evaluate the existing management competence of schools and take measures to address shortfalls. In theory, competence can be strengthened by providing systematic teacher development programs, improving professional and career opportunities for staff, and developing systems for assessing performance. These three measures need to be linked coherently with the longer term goal for organizational development (Noguera, 2003). These measures, in conjunction with additional organization structure mechanisms would greatly improve educational infrastructure performance and functionality.

### **2.4.3 Pedagogy**

Across a number of least developed countries, educational infrastructure faces adverse conditions: rundown school buildings; inadequate financial resources; and poor governance. In addition, however, of no less importance is the need to have effective instruction strategies, or teacher pedagogy. Inadequate pedagogy in educational infrastructure consists of poor teaching practices, curriculum, and insufficient instruction time. Each of these factors is critical and places severe constraints on the potential of the schools. In addressing the functionality of schools, there are three critical determinants that are imperative: teacher pedagogical skills, knowledge of subjects, and the motivation to teach (Eisemon 1988).

Enhancing student learning means that teachers (newly hired and on-contract) need to be better trained and better motivated. Shifting the preparation of prospective teachers from training institutions to schools, development of teacher pedagogical skills, and enhancing teacher motivation through improved compensation policies, working conditions, and support services are certain measures that are stressed by various scholars. Many schools in developing countries face fiscal constraints that impede in adequately preparing and motivating teachers. Additionally, because teacher training programs place a greater emphasis on broader theoretical issues as opposed to specific instructional strategies, little effect is accomplished in teacher pedagogy (World Bank 1990). Noguera (2003) contends in shortening the teacher training program, thus placing greater focus on the development of pedagogical skills in classrooms. On the other hand, according to research on teacher pedagogy in developing countries by OECD, it is discussed that teacher training can become more cost-effective if teachers are provided with greater opportunity to practice under supervision in real-time classes (OECD 1995). Improvements in teacher pedagogical skills would resultantly be realized as well as teacher morale are furthered.

In addition to teacher's instruction ability, teacher knowledge of the subject matter is also critical. Employing staff with that have greater experience in teaching would greatly enhance the overall functionality and effectiveness of a school. A key component of teaching effectiveness is the academic preparation of teachers. Teachers, generally in most developing countries, have had not had adequate training (OECD 1995). Coupled with the higher rates of young age population in most developing countries and rapid expansion of education system, the overall pedagogical level in schools leads to a reduction in the amount of education level required for teaching. Resultantly, inadequate preparation of teachers who do not have particular level of intellect and academic background lead to lower school standards, poor performance of students, and reduced functionality of schools (World Bank 1990). Adequate teacher knowledge is necessary, yet many schools find training programs expensive. On average, a general secondary education teacher training program costs seven times the annual per student cost to schools (OECD 1995).

Teacher training has a direct correlation to motivation. Lower teacher morale leads to higher rates of absenteeism of teachers as well as of students. Teacher absenteeism reduces the

overall time during which a student learns (UNDG 2008). This has an indirect effect on the costs of teacher training programs to schools, and it transcends to undermining of other diligent teachers' enthusiasm levels at schools, ultimately causing lower salaries, insufficient working conditions, and weaker support services. Funding and organizing teacher training programs can significantly boost teacher morale and improve level of performance of schools. Additionally, providing sufficient salaries and benefits to teachers is deemed as panacea to lack of teacher motivation (Dalton 1996). However, teacher salaries and benefits in schools of most developing countries are often lower, and generally do not exceed to more than sixty percent of school expenditures (UNDG 2008). In a recent World Bank study, it has been found that per-teacher spending has been reduced by almost thirty percent on average in many West African countries and early 1990s (World Bank 1990, World Bank 2009). Similarly, teacher earnings have been on the decline or remained stagnant since the turn of the Century in many countries in Asia (UNDG 2008), resulting in many teachers to find supplementary income by other pursuits (which also contributes to teacher absenteeism and lower motivation). Most schools in urban regions, particularly in developing countries, need considerable improvement in the physical structures. In general, working conditions in classrooms are unfavorable and there are not enough instructional materials to support learning. There are instances where facilities within schools (proper bathrooms, staff areas, workspaces etc) are inadequate, or if any are poorly maintained. Citing lack of budget (and lack of space in urban areas), there is a shortage of classrooms, and of them, most are overcrowded with a double the number of students a room is designed for. Such working conditions further reduce teacher motivation and discourage professional commitment.

Support services in schools greatly improve teacher performance and increase functionality of schools. Support services include innovative teaching projects, career advancement opportunities, and physical facilities such as staff rooms and other administrative offices. However, in certain instances, it has been found that late payments of salaries to teachers have been a recurring trend in most schools in least developed countries. In certain urban cities in Pakistan, teachers had to resort to being absent in school to travel to administrative offices to collect salaries. Additionally, inefficient supervision and administration lead to poorer teaching performances and encourages further absenteeism. These support services are seldom a result of financial constraints, but rather a reflection of poorer management of schools, (van den Berg, Braun, Otgaar, 2004). In order to strengthen the support services, certain strategies need to be adopted by schools, particularly in developing countries. These strategies include both fiscal and non-fiscal measures. Support services can be strengthened by competitive salary schedules, career opportunities, incentives for performance, and innovative teaching projects. These measures need to be coupled with adequate working conditions and professional administrative support at the school levels.

## **2.5 Concluding Remarks**

Based on the readings and literary works, it is commonly acknowledged that governments throughout the developed and developing countries share a common vision of providing quality education to all its citizens. Various efforts related to design, finance, and functionality of educational infrastructure have been implemented over a number of years. In linking the theoretical concepts pertaining to educational infrastructure to practical implementation of those theories, there have emerged some aspects from which lessons can be learned. This chapter analyzed the concepts pertaining to educational infrastructure, and reviewing the design, financing mechanisms, and organizational arrangements of schools.

## **Chapter 3: Research Design and Methodology**

*Building on the concepts and theories identified earlier, this chapter discusses the design of and the research method used to address the main research question. The chapter includes information on the research instruments, the sample size of the study, and the manner in which the data is analysed and approached, and challenges and limitations of the study.*

The research methodology involves a closer look at the work already done to improve educational infrastructure worldwide and focuses in particular on two case studies: one, in developing country to help identify the reasons which make it difficult for educational infrastructure to be sustainable, cost-effective, and result oriented. The other case study pertains to the case of a developed country in order to not only identify the specific challenges that developed societies face in using optimally the educational infrastructure to achieve their goal of education for all but also learn lessons from successful practices that could be emulated elsewhere in the world. For the purpose of developing country example, the City of Lahore (Pakistan) has been selected which has thousands of public schools providing varying quality of education. Examples will be cited from my personal experiences and observations in designing and building of public schools. In the case of developed country, the City of New York has been chosen, which hosts a large public school network. Lessons learned through my personal involvement with New York City laws relating to public schools and case studies have been used to test the thesis of this paper.

### **3.1 Description of the area of study:**

#### **3.1.1 Spatial Context: Current Situation and Brief Site Analysis**

The City of Lahore in Pakistan has been in the midst of rapid urbanization and growth for a number of years. Lahore is the second largest city in Pakistan in terms of population and density, with many residential and commercial developments taking place throughout the City which have transcended efforts of the local government to provide for the necessary infrastructure such as roads, highways and water management in support of the increasing urban sprawl. These developments in Lahore have translated into construction of multiple residential communities and commercial developments over a widespread area east of the Ravi River. Accordingly certain new urban development projects were initiated in Lahore in the year 2009, for which I was part of the design and development team within one of architecture firms in Lahore. Nevertheless, while there seemed to be a steady growth in infrastructure facilitating the new development, much of the development that took place was centered on development of residential communities. With the rise in population of areas, necessary services such as educational and health facilities were not developed in proportion. This component contributed to burdening of such infrastructures elsewhere and worsening of existing urban infrastructure. Thus, of the many proposals, one architectural intervention proposed was that of a middle-high school that would service the local residents of the area. The architecture and the programmatic requirements of the project were like many that most architecture firms design for. The school project was hoping to not only reduce burden on schools further away and to cater to the residents of the Defense Housing (DHA), but also to serve as a catalyst to attract future development. In essence, an architectural program was thus aimed to serve multiple functions in an urban development context: one of them to address the performance of the building itself, and the other to promote the economic development of the region in which the project is situated.

Lahore is Pakistan's second largest city with over ten million residents in the urban region, and is currently in the midst of rapid re-urbanization. It is transiting through a stage of the urban life cycle where a society trends gradually towards becoming an "informational" one, (van den Berg, Braun & van der Meer 1997). As with any other such city's population over a period of time, the population in Lahore's urban center is rising continually – and dramatically at a rapid pace. Needless to say, it is hence creating a drastic impact and pressure on various aspects such as transportation within the city, overall quality of life, and the environment where businesses and residents can thrive (Vaner et al. 1951). Governance system in Lahore is generally in the direct line of growth where it is at times inefficient in servicing the rapidly urbanizing, coupled with the public's mistrust of the government's policies. Hence, the policies although have an affect the outcome of Lahore, the local government would need arrangements in its capacity to facilitate towards a positive growth of Lahore. Having established that at its core of governance tools and that the varying demands by the urban actors (public, private and civil) of a region, a policy can be an excellent tool for governments to fulfill those variances in demand, as it charts out what the government intends to do (and/or not do) (van den Berg, Braun & van der Meer 1997). The policy puts forth an agenda for revitalizing a region/area while incorporating the overall vision and goals. In the case of Lahore's Development Plan, where local government plays a critical role in implementation and administration of the policy, it does so based on assumptions of market conditions which may not necessarily be reflective of true conditions present in Lahore. With gauging the potential impact of the policies without complete information, the components of a policy, and what it can yield, such that future developments and plans are in alignment to Lahore's over-arching vision as a city cannot be fully realized. As mentioned above, there have been disparities among practitioners regarding the role of the government system and to an extent about the approaches to urban policies and planning.

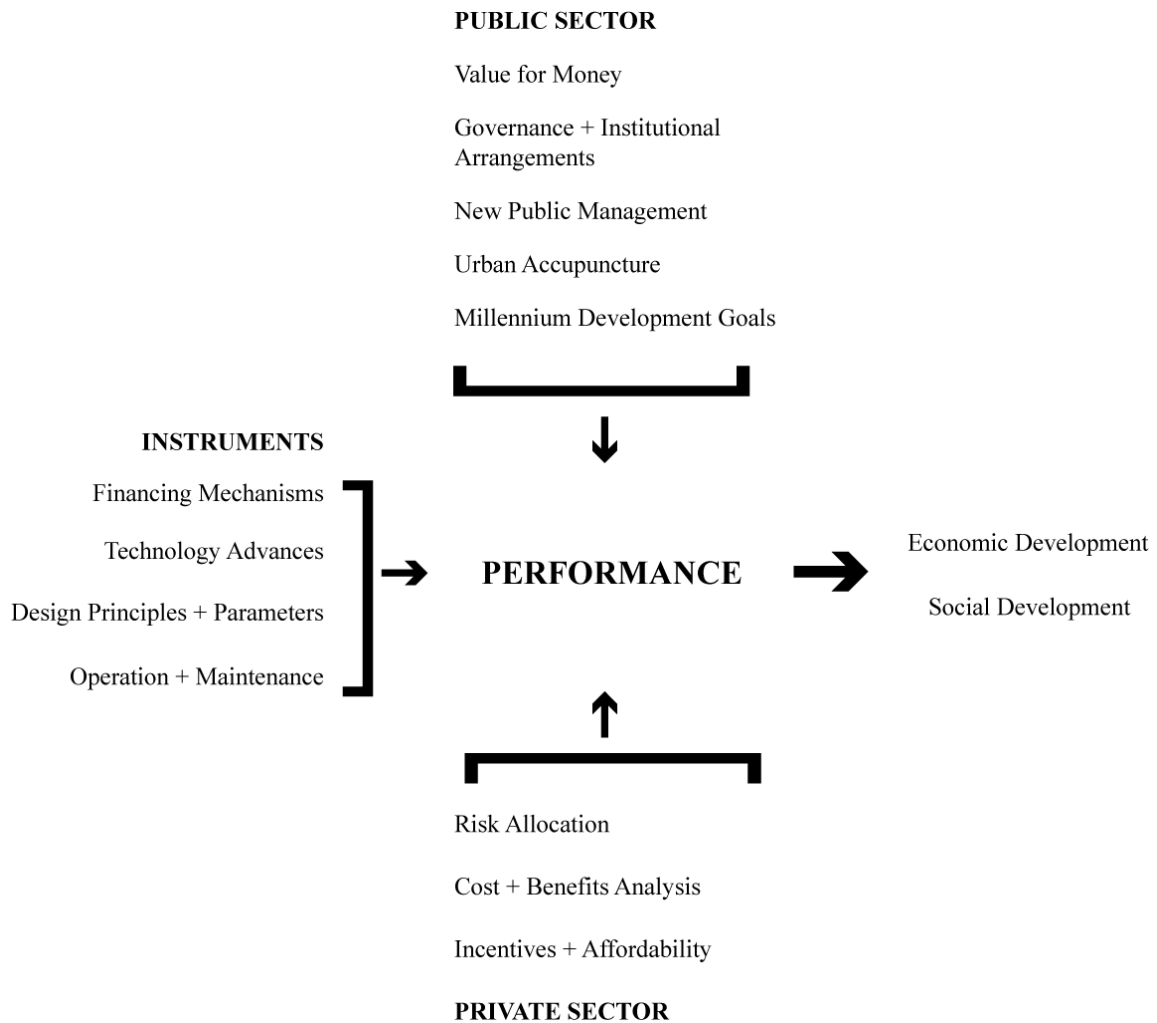
### **3.2 Research type and strategy**

The process of research strategy is structured around three critical components: identification of the problem, analysis of the literature and case study, and recommendation to improving the performance of provision of education infrastructure. Likewise, this thesis research paper employs the use of qualitative and quantitative data to explore (with certain element of descriptions) identify, and evaluate the challenges to education infrastructure. The paper further explores avenues in order to enhance the performance of education infrastructure, basing on explored data, site analysis, and case studies. The overall strategy involving multiple steps is outlined below.

### **3.3 Conceptual framework**

The conceptual framework draws upon various theories and literature in connection with the "performance" aspect of infrastructure. In efforts to shed insight into the term "performance", the framework dissects multiple concepts in terms of design, financing, and operational functionality. The framework revolves around the current existing learning spaces in cities of the developing countries and developed countries – essentially to inquire on what it means to be "well-educated" and how does the education infrastructure facilitate this notion. As the diagram below illustrates, all aspects relate to and suggest improvement avenues to education infrastructure provision in developing countries. Through this framework, new, innovative design and financing guidelines for development of schools in developing countries are analyzed: Millennium Development Goals and Challenges, managing interface with private

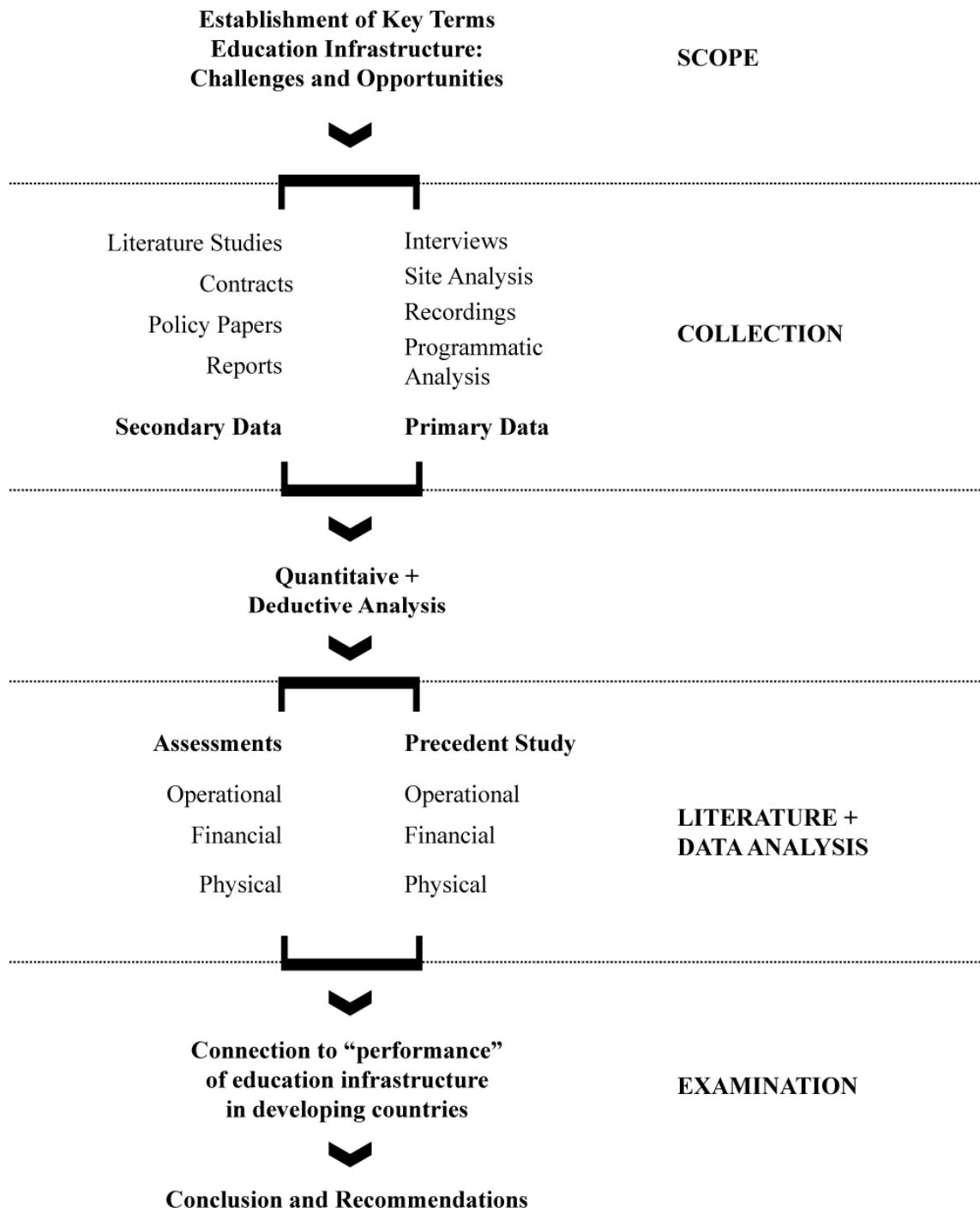
sector, role of governance and New Public Management, role of technology in education infrastructure, and project assessment tools.



**Figure 1: Conceptual Framework**

### 3.4 Analytical framework

The analysis of the research topic consists of a multitude of needed components, from scoping of the requirements and establishment of the term to collection of data through primary and secondary means. The secondary data plays a significant role as it will utilize analyses and research of schools that explore and enhance the quality of education through architecture, looking particularly of architectural precedent works by Hertzberger, Thom Mayne, and Antoine Predock. Primary data will employ use of site analysis done at Site in Lahore, along



**Figure 2: Analytical Framework**



with key measurements taken. The collected information will be analyzed and evaluated against the backdrop of previous examples done on education. The framework builds upon previous work of scholars and makes recommendations in how to expedite the performance of education based on data collected. The figure below outlines the manner in which the research is further analyzed.

### 3.5 Units of analysis

Utilizing analyses and research of schools that explore and enhance the quality of education through architecture, the case studies in terms of design are particularly of architectural precedent works by Hertzberger, Thom Mayne, and Antoine Predock. Additionally, data will employ use of site analysis done at Site in Lahore, along with key measurements of physical conditions, distances, proximities, and other recordings taken. The collected information will be analyzed and evaluated against the backdrop of previous examples done on education. The analysis will consist of an in-depth illustration of the case for financing for public infrastructure in New York State, with complementary examples of schools in New York City. The description will focus on the management of education infrastructure, the institutional arrangements, the operation and maintenance setups, and the financial arrangements of K-12 schools. The recommendations and conclusions are built on existing system and better recognize the real costs of today’s education infrastructure and target funding where it is needed the most.

*Research Question:*

**What are the factors that can enhance the performance of provision and delivery of education infrastructure?**

<b>Variables</b>	<b>Indicators</b>	<b>Analysis</b>
<b>Natural assets</b>	Site Location Proximity to other services Access to neighborhood with population demographics of the area	A civic equity inherent in the program allocation itself, the analysis is a focus that does not address the program merely as fulfilling an x-y-z function, but is rather aimed towards fulfilling architectural ideas that pertain to the learning of young children, all the while aligning the functions within the urban context.
<b>Financial</b>	Financial feasibility: Budget allocation Payback period Residual method (capital value – building costs = land value) Resources and key cost figures Investment criteria (Net Present Value, future value calculations in relation to infrastructure planning)	A central feature is to formulate a recommendation for education facility for public/private actor planning to develop; details of the site and organization of program is analyzed. Rather than being limited to a single solution, the analysis allows making recommendations based on a number of variants.

<b>Physical</b>	<ul style="list-style-type: none"> <li>Design of education facilities</li> <li>Size of facility and building technology</li> <li>Programmatic breakdown</li> <li>Materialization</li> </ul>	<p>A central feature is to formulate a recommendation for education facility for public/private actor planning to develop; details of the site and organization of program is analyzed. Rather than being limited to a single solution, the analysis allows making recommendations based on a number of variants. With each variant having its own feasibility context, these variants differ in qualitative and quantitative terms.</p>
<b>Human</b>	<ul style="list-style-type: none"> <li>Teacher-student ratio</li> <li>Class size</li> <li>Level of facility services</li> <li>Training/retraining</li> </ul>	<p>Management is viewed from the perspective of “owners” and “end-users”, which give rise to a number of influences and requirements made by the facility: general management, technical management, and administration. The essential part of the analysis is the integration of different approaches used when balancing supply and demand of the infrastructure, followed by examination of the knowledge and skill elements.</p>
<b>Socio-economic</b>	<ul style="list-style-type: none"> <li>Curriculum diversity</li> </ul>	<p>Critical appraisal of published research.</p>

**Table 2: Research Variables and Indicators**

### 3.6 Sampling strategy

The sampling strategy and the respondents are selected using a non-random, purposive sampling approach based on key criteria indicated in the conceptual framework. The respondents and selection of projects that pertain to best showcase performance of education infrastructure are identified based on their operation, participation, and expertise at both private and public level. The selected projects have proven their success and the strategy of the research is to capitalize on their experiences as they have managed the process, taken considerable comfort in engaging with private sector and working with public officials. As precedents to education infrastructure are varied depending on location, the sampling strategy has avoided sending out “wish-lists” to disconnected projects that are not a significant contributor to the research, and has focused on projects in Pakistan as they address a multitude of factors under study.

### 3.7 Data collection instruments

Part of the preliminary data has been collected before fieldwork, as part of continuing research through means of informal meetings and structured interviews of members of project teams and officials. In Lahore, I will be administering the questionnaire via conferencing, in-depth interviews with the private sector agents responsible for the implementation and operation of education facilities. To address the provision of infrastructure through public sector point of view, data will be collected by means of published municipal policy reports, capital budgeting documents, framework reports, and other related publications by the Lahore Development Authority (LDA) for the region at study and for all case studies. Additional

survey will be done as part of site analysis in order to locate facilities and their proximity to other services. A thorough site analysis, complete with measurements (as described in variables and indicators table) of physical and natural assets of education infrastructure in Lahore, and all cities represented in the case studies.

### **3.8 Secondary data**

Secondary data consists of a myriad of municipal policy reports, capital budgeting documents, framework reports, and other related publications by the Lahore Development Authority (LDA) for the region at study and for all case studies. In line with the research, secondary data utilizes case studies to further inform the analysis of education infrastructure. As current situation suggests, there is no educational facility to support for an increase in residents in the area of DHA. Thus, secondary data plays a significant role as it will utilize analyses and research of schools that explore and enhance the quality of education through architecture, looking particularly of architectural precedent works by Hertzberger, Thom Mayne, and Antoine Predock. In particular, the Alpine Middle School in Utah, U.S., is quite successful in encouraging an interdisciplinary approach to curriculum, accommodating and collaborating across disciplines.

### **3.9 Research scope, limitations, and focus**

This research framework, drawing insight from the various theories and literature regarding the performance component of educational infrastructure, focuses on public education provision. The framework reviews the current existing public schools in urban regions of the developed and developing countries, with a view to strengthening effectiveness of public educational infrastructure. While recognizing the inter-linked components of design, finance, and function, the research analyzes the governmental policies, incorporating the various choices made by the public, the role of the government and the private sector, and its effects on public educational infrastructure. The concepts and theories assess the performance of public schools through the lens of design, financing, and operational functionality.

## **Chapter 4: Research Findings and Lessons Learnt: Developed and Developing Countries**

*This chapter analyzes the educational infrastructure in both developed and developing countries. It studies the design, financing mechanisms, and organizational arrangements of schools in New York City in the developed country of United States, and the City of Lahore in the developing country of Pakistan. Educational infrastructure throughout developed and developing countries has varying degrees of effectiveness, and their successes are greatly interdependent to the three factors of design, finance, and functionality.*

Governments throughout the developed and developing countries share a common vision of providing quality education to all its citizens. Various efforts related to design, finance, and functionality of educational infrastructure have been implemented over a number of years – some that have yielded a greater degree of success than others. In linking the theoretical concepts pertaining to educational infrastructure to practical implementation of those theories, there have emerged some aspects from which lessons can be learned. This chapter analyzes the educational infrastructure in both developed and developing countries. It studies the design, financing mechanisms, and organizational arrangements of schools in New York City in the developed country of United States, and the City of Lahore in the developing country of Pakistan. One of the common observations from both developed and developing countries is that not all schools are designed efficiently, nor are funded equally, and neither do all children attend the same quality of schools. Educational infrastructure throughout developed and developing countries has varying degrees of effectiveness, and their successes are greatly interdependent to the three factors of design, finance, and functionality.

The research methodology involves a closer look at the work already done to improve educational infrastructure worldwide and focuses in particular on two case studies: one, in developing country to help identify the reasons which make it difficult for educational infrastructure to be sustainable, cost-effective, and result oriented. The other case study pertains to the case of a developed country in order to not only identify the specific challenges that developed societies face in using optimally the educational infrastructure to achieve their goal of education for all but also learn lessons from successful practices that could be emulated elsewhere in the world. For the purpose of developing country example, the City of Lahore (Pakistan) has been selected which has thousands of public schools providing varying quality of education. Examples will be cited from my personal experiences and observations in designing and building of public schools. In the case of developed country, the City of New York has been chosen, which hosts a large public school network. Lessons learned through my personal involvement with New York City laws relating to public schools and case studies have been used to test the thesis of this paper.

### **4.1 Case Study: Developed Country; New York City**

#### **4.1.1 Context**

*Context and issues on a national, state, city level, and individual school level*

New York, like most states in the United States of America has a long tradition of funding for public schools. The New York City Department of Education is considered the largest network of public schools within the continental United States as it serves over one million

students annually in approximately seventeen-hundred schools. The New York State Education Department aims to provide students throughout the urban cities with quality education, opportunities and chances to succeed. Currently, it has been observed that not all children receive the same quality of education, or are given the same opportunity to succeed, in a number of schools in the State of New York. Because of differences in design, financing, and functionality, some schools perform better than others. This notion has been recurrent in many other states including the State of New York. Depending largely on the district and funding system setup in a district where the school is situated, distinct locations yield polar opposite experiences for students. For instance, it is considered both unrealistic and unfeasible to hire a teacher for an elective course or a special program in a school if only a limited number of willing students would be participating in the course and are present in that locality. Whereas, the same elective course may be offered to students when the number of students enrolled for that elective class reaches a sizeable amount. Thus, distinct locations yield polar opposite experiences for students, as one student benefits from the class while the other student may not. To cover the expenses associated with such courses, the same holds true if the number of students enrolled in that school are higher. In essence, though students from either locality should get and deserve the equal level and quality of education regardless of where they live, creating such an opportunity requires improvements in design, financing, and functionality of schools.

#### 4.1.2 Design of Public Schools in New York City

Schools in New York City integrate the use of information technology in education programs as well as the building management. Most schools, like that of Bayard Rustin High School on West 18<sup>th</sup> Street, are developed to create education programs in the urban region that would complement the entire borough of Manhattan’s technology based economy. As a measure of the success of these schools, the focus had been placed on the ability of the education infrastructure to produce students that have an ability to excel in their vocational placements. Rather than focusing entirely on skill-based learning, the curriculum of New York City schools have been designed to promote academic learning that includes mandatory foreign language courses and higher level mathematics. These additional programs required that all New York City schools be equipped with and allocated the necessary infrastructure required. Thus, creating a connection between the users, students, and teachers at the schools and design was a key goal.

The schools in New York City, like many of the buildings in the City are allocated on mixed-use properties, structures rising up to 6-10 stories. The schools are organized into four distinct zones: classrooms, administration, library, and extra-curricular spaces. The facilities include cafeterias, gymnasiums, swimming pools, art and music rooms, and laboratories. The resulting organization of programmatic requirements yields less integrated cohesion of program. The classrooms which are allocated depending on grades are occupied on single floors, and are detached from complementing facilities such as labs and teaching materials storage areas. This disassociation of program resultantly develops into an organized double-loaded corridor that maximizes the number of classrooms allocated to each floor. As the entire structure of the school follows along the column grids of the building,



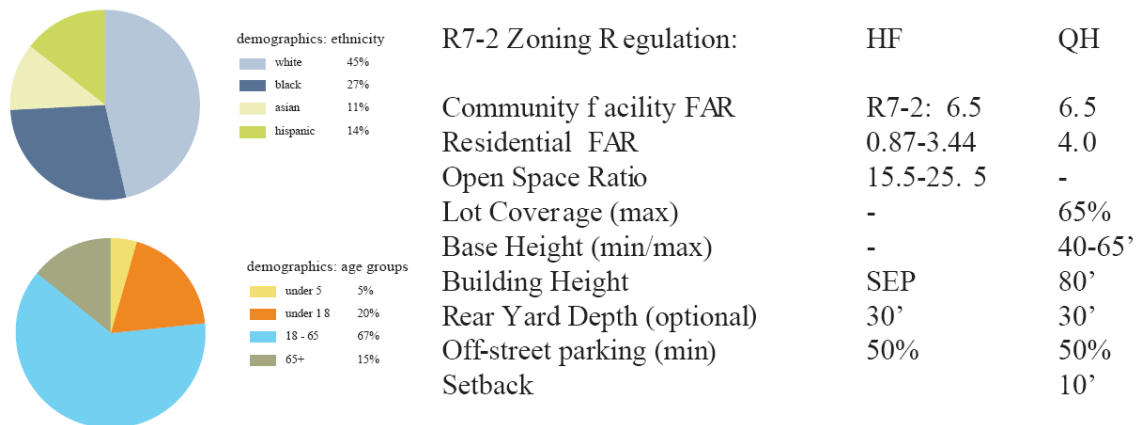
**Figure 3: Design Organization**

(source: Author)

certain walls can be moved and reorganized to create larger spaces such as laboratories and technology spaces.

### Connection to Urban Land Use

Schools in New York City in relation to its attention towards community, serves as a link between educational and broader urban activities. Planning of educational infrastructures in New York City includes coordination with other social, economic, and environmental concerns of the City. As the areas around the schools are increasingly diverse in terms of population, demographics, and age-groups, educational infrastructures in New York City play an increasingly complex role of catering for individual’s occupational and social development, as well as enhancement of the urban activities. Resultantly, certain schools end up becoming modular buildings reconfigured for school use, remaining within and in accordance with standard building codes. Such standardization transcends into planning that are in conflict with requirements of the school programs. For instance, physical education spaces that require wide open spaces are not possible in schools in New York City. Hence, schools incorporate indoor gymnasiums as an alternative. Design for indoor gymnasium requires higher ceiling, which the building codes generally have stringent requirements for, thereby making such facilities in schools costly and sometimes unfeasible. Consequently, districts place greater dependency on certain schools with different site characteristics to compensate for lack availability in other schools. Resultantly, certain schools in New York City become highly specialized, and concurrently are required to remain flexible enough to accommodate, adapt, and expand for changing societal needs.



**Table 3: Demographic Table**

(source: Author)

Therefore, educators and citizens need to maintain a continual dialogue in the refining of education infrastructure objectives and implementation.

## **Physical Planning**

Recognizing the comprehensive building regulations in the State of New York, schools in New York City provide adequate physical conditions for learning. Although there can be considerable improvements made in various aspects, a majority of classrooms in the schools have proper ventilation and lighting. Ceilings and walls in are required to have a fresh coat of paint at end of every school year. All corridors and classrooms are to be affixed with lockers, storage spaces, and ample electrical switches. Depending largely on the space available on site, all schools are to have a minimum of eighteen feet wide classrooms with at least two egresses for emergencies. Nationwide building regulations couple with specific New York City building codes place certain parameters and structural requirements that distinguish schools in New York City from most other suburban schools. Furthermore, each school in the City is modeled and developed according to adjacent building conditions and arrangements. The spatial plans of each floor situate classrooms that open out to double loaded corridors. Resultantly, most schools conform to a standardized planning process, creating each floor of the school building to resemble the rest. This process helps in the upgrading and maintenance of buildings, especially for structural reasons. It also allows speedier construction and renovation, and enables school buildings to rise up to multiple stories.

In a majority of schools in New York City (and in other dense urban regions), administration programs and few non-academic areas such as auditoriums are generally located on lower floor levels. Support services like cafeterias and laboratories are allocated on highest floors. Academic spaces such as classrooms and art rooms are most sandwiched in middle floors. This generic planning is found in almost all New York City schools, differing in terms of either vertical arrangement or horizontal distribution, depending on the surface area available.

The number of students per classroom in New York City schools ranges from 18-24, depending on the grade level. These figures have certain implications on the demand for land space in terms of users and positioning. Student population of this magnitude translates into approximately thirty thousand square feet of space for primary schools. Middle schools require roughly twenty thousand, while high schools generally require thirty to forty thousand square feet. These figures are general and vary based on the zoning density of the particular area. Schools in New York City have strong linkages to its surroundings: proximity to police and fire stations, and related to groupings of land-use. Planning for each school takes into consideration the activity patterns of the users and addresses the habitable requirements (mechanical, electrical, and structural).

### **4.1.3 Financing Educational Infrastructure**

Access to equal education is a right of every child and thus schooling is mandatory for all children in the United States. As of 2009, roughly eighty-seven percent of children are enrolled in public schools. Parents and guardians are not billed for any tuition for sending children to public schools, but are taxed for the provision of the education depending on the state and the district in which they reside. There are roughly fourteen thousand districts in the country which amounts to more than five hundred billion US dollars as government expenditure of on primary and secondary education annually. For such a large expenditure, the US government turns to alternative sources of revenues, like that of property taxes. Although property taxes are considered by economists as a venerable and important source of revenue (England 2009), they are still perceived as widely inequitable and generally unfair (Youngman 2002). The state of Michigan amended the constitution to limit the increases in

property assessments and thus increased the retail sales taxes to assist in funding for the public schooling within the state. These challenges faced by governments in the provision of educational infrastructure have strengthened the need for development, and allowed for other avenues of needed improvement. The intervention of the private sector (or private contractors) can be positively utilized by clearly defining the requirements and parameters of the needed service, ranging from the maintenance of the public facility, to extended operation of the facility through use of concessions or leases. To pave the way for governments, the focus may need to shift from monitoring inputs (for instance student-teacher ratio) to monitoring results (graduation rates, students reading at grade level, etc.). Redevelopment in educational infrastructure has the potential to reduce such social conflicts while strengthening the growth in living standards coupled with advancements in newer technologies and access to global market.

One of the critical components in the current debate about public schooling is centered on the current funding system policed in the infrastructure provision of education. Unfortunately, the current funding system is based on a formula that is an outdated “one-size-fits-all” approach towards funding, and is adopted by various states in the United States, including the state of New York. For instance, policy makers placed a revenue cap in the early 1990s, a form of an annual limit on the increase in the amount of funds that are supposed to be spent by the schools in each district per student. School funding and property taxation are closely linked in many states in the United States, where nearly half of all revenues generated from property taxes are designated for public elementary and secondary education (K-12 school). Thus, the main proponent behind the revenue cap then was to temporarily control the rates of the property taxes, (shortly thereafter though, this “temporary” measure translated into a permanent legislation by 1995). Regardless, with the revenue cap adopted by the state of New York and also by other states in US, local communities were consequently deprived of their ability to allocate decisions on what they needed most. As indicated earlier, distinct locations yield polar opposite experiences for students yet, the revenue cap falsely assumes that all students in every locality require a uniform cost to educate. Thus in theory, this may sound fairly equitable however, not all students cost the same to teach. As a majority of public schools enroll all children, a certain percentage of students have different and special needs that need to be addressed. These special programs require funding which the funding system deprives the districts and ultimately the school of. Furthermore, financially disadvantaged students, special need students, and students who are not proficient in the English language can cost more than the cap allows for. Simply, basing funding entirely on enrollment just does not make it any equitable, or establishing a uniform increase per student. Yet, in the state of New York, the amount that can be expensed by a school is a function primarily of student enrollment and that of the yearly allowed increase.

Ultimately, as an example, household bills of families with four household members’ do not get reduced by twenty-five percent if one household member relocates or moves out of the house. Expenditures such as the mortgage, insurance, and maintenance costs remain constant for the household regardless of how many members are residing within the house. Likewise, a similar analogy holds true for public schools: certain expenditures remain constant regardless of how many students are enrolled. However, the school funding formula assumes that all of these expenditures would decline should the enrollment within the school decrease. Essentially because current system in retrospect penalizes schools that have a decreased enrollment. In the state of New York, around sixty percent of the districts have reported declining enrollment (drop-outs, relocation, etc.). In essence, as one student relocates out of



the district in which the school was present, that district loses the funds associated with that student, regardless of the fact that the expenses to those districts for financing schools for heating, insurances, and maintenances stay constant. Thus, enrollment fluctuations place a significant financial stress on the entire district. Inversely, urbanizing, populating, and growing districts within the state of New York (as in other states too) suffer equally. Additional students lead to overcrowding of school building, the need to increase teachers and staff, and to provide for additional supplies and overhead costs – all within the revenue cap! Thus, operational and maintenance setup is a real challenge for districts to respond to, due to sudden fluctuations and the funding system. Unfortunately, all of these challenges force various districts to take detrimental measures, budget cuts or other reforms.

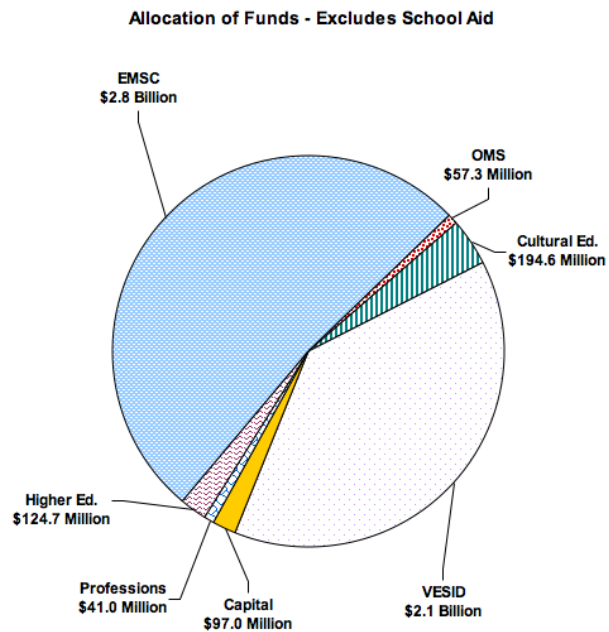
The current funding system and the formula-based system negate the fact that the population and demographics of students and families are drastically changing. New York's student population has changed from the early 1990s since the adoption of the funding formula. Today, much of the student population require additional services and more of special programs, such as special education English language training as mandated by the law of State. For instance, from the onset of the funding system to twenty years on, (from 1990 to 2009), New York state and the schools have resulted in a whopping three-hundred percent increase in the number of English language learners. Due to changes in immigration policies and general population growth, the school's current funding laws need to be armed to tackle such fluctuations. Unfortunately, currently this provision is not present: the funding system does not have the capacity nor the provision of the flexibility needed to meet the requirements of the students or of the schools. Thus, the nature of these significant gaps in the funding system causes the school districts to take drastic measures and make hard choices in terms of executing the education infrastructure. Inversely some critics have argued that the schools need to better adjust their budgets, (which schools also have). These adjustments however are made to cover increases in one area or a program at the expense of others. Ultimately, these lead to expenditure cuts, balancing of the revenue assignments, and causes reductions in many areas such as maintenance or technology, elimination of various non-technical subjects like art, music, foreign languages, business and vocational technical education. These measures consequently threaten New York State's long-standing tradition of providing quality public schooling and education infrastructure.

### **Tariff Setting and financial arrangements**

#### *From New York State to New York City and Individual Schools*

The New York City Department of Education is considered the largest network of public schools within the continental United States as it serves over one million students annually in approximately seventeen-hundred schools. Funding of these public schools utilize an innovative funding system that aims to achieve equitable learning environments for students of diverse backgrounds.

The Department receives a significant portion of its overall budget in terms of a grant system, in the form of a Foundation Aid from the State of New York. The overall budget accommodates for changes in budget based on yearly increase, and New York City Department of Education is allowed for using the State's Foundation Aid Funding for development of additional programs, increases in the operation and maintenance of the schools, and the advancement of the State's "Contracts for Excellence" program. The Contracts for Excellence program is fairly recent, and New York City schools received funds associated with this program for the first time in the 2007-08 school year. Contracts for Excellence are funds that must be allocated to a specific number of indicated schools for certain specific program area and expenditures. Since 2007, the program has been elaborated into additional provisions, and the funds associated with the program have expanded existing programs, as well as supporting new activities. For instance, in the school year 2010-11, New York City received funds under the State's Contracts for Excellence law to establish and supplement six new programs and additional measures to reduce class size, teacher and principal quality initiatives, and restructuring of middle and high schools. These funds transferred from the State to the City are meant not to supplant, but are directed towards the students with the greatest need, from improving the students' performance to meeting the educational needs of students with disabilities, students in poverty, and those who risk not graduating.



**Table 4: New York State Education Department total budget of 2008-2009 -- \$5.4 Billion**

Source: New York State Education Department

### Overall Budget and Fair Student Funding

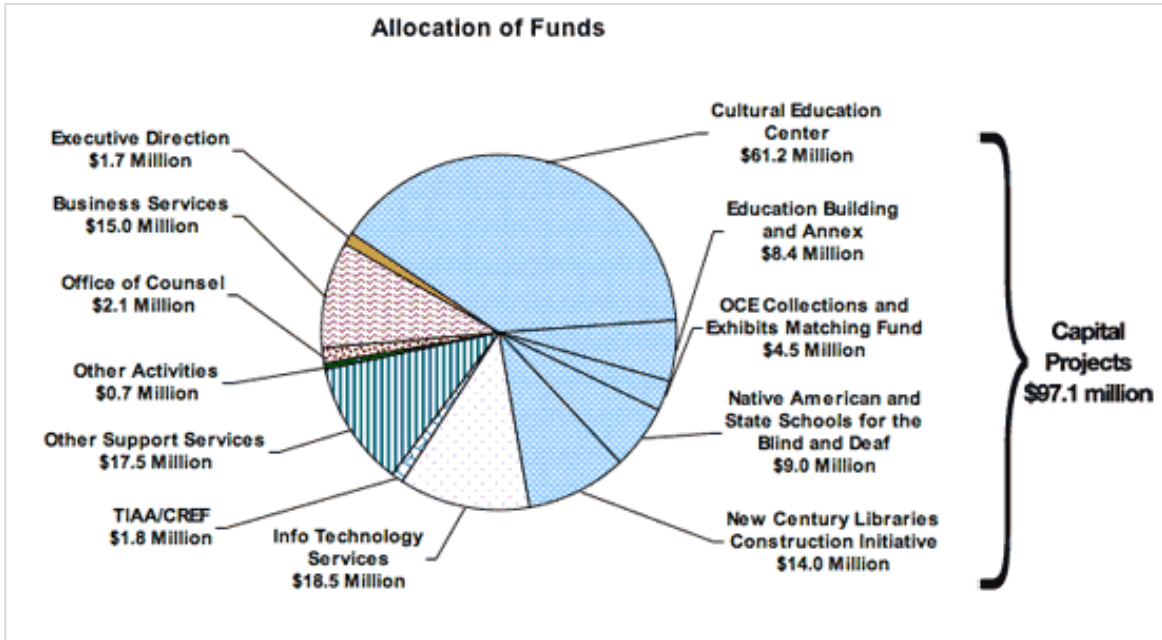
The overall budget for the Department of Education for all public schools in New York City for the fiscal year 2009 to 2010 was approximately twenty two billion USD, which included payments towards pensions and interests on the Capital Plan debts. It is a large sum of money allocated for operational and maintenance expenditures. Of the total budget, almost ninety percent, a total of eighteen and half billion USD amounts to the Department's overall operating budget – which includes funding for the principals and teachers, books and supplies, and overall maintenance and operation of school buildings. The operating budget also includes funding and expenditures of running of school buses, safety, and catering of school-wide lunches served in school's cafeterias. These supplementary services in addition to classroom instruction related expenses are provided solely by the public sector to the seventeen hundred schools already constructed and operating in the City. The Office of Operations and Management Services of the State of New York's Education Department

provides the overall executive direction, leadership and administrative support for all the overarching program offices of the State. It has a fundamental aim to assist the districts in potentially realizing the six Regents goals established in the Department's strategic plan. Essentially, the basic functions of the Department include the management of human resources, staff development, fiscal services, labor relations, information technology, auditing, and budgeting. Facilities management, public information, intergovernmental relations and legal services also fall under their responsibility. Furthermore, New York City's Department of Education also extends its support to central administration and field support offices, all of which assist and collaborate with individual schools in helping improve student achievement. These extension of service costs the City roughly an addition billion USD.

In addition to the overall operating budget, the New York City Department of Education initiated a five-year (2010-2014) Capital Plan Budget for the advancement of current education infrastructure in the City. The plan includes funding for construction of additional school buildings, improvement of and renovation the existing school infrastructure, and investing in new equipment and other assets within the schools. This Capital Plan Budget would be an additional investment of eleven billion USD. These funding arrangements yield certain implications at the local level. For instance, the Bayard Rustin High School for the Humanities located in lower-west side of the Borough of Manhattan in New York City had a total budget of over \$7.5 million USD allocated to the school by the New York City Department of Education. Of this total capital budget, roughly \$1.5 million USD was deducted as part of the Fair Student Funding program of the Capital Plan Budget.

The main idea behind the Fair Student Funding was to allocate services that are hosted by a particular school in their budget that provides for the resources and services rendered and shared by multiple schools. The funds in Fair Student Funding in terms of monetary value amounts to roughly \$4.5 billion USD in the school year 2009-10, and are essentially utilized by schools to cover for basic instructional requirements. These funds are allocated to each individual school based on the number and need-level of students enrolled in that school.

These Fair Student Funding amount are subtracted, and the programs associated with it, such as the TL Attendance, TL Mandated Counseling, APE Teacher, etc. are all for the purposes of establishing an equitable base. Although all funds allocated through the Fair Student Funding program are to be utilized at the principals' discretion, the basis of the adjustments made in the school's budget are done on equity grounds, and are reflected in the following fiscal years. The following table illustrates the deductions made in the Bayard Rustin High School.



**Table 5: New York State Allocation of Funds**

Total 2008-2009 - \$156.4 Million

Source: New York State Education Department

**Cost and Benefits**

One of the significant concerns for establishing a uniform funding formula are the factors of uncertainty reflected as such in the fiscal year 2011 budget of the New York City Department. The figures established are partly based on estimates - which have a higher degree of potentiality to shift as the New York State would still need to disclose its own budget. As of year 2011, the City’s education department is planning to reduce expenditures in State education aid, on the directive of the assumption of the State cut on special education and compensation obligation cuts.

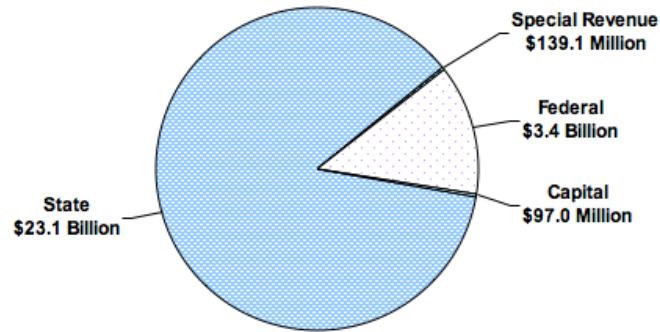
These cuts could amount to nearly one billion USD and high degree of dependency on State’s grants pose great challenges for New York City’s schools. Thus, to mitigate the potential harm the cuts could bring and to cover for a significant portion of increasing expenditures, the City’s Department of Education is proposing to reduce non-school budget by \$130 million USD. Unfortunately, these measures are minute compared to the State’s allocation of funds, and these measures are compounded by the increasing amount of expenditures of non-discretionary costs to the City’s Department of Education.

## Additional Costs and Revenue Sources

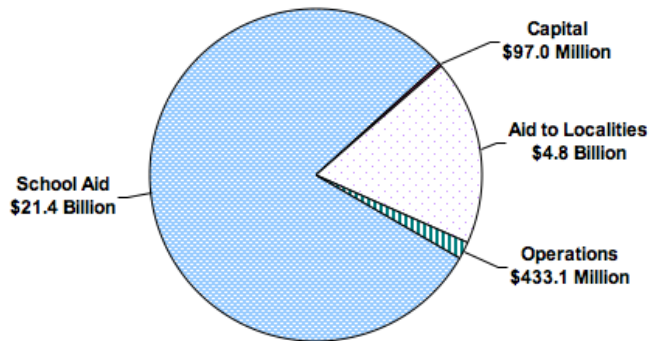
School funding and property taxation are closely linked in many states in the United States, where nearly half of all revenues generated from property taxes are designated for public elementary and secondary education (K-12 school). Taxes, generally, are levied on economic activities that increase financial resources for governments. As such, taxes raise the market price for particular taxed goods which gives a distorted view and inflicts an additional cost on the economy due to the decline in production and the consumption of the goods. Concurrently if the tax that does not affect the production or consumption of the good, it implies that there is less cost to the local economy and the tax is therefore more efficient. Land is therefore considered as one of such special “goods” whose amount is “fixed”, and the value is unaffected by the tax – making taxes on land more efficient. Thus, as taxes on land are considered an efficient tax such multiple details, it entails lesser unintentional costs when governments attempt to raise revenues, and hence funding social infrastructure for and on the lands where they are taxed is common to be a viable option.

Henry George, the nineteenth century political economist argued that the taxes accrued on the basis of land ultimately promote fairness, mainly due to the fact that the value of the land is determined more so by the community rather than purely on individual basis and efforts. Thus a tax on land can be considered efficient as it prevents any distortion in the choice and decision making of investments. In terms of financing for public schools, the development of schools would raise land value, and should there be a tax on the value of improving the land, it would be discouraging further economic development. Thereby, any impediment would negate the benefits of development of social infrastructure such as schools.

Source of Funds - Includes School Aid



Allocation of Funds - Includes School Aid



School Aid; Total 2008-2009 Budget: \$26.7 Billion (top, 2 charts)

Source: New York State Education Department

Figure 4: New York State Education Department Summary

By the school year of 2009-2010, an approximate sum of nine billion USD was allocated to the schools throughout the City. The major sources of contributors to this grant were the Fair Student Funding, the American Recovery and Reinvestment Act, and the Contracts for Excellence Funds. The American Recovery & Reinvestment Act (ARRA) funding was allocated to school districts by the United States Federal government in 2009 aimed towards saving jobs and improving student achievement in schools. ARRA funding fell into two categories: first, stabilization funding intended to close budget gaps created by tax shortfalls, and second, increases to existing federal grant programs such as Title I and IDEA. The Department of Education received an approximate sum of \$1.6 billion USD in ARRA funds for use in the 2009-2011 school years. Additionally, the Contracts for Excellence Funds (C4E) are allocated by the State of New York in consequence to their pledge towards increasing funding to New York City schools. Although these funds total an approximate \$600 million USD, these funds must be distributed to each district in accordance to the State's established methodology. Furthermore, these funds are required to be expensed by the schools in accordance with New York City's Contract for Excellence with New York State.

### **Equitable Budget**

Once the budgets of the schools are adjusted reflecting the reallocation of funds for operating capacity, the total reduction in budget for all schools do not exceed by more than four percent. Since there are various differences between multiple schools in the City, this reflects so in the requirements of the school and about fifteen percent of the schools receive a much lower percentage of cuts. In essence, almost all the City's schools experience the percentage cut however, no school experiences a cut to their total budget larger than as established. The general methodology for figuring out what the individual schools cuts is to follow the parameters set for the three major funding options for schools. All of New York City's schools that receive the Fair Student Funding experience the uniform percentage cut no larger than four percent. Similarly, all schools C4E fund are cut by approximately \$29 million USD. In addition, to account for the variances in funding streams across the City's schools, the Department of Education distributes the ARRA Stabilization Funds across schools. This distribution is based on the premises and goal of streamlining all schools to the same percentage cut on their total budgets. These adjustments to school budgets aim to improve operating support for the schools which face the most difficult financial shape, and to maintain the relative improvement made in funding for schools through Fair Student Funding over the years, the Department of Education allocates the ARRA Stabilization funds across all schools to equalize the cut.

**Calculation of Adjustments Made to Reach FY11 Cut Base /  
Calculation of FY11 Budget Reductions**

**M440 - Bayard Rustin Educational Complex**

<u>Calculation of Preliminary FY11 Cut Base By Adjusting FY10 Total Budget For Projected FY11 Fair Student Funding (FSF) and Changes to Other Allocations Common to All Schools</u>			
	FY10	FY10 Adjusted for FY 11 (Prelim.)	Calculation
Adjusted FY10 Total Budget - net of shared resources	\$7,566,823		<b>\$7,566,823</b>
<u>Adjustments</u>			
<a href="#">Fair Student Funding</a>	\$4,076,183	\$2,446,798	<b>(\$1,629,385)</b>
<u>Other Allocations Common to All Schools</u>			
<a href="#">Legacy Teacher Supplement</a>	\$148,233	\$69,112	<b>(\$79,121)</b>
<a href="#">TL Summer School Shared</a> (formerly FSF Summer)	\$77,439	\$14,504	<b>(\$62,935)</b>
Children First Funding	\$168,744	\$118,141	<b>(\$50,603)</b>
<b>Adjusted FY10 Total Budget Updated for FY11 (Preliminary FY11 Cut Base)</b>			<b>\$5,744,779</b>
<u>Change from Adjusted FY10 Total Budget to Prelim. FY11 Cut Base</u>			
Adjusted FY10 Total Budget Updated for FY11 (Preliminary FY11 Cut Base)			\$5,744,779
Adjusted FY10 Total Budget		-	\$7,566,823
			<b>(\$1,822,044)</b>
<u>Step II. Reallocation of Non-FSF, Unrestricted Funding for Basic Operations for ALL Schools</u>			
<i>No school's loss of reallocated funds will exceed 3% of its Preliminary FY11 Cut Base. All schools will be brought to a minimum operating threshold of 86.1%.<sup>1</sup></i>			
	<b>FY11 Funding for Basic Ops.</b>	<b>% Funded to Op. Threshold</b>	
FY11 FSF Formula Amount with No Weighting for Academic Need ("Operating Threshold")	\$3,063,916	100.0%	
<u>Unrestricted Funding for Basic Operations Before Reallocation</u>			
Preliminary FY11 Fair Student Funding allocation	\$2,446,798	79.9%	
Other Unrestricted Funds Prior To Adjustments <sup>(7)</sup>	\$68,141	2.2%	
<b>Total Unrestricted Funding for Basic Operations Before Reallocation</b>	<b>\$2,514,939</b>	<b>82.1%</b>	

**Table 6: Calculation of Adjustments/ Budget Reductions to Bayard Rustin HS, NYC**

Source: New York City Department of Education, Bayard Rustin High School Budget 2011

### 4.1.4 Functionality of Public Schools

#### Institutional Arrangements and Management Structure

*From New York State to New York City*

There are a number of different role players involved in the provision of education infrastructure in the State of New York. The municipalities in which the schools are situated conform to the comprehensive institutional mapping to maintain clear direction and responsibilities in the education service. In New York's education system, (New York Department of Education), the Board of Regents establishes an overall education policy for the entire State of New York's districts and also spearheads The University of the State of New York (USNY). Although USNY falls under higher education (in addition to elementary and secondary education), it has one significant aim: to provide knowledge and skills to all. The elementary and secondary education is headed by the Board of Regents which consists of seventeen members elected by the State Legislature for tenure of five years. These members

serve the office without salary. Of the seventeen members, thirteen of them represent the State's thirteen judicial districts, (one from each district), and four at-large. The Regents allocate a Commissioner of Education who heads the entire State Education Department and also serves as the President of the University of the State of New York. In essence, the primary responsibility of the Regents is set policy whereas the Commissioner has responsibility for carrying out that policy.

In the entire United States, there are more than three and a half million teachers in the public and private elementary and secondary schools in the year 2010. This number of teachers taught roughly a student population of over fifty-five million in the a hundred and thirty three schools. This amounts to approximately fourteen students to one teacher on average across the entire 50 states. However, the states do not make proper reporting mandatory for school districts for the purposes of analyzing the efficiency of the return on investments. The only exception to this situation are the two large states of Florida and Texas, which provide annual school level productivity evaluations indicating to the institutions about how well school funds are being utilized at the local level. Should it become mandatory for every state, including New York, states would be in a better position to evaluate and create comparisons of schools within it.

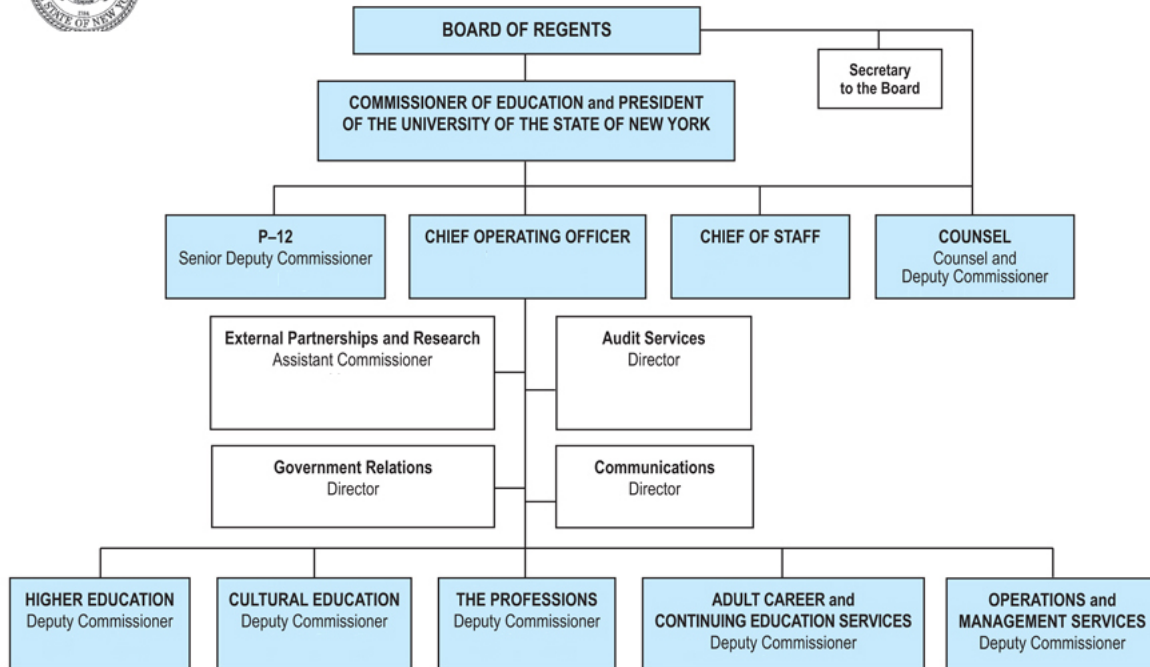
### **The municipal environment**

Responsibility for education service is in most cases divided between the local and district municipalities. The New York State Education Department regulates the various schools and the curriculum represented in the program. In New York, depending on the district, various high schools provide for an Advanced Placement (AP) or International Baccalaureate (IB) course programs. These are special forms of classes whereby the curriculum is slightly altered than the rest of the public schools' curriculum is a little more rigorous, and the lessons are more challenging than the standard courses offered elsewhere. These programs are regulated by the NYSED as these courses are intended to be the equivalent of first year of college courses; therefore, granting unit-credits is the prerogative of the state.





NEW YORK STATE EDUCATION DEPARTMENT  
**ORGANIZATIONAL CHART**



**Table 7: New York State Educational Dept. Organizational Chart**

Source: New York State Education Department, 2011

Furthermore, NYSED is also responsible for the selection of examinations and the establishment of minimum scores required granting credit or placement. This distinction of provision of additional special program to certain schools is crucial. It highlights the discrepancy of not providing these advanced courses in impoverished inner-city high schools throughout the state and only to a selected few. The drastically uneven levels of secondary education only gets reiterated by graduate go on to receive advanced courses, compared with both public and private schools in wealthier districts. Thus it is often seen as a major cause of discrimination and funding misalignment.

### Operational and Maintenance Setup

*Transition: improving operational capacity for all schools*

In order to make a transition in efforts to improving the operational capacity of all schools in New York City, certain measures involving budget shifting needed to take place. Before implementation of the budget reduction, The New York City Department of Education planned to reallocate funding between school budgets to ensure that all schools meet a basic level of operating capacity. Through the funding formula established in the Fair Student Funding regulation, funds to all schools remain unrestricted in order to meet the basic funding requirements for classroom operations, special education programs, and language instructions. As the funds generated through the Fair Student Funding Formula are supplementary, these

efforts aim to operationalize the schools, as well as assist those struggling students in these schools to meet academic standards. Progressively over the course of two years since 2008, a number of state budget cuts have reduced the Fair Student Funding amount of money by more than twenty-five percent, which has made the transition efforts for schools a lot challenging. Nevertheless, the amount of funds allocated to traditionally under-funded schools in New York have been higher than before due to the implementation of the Fair Student Funding initiative. Additional funds meant under-funded schools to garner more flexibility and manageability in the midst of budget reductions. While this pattern fared well for under-funded schools, a number of other schools in New York City, particularly middle schools had their budgets less than their traditional funds since the implementation of the Fair Student Funding initiative. Although this disparity at first seems to undermine the effective and capability of the Fair Student Funding initiative in assisting schools cover basic operations, the fundamental reasoning behind the mis-match of funds is that many middle schools commenced closer to below their Fair Student Funding formula. This disparity is closely linked to the improved performance of schools as a whole in the City, and particularly the improved performance of students entering middle schools. As a greater number of students have performed progressively better than previous years, these students transition from elementary schools to middle schools, and these middle schools received fewer Fair Student Funding dollars in comparison to other primary, elementary, and high schools. Fair Student Funding thus has fared well in improving the transition for many under-funded and under-performing schools to meet basic standards as well improve their budget strength in the midst of immense across the board budget cuts.

Although in addition to the Fair Student Funding, other sources of funding have helped improve schools operation capacity during the seemingly increasing budget reductions, there are still efforts needed to bring all schools budgets to meet the basic operating levels. These seemingly comprehensive tasks have been faced with over \$850 million cuts in New York City Department of Education cuts, and an additional 25% of budget reduction of the source of funding itself – the Fair Student Funding! Thus it has been proven critical for schools to decentralize dependency on grants and make local level adjustments to their school-year budgets. On a local level, the schools undertook various budget adjustments, and most responded well to operating above the minimum operating level and under the directive of Department of Education redirecting additional funds to under-funded schools. In essence, the stabilization led to increase in budget for over four hundred schools, while a decrease for around one thousand schools. However, this decrease has been no more than three percent of the schools total budget and no school received less Fair Student Funding than it would have received should no reallocation had been operationalized.

Depending largely on the state, the age bracket for which school attendance is compulsory varies slightly, as most children commence their elementary education at the age of five or six, and roughly complete their secondary education by eighteen years of age. It is during this time duration of roughly fourteen years that the states are responsible for the delivery of education infrastructure. Although high schooling is mandatory for all students, within this timeframe for however, in certain instances students may be allowed to leave school at the age of fourteen (with parental permission), and certain families would send their children off to private schools and fewer would teach their children at home (home-schooling).

Additionally, according to the statistics taken in 2007, nearly six million students dropped out of high school above the age of sixteen. The issue of high-school and secondary school drop-outs is considered significant because of the diversity of the student population, and fiscally

due to the funding formula associated with each student. As indicated earlier, the current funding system in the state of New York (likewise in many states throughout the US) associates the amount of funding received or allocated to a school is based on the number of students enrolled in the school. Consequently, the current funding system implies that the school is actually punished for decreased enrollment, and almost sixty percent of districts in New York alone reported declining enrollment. When a student drops out or simply relocates from one district, that district also loses the funds attached to that student -- even though the costs and expenditures to the districts such heating, overheads, and insurance remain the same. Thus, enrollment statistics, drop-out rates, and related fluctuations can imply significant financial concerns and stress on the whole of the district. Likewise, urbanizing or growing districts can also writhe as additional students result in an overcrowding school building, student-to-teacher ratio, the prerequisite to over staff and provide additional supplies. Therefore, fluctuations imply significant operational and maintenance challenge for districts to respond to, and these fluctuations lead various districts to take drastic measures such as cuts and program changes.

## 4.2 Case Study: Developing Country: Lahore City

Investments in education are important for Pakistan's progress. Pakistan's education system since gaining independence in 1947 has expanded significantly. Sixty-three years on, despite considerable achievements, the country still faces numerous challenges: enhancing the provision of education for all of its population, meeting the increasing socio-economic requirement of the country, reaching the level the standard of the neighboring countries in South Asia and aspiring towards meeting the Millennium Development Goals. The literacy rate in Pakistan has continued to improve gradually over a number of years however, the country's indicators to this date remain amongst the lower end of the global rankings. Public spending on education as a percentage of the gross domestic product (GDP) in Pakistan amounts to the lowest share in its total budget, concurrently when the country's national policies have widely acknowledged that investments in education are a critical factor of poverty alleviation, human and economic development of the country. Among the neighboring countries in the region around Pakistan, only Bangladesh achieves outcomes lower than Pakistan in terms of both public spending and literacy rates, while Nepal has consistently allocated a significantly higher level of expenditure on education and maintains a considerably higher literacy rate. Encouragingly, several vital initiatives related to education in Pakistan have commenced by the public sector, like that of the Nine Point Plan of 2008, and it is hoped that these initiatives will play an overarching role and have a cross cutting impact on all aspects of human life. The following pages describe the current education system present in the country, in terms of physical conditions of schools, to financial statistics, and the effectiveness of educational infrastructures in Pakistan.

### 4.2.1 Context

Pakistan is aspiring towards meeting its acute challenges of poverty reduction and economic growth. Taking into consideration the increasing population growth rate and rapid urbanization of cities in Pakistan, the National Government has adopted a multi-pronged approach to make comprehensive reforms towards economic revival, enhancement of human development, and improvement of social indicators. The government recognizes that success in achieving significant developments is contingent to substantial investments in the social sectors, such as health and education. Investments particularly in educational infrastructures will play an important role in the economic prosperity, social cohesion, and poverty alleviation. In effect, this translates into efforts to be made in improving physical infrastructure, sustainable fiscal reforms, and refinement of human resource skills and development.

Currently, the provision of primary, secondary, and intermediary education is the fundamental responsibility of the government. The public sector has made comprehensive investments in education in formal and non-formal institutions in urban regions. Coupled with the efforts made by the public sector, the private sector also participates on a limited scale in the provision of educational infrastructure. The private sector has established formal schools which are mostly located in large urban cities. Additionally, some non-governmental organizations under the formal and non-formal systems provide primary schooling. The educational infrastructure in Pakistan is organized into five distinct levels, ranging from primary, middle, high, intermediate, to university. Students in primary schools attend grades one through five, while six through eight graders and nine to ten are enrolled in middle to high schools respectively. Grades eleven through twelve (equivalent to high school in United

Country	Public Sector Spending (As % GDP)	Literacy rate in (%)
Bangladesh	2.6	55.0
China	-	93.7
India	3.3	-
Indonesia	3.5	-
Iran	5.2	-
Malaysia	4.7	92.1
Nepal	3.2	57.9
Pakistan	2.1	57.0
Sri Lanka	...	90.6
Thailand	4.5	-
Vietnam	5.3	92.5

- : not available

Source: World Bank, UNDP, UNESCO, FBS, Ministry of Education

Figures for latest available year

**Table 8 Comparison of Public Spending on Education across South Asia**

States education system) are essentially intermediate schooling leading students to gain an FA diploma in arts of FS in sciences.

Source: World Bank, 2009.

#### 4.2.2 Design and Planning: physical conditions

According to the recent national census, Pakistan has roughly five hundred thousand schools of which approximately 162,000 are primary schools, 24,000 secondary, and about 40,000 intermediate/high schools. All across different levels of schooling in urban cities, the student-teacher remains above 35 students to 1 teacher. This results in crowded classrooms and educational infrastructure that requires considerable improvement in its design and performance. In Lahore, the estimated student-teacher ratio exceeds 43:1, which is one of various factors that are causing immense pressures on infrastructure requirements of public schools present in Lahore. Currently, the physical conditions of a majority of public schools are deteriorating rapidly. A large number of schools are missing even the most basic infrastructure elements. About thirty-eight percent of schools up to secondary levels do not have adequate boundary walls, which creates security concerns and permits illegal squatting of street vendors on school property. Roughly thirty-two percent of all schools do not have adequate means of providing safe drinking water, and another thirty-eight percent do not have clean or periodically maintained bathrooms. Additionally, a majority does not have adequate supply of electricity and the physical building itself consumes and wastes a bulk of energy that is provided. Resultantly, overcrowded, cramped, and poor ventilated classrooms limit the output and quality of education.

#### Utility and Technology

In design terms, the educational infrastructures in Lahore characterize procedures and process of utility. The programmatic organizations of schools in Lahore are divided largely into two categories: academic and non-academic spaces. The academic spaces consist of classrooms, laboratories, and media rooms, and they are considered elements that can, either directly or indirectly, enhance the effectiveness of the schools. The non-academic spaces, including administration, building support spaces and student services are areas that have a higher propensity of increasing the utility of the schools. Currently, classrooms in a number of schools in Lahore are not improvised with the state-of-the-art technological equipment that is allocated in various schools of developed countries. Furniture is deteriorating and need considerable fixing. And in many instances, furniture needs to be replaced or even added in

classrooms to accommodate for large number of students. The curricular activities required by the MoE cannot be effectively realized due to existing physical conditions. Although, various classrooms may be installed with blackboards, yet provision of supplementary items such as chalk and erasers are not readily available. There are almost no storage spaces for every classroom, generally due to lack of available space. With roughly over forty students in every classroom, additional furniture and storage of materials in classrooms are required – more than the current space allows. Additionally, greater occupancy of rooms impacts the indoor environmental quality of the room, which is not suitable for learning. A roughly four-hundred square feet classroom requires at least three to four ceiling mounted fans, and two operable windows for adequate ventilation . Currently, the standards in schools almost equip only two fans; some windows operate, most are fixed. Coupled with reduced electrical supply (as 60% of schools receive periodic supply of power), the unattractive conditions of classrooms makes it difficult for students to concentrate – poor retention and high dropout rate s are increasing.

The design utility of public schools is evaluated based on the discussion of activities, environments, and the equipment rendered to the maximum number of recipients. The MoE aims to increase the utility of educational infrastructure through placing planning among learners. Thus, despite considerable challenges, the administrators have been successful in providing relatively high number of teaching aids and learning materials, in the form of books, stationary, and charts at free of cost.

Province/ Area	Without Building	Without Boundary Wall	Without Drinking Water	Without Latrine	Without Electricity
Punjab	505	13,378	8,279	14,551	26,825
Sindh	11,669	24,470	26,240	22,588	39,616
Khyber Pakhtunkhwa	1,113	9,116	10,029	7,888	13,719
Balochistan	681	7,689	4,197	8,425	9,806
AJK	2,705	4,498	3,074	3,390	4,083
Gilgit-Baltistan	183	1,084	1,069	1,072	1,072
FATA	908	1,024	2,101	1,882	1,640
ICT	0	15	7	50	8
Total Pakistan	17,764	61,274	54,996	59,846	96,769
In %	10.9%	37.7%	33.9%	36.9%	59.6%

Source: NEMIS 2008-09 AEPAM, Ministry of Education, Islamabad.

**Table 9: Missing Facilities in Pakistan Government Schools 2008-09**

Source: Ministry of Education Pakistan, 2009

The MoE has initiated various school development projects that facilitate the existing physical infrastructure of schools. The aim is to strengthen, improve, and rehabilitate existing educational infrastructure on priority basis. The goal is to provide additional facilities such as additional classes, revamping science labs, and equipment for workshops. To further increase the utility of public schools, requisite machinery, accessories, and equipment for computer labs will be provided throughout to all schools.

Schools without Facilities		Urban	Rural	Total
Electricity	In Number	11,609	85,160	96,769
	In Percentage	35.8%	65.5%	60.2%
Water	In Number	2,179	52,817	54,996
	In Percentage	6.7%	40.6%	34.2%
Latrine	In Number	9,763	50,083	59,846
	In Percentage	30.1%	38.5%	37.2%
Boundary Wall	In Number	9,026	52,248	61,274
	In Percentage	27.9%	40.2%	38.1%

Source: NEMIS 2008-09 AEPAM, Ministry of Education, Islamabad.

**Table 10 Missing Facilities Pakistan: Urban/Rural Disparities 2008-09**

Source: Pakistan Ministry of Education, 2009

## 4.2.3 Funding Educational Infrastructure in the Public Sector

### Fiscal Requirement

At present, public expenditure on education as percentage to gross domestic product is lowest in Pakistan as compared to other countries in South Asia. Based on official data, it is observed that Pakistan allocated only about 2.5% of its GDP during the year 2006-07 on educational infrastructure. The percentage since then has been on the decline. The figure dropped to 2.4% in 2007-2008, 2.1% in 2008-09, and 2.0 % in 2009-10. In comparison to other countries, the public sector expenditure on education as percentage of GDP is 2.6% in Bangladesh, 3.2% in Nepal, and 3.3% in India. According to estimate by UNESCO's EFA Global Monitoring Report 2009, public expenditure on educational infrastructure in Pakistan is expected to reduce even further. The statistics of illustrate that the limited public sector financing and resulting outlays have led to decline of student enrolment in public schools and greater student enrolment in private sector educational infrastructure. Over the years, the provision of Pakistan's educational infrastructure requirements has been fulfilled by the private sector participation in terms of investment, ownership and operation of institutions. Although the private sector participation in the educational infrastructure may seem encouraging, it has been as a consequence of the public sector's lack of capacity to fully meet the educational requirement. With the whole school aged and illiterate population of the country on the rise, the role of philanthropists, non-governmental organizations, and business communities and their involvement has become critical. Of the total number of schools in Pakistan, almost forty thousand schools are administered wholly by the private sector. According to the Medium-term Development Framework (MTDF) of 2005-2010, the investments amount to approximately 50 billion PKR made by the private sector for the expansion and development of educational infrastructure.

Provincial population census reports and projections indicate that the net enrolment in primary education is expected to go beyond 17.5 million students by the year 2015. In effect, this translate to about 9 million boys and 8.5 million girls enrolled in primary education. The

total cost of primary education to be incurred by the public sector will exceed Rs. 955,000 million. This figure represents the fact that of the total sum, about Rs. 582,000 million is projected as a maintenance outlay for the present participation rate, and roughly Rs. 373,000 million is for financing additional students. In addition, the total cost of achieving a participation rate of at least fifty percent in early childhood education for both boys and girls in urban areas is a little less than Rs. 50 million. It is estimated that the public expenditure on educational infrastructure will be approximately Rs. 1,200,000 million by 2015.

Financing of educational infrastructure in Pakistan through utilization of public funds and domestic resources is challenging mainly due to the current financial arrangements in the country. Although current budget allocation to educational infrastructure is considerably “modest” (EFA 2003), financing for education remains on Pakistan’s national government’s highest priority amongst other social sector agenda<sup>5</sup>. On a national level, current expenditures in educational infrastructure exceed the revenue collections, and resultantly, fiscal deficits have remained high since the turn of the Century. Efforts have been made to reduce the resource gap and to balance the expenditure and revenue assignments. Consequently, there has been a substantial reliance on external borrowing of funds.

The financial arrangements for the provision of education in Pakistan are slightly similar to other forms of developed countries. The national government through inter-governmental transfers allocates funds to the four provinces using a population based formula. On the national level, these funds are budgeted and are released through the Ministry of Finance. In certain cases, the Ministry of Finance provides additional supplementary or earmarked grants to the provinces, depending if there is an immediate requirement for certain capital projects such as construction of specialized or disaster relief schools. Coupled with inter-governmental transfers and own revenue sources, the provincial governments are authorized to allocate funds to educational infrastructures according to their own provincial regulations and requirements. Currently, the province of Punjab, allocates around 20-30% of total budget towards educational infrastructure for all its urban cities including the City of Lahore.

Financing for educational infrastructure in urban regions is further divided into three categories: primary education, adult literacy, and early childhood education. At the turn of the Century, it has been estimated that of the budget requirements, the three categories expenditure amount to around Rs. 786,000 million. Additionally, as mentioned earlier, the national government’s prerogative to close the “fiscal gap” amounts to around Rs. 426,000 million. Thus the total financial requirements for educational infrastructure in Pakistan are around Rs. 1,200,000 million, the resulting “financing gap” is to the tune of Rs. 426,092 million.

### **Budget Allocation**

Currently, an average slightly more than half of the total education budget at the national level is allocated to primary educational infrastructure. The remaining one half of the budget is

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<sup>5</sup> The current geo-political situation of Pakistan has resulted in increased budget allocations to defence and security. Interest payments and defence expenditures consist of about one-fifth and one-third of total expenditures. Resultantly, the amount spent on social and economic sectors is roughly 15% of the total expenditure. It is estimated that of fifteen percent, almost one-half, or about 7% is spent on education.



distributed equally to secondary level and all other education levels. At the provincial level, the Province of Punjab allocates the highest amount of funds, at around 65 % to primary level. This translates into the total cost of achieving primary education in urban regions such as Lahore to Rs. 48,500 million for boys and Rs. 51,900 million for girls. The highest expenditure proportion is allocated to the Province of Punjab. Within the educational infrastructure budget in the Province of Punjab and in schools in the City of Lahore, funds are primarily spent on non-academic and administrative functions. For educational infrastructures, these are expenditures attribute to payment of salaries, operations, and maintenance of school facilities. According to statistics, at present this proportion hovers around 95% in schools in Lahore, and as little as 5% of the amount is left for development expenditures. The 5% amount left for development consists of supply of teaching aids, classroom materials, and balancing of the expenditure and revenue assignments. Consequently, educational infrastructure in Pakistan in the public sector have place increasingly substantial reliance on external borrowing of funds, including foreign assistance.

	BOYS			GIRLS		
	2003-06	2006-11	2011-16	2003-06	2006-11	2011-16
<b>Punjab</b>						
Development	3702	1297	2590	3136	1058	4537
Recurrent	1337	4163	5905	1,126	3,444	5,679
Total	5039	5460	8495	4262	4502	10216
<b>Sindh</b>						
Development	3644	2012	465	3607	1929	3002
Recurrent	1,327	4,699	6,352	1,332	4,702	7,219
Total	4971	6711	6817	4939	6631	10221
<b>NWFP</b>						
Development	513	940	1237	394	794	1558
Recurrent	173	905	1,878	128	717	1,708
Total	686	1845	3115	522	1511	3266
<b>Balochistan</b>						
Development	253	829	902	258	714	1328
Recurrent	81	587	1,346	85	556	1,413
Total	334	1416	2248	343	1270	2741
<b>Pakistan*</b>						
Development	8265	5330	5408	7580	4694	10686
Recurrent	2,974	10,631	15,971	2738	9694	16531
Total	11239	15961	21379	10318	14388	27217

\*Estimates for Pakistan include estimates for FATA and ICT

**Table 11: Total Cost (in Rs. m) of achieving Universal Primary Education in Urban Areas in Pakistan**

Source: Ministry of Education Pakistan, 2009

## **Foreign assistance for financing of educational infrastructure**

Since 2008, international development agencies have facilitated in the development of educational infrastructure in Pakistan. Foreign assistance also includes an annual average additional cost of achieving primary education in major urban and rural regions. Assistance is extended by eight international agencies including UNICEF which allocates roughly US \$790 million, UNESCO with US \$395 million, and the World Bank with US \$660 million. According to the Pakistan Ministry of Education, the financing gap at present is considerably high and exceeds Rs. 2,000,000 million, and much of the monetary assistance extended by international agencies inadvertently goes to meeting the gap.

## **4.2.4 Functionality of Public Sector educational infrastructure**

### **Governance and Organizational Structuring**

Functionality of schools in Pakistan depends on suitable organizational structuring. Organizational structuring facilitates in management of schools and of its facilities, in terms of leadership, human resources, and competency. Current educational infrastructure in Pakistan is heavily centralized. Currently, the Pakistan Ministry of Education, realizing the immense challenges for educational infrastructure in Pakistan in terms of functionality, aims to expedite provision of education through decentralizing institutional arrangements. Forty-six percent of population of Pakistan is considered illiterate, the education index of the country is significantly lower, and Pakistan stands at 138th position in the human development index of 175 countries around the world. Consequently, decentralization will reconfigure certain components in organizational structuring of educational infrastructure, and may increase the literacy, pedagogical skills, and overall functionality of schools. Measures in removing illiteracy<sup>6</sup>, increasing pedagogy, and increasing competency, are the fundamental goals of the MoE enabled through governance and structuring of educational infrastructure in Pakistan.

Improving the functionality of current educational infrastructure, particularly of the primary level schools, requires the central government decentralize the design and implementation of its “education strategy” (MoE 2009). The aim behind the “education strategy” is to increase public community participation in the educational infrastructure. By providing parents with a greater voice in the operation of schools, much control of primary and secondary schools would thus be transferred to local levels. This allows governments to allocate and restructure resources towards critical aspects such as literacy and pedagogical skills. However, such measures have required considerable restructuring of the administration of educational infrastructure. Although the government’s vision is to gradually provide all schools with greater degree of independence, current existing organizational structure is fairly rigid, and prevents any realistic schedule for achieving this goal (World Bank 2009).

### **Education Statistics and Effectiveness**

#### *Structure, Enrollment and Institutional Arrangements of primary through high schools*

Educational infrastructure in Pakistan is organized into five distinct levels, ranging from primary, secondary, high/intermediate, to university. From grades one through five, students

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<sup>6</sup> One of the goals of the MoE regarding literacy is to provide “free and compulsory secondary education within minimum possible period” (MoE 2009)

are enrolled in the primary schooling, while six through ten are secondary schooling. Grades eleven through twelve are essentially high/intermediate schooling, leading students to gain an FA diploma in arts or FS in sciences (equivalent to the USA high school diploma). As the provision of education is the primary responsibility of the federal government, the MoE coordinates the academic as well as non-academic functions of primary up to the intermediate/high school level of all four provinces. Provincial governments further delegate tasks to various districts which are responsible for implementing instruction, operating and maintaining of all school facilities in urban cities. This top-heavy organizational structure, regulated extensively by national and provincial governments, consequently results in limited autonomy of schools at local levels in terms of management and financial arrangements. The organizational structure also widens the communication gap between provincial and local school administration. Daily operations of schools are subjected to lengthy bureaucratic processes which result in resource ineffectiveness. Resultantly, inefficiencies in school governance arise; functionality of various schools in urban cities weakens; and the overall literacy levels decline. Each of these factors is critical and places severe constraints on the potential of current existing schools.

The functionality of various schools in urban cities of Pakistan, particularly in Lahore, is declining. There are roughly 156,600 primary schools<sup>7</sup> in the country, with over 465,300 teachers employed in these schools. The number of schools has been on the rise annually. Each one of them is structured according to similar organizational patterns regardless of taking into account the context-specific requirements. The number of primary schools has had increased by 0.6% from 2007-2009 and the figure increased by another 1.3% percent over the course of the 2009-2010 academic year. These large quantity of primary schools that have operated on the same organizational pretext and limited financial arrangements highlight the severity and limitations it places on the functionality of Pakistan's schools. This pattern is similar in other higher level educational infrastructure. Secondary education, which begins from grades six through ten; employs around 320,600 teachers in roughly 41,000 schools. With over 7.5 million students enrolled just in secondary schools, the staff-student ratio gets affected in every school. Overcrowded classrooms, over-worked teachers, and under-paid staff are just few of the negative consequences lack of proper organizational structure places. Similarly, over the course of the years, the enrollment in schools has been declining, from almost 0.2 %, in 2006-2008 to roughly 2.9 % in 2008-09 and 5.6% in the current academic year. Similarly, high school education, delivered in over 24,300 schools by more than 439,000 teachers have also reported decline in student enrollment. The increasing drop-out rates are a result of the multifaceted factors. One of the factors is attributed to the existing organizational structure that significantly limits functionality and constrains resources. Lower administrative capacities lead to inefficient supervision of human resources, paving way for poorer teaching performances and increasing absenteeism of students as well as teachers.

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<sup>7</sup> In addition to primary schools is the Pre-Primary Education. In Pakistan, it is acknowledged as an important component of Early Childhood Education (initiative by the MoE) and the country has seen an overall increase of 2.6% in pre-primary enrolment, to an amount of 8.4 million in academic year 2008-09 over 2007-08 academic year's 8.2 million. Currently, the enrollment has continued to increase by another 2.2 percent.

Year	Enrolment			Institutions			Teachers		
	2007-08	2008-09 (P)	2009-10 (E)	2007-08	2008-09 (P)	2009-10 (E)	2007-08	2008-09 (P)	2009-10 (E)
Pre-Primary	8,218,419	8,434,826	8,623,544	--	--	--	--	--	-
Primary* Mosque	18,360,468	18,468,096	18,714,582	157,407	156,653	156,364	452,604	465,334	469,151
Middle	5,426,548	5,414,157	5,445,247	40,829	40,919	41,456	320,611	320,480	323,824
High	2,484,537	2,556,186	2,699,589	23,964	24,322	24,822	429,932	439,316	447,117
Higher Sec./ Inter	959,690	1,074,323	1,147,807	3,213	3,291	3,399	74,223	76,184	78,656
Degree Colleges	383,810	429,251	458,835	1,202	1,238	1,275	20,971	21,176	21,385
Universities.	741,092	803,507	948,364	124	129	132	46,893	50,825	56,839
Total	36,574,564	37,180,346	38,037,968	226,739	226,552	227,448	1,345,234	1,373,315	1,396,972

P: Provisional  
E: Estimated

Source: Pakistan Education Statistics 2007-08, 2008-09 and 2009-10, EMIS- MoE Islamabad

**Table 12: Number of Mainstream Institutions in Pakistan, Enrolment and Teachers by Level**

Source: Pakistan Education Statistics, 2010.

### Enrollment and Pedagogical Skills

As the complexity in organizational structuring of Pakistan's schools has impacted functionality of schools, in Lahore it has also strained the effectiveness of teacher pedagogy and human resources across the rest of educational infrastructure in the Province of Punjab and other provinces. Inadequate pedagogy in educational infrastructure consists of poor teaching practices, curriculum, and insufficient instruction time. Each of these factors is critical and places severe constraints on the potential of the schools. Within these schools, the total enrolment at primary stage is 17.3 million, out of which 12.16 million (71%) is in public sector and 5 million (29%) is in the private sector. As there are roughly 156,600 primary schools<sup>8</sup> in the country, with over 465,300 teachers employed in these schools, the student-teacher ratio is 43:1. Overcrowded classrooms and over-worked teachers begin to take a toll on student enrollment and pedagogical skills of the staff. It is widely acknowledged that the imbalanced student-teacher ratio and teacher training has a direct correlation to motivation. Lower teacher morale leads to higher rates of absenteeism of teachers as well as of students. The total teaching staff in schools is a little over 1.3 million teachers - of which 56% of teachers are hired in the public schools while 44% are in private sector. Out of the total 1,363 million teachers, female teacher outnumber the male teachers -- 47% are male and 53% are female teachers. With inadequate resources provided to schools, the enrollment and pedagogical skills are declining. Teacher absenteeism has increased, and consequently the overall time during which a student learns is reduced. For educational infrastructure, it has an indirect effect on the costs of teacher training programs to schools. This consequently further undermines other diligent teachers' enthusiasm levels at schools, ultimately causing lower

<sup>8</sup> In addition to primary schools is the Pre-Primary Education. In Pakistan, it is acknowledged as an important component of Early Childhood Education (initiative by the MoE) and the country has seen an overall increase of 2.6% in pre-primary enrolment, to an amount of 8.4 million in academic year 2008-09 over 2007-08 academic year's 8.2 million. Currently, the enrollment has continued to increase by another 2.2 percent.

salaries for teachers in schools in Pakistan -- in addition to insufficient working conditions, and weaker support services.

Subsequently, private sector involvement in the provision of educational infrastructure has been on the rise. Mainly due to the private sector's relatively efficient organizational structuring, and its limited dependence on public organizational and financial arrangements, schools are better designed, and better run. At present, of the total over 156,600 primary schools, 139,342, or almost 89% fall within the classification of a public sector administered school, while only 17,250 or 11% are administered by the private sector. However, in higher education levels, private sector participation is more. In the total 23,964 high schools; over 9,900 or 41% are operated by the public sector while a majority of high schools, around 59%, are provided by the private sector.

REGION/ PROVINCE		Literacy rates (10 years & above)			GER Primary (age 5-9)			NER Primary (age 5-9)		
		2006-07	2007-08	2008-09	2006-07	2007-08	2008-09	2006-07	2007-08	2008-09
Pakistan	Male	67	69	69	99	97	99	60	59	61
	Female	42	44	45	81	83	83	51	52	54
	Both	55	56	57	91	91	91	56	55	57
	Rural	45	49	48	84	83	85	52	51	53
	Urban	72	71	74	106	106	106	66	66	68
	GPI	0.63	0.64	0.65	0.82	0.86	0.83	0.85	0.88	0.87
Punjab	Male	67	70	69	106	102	102	64	62	64
	Female	48	48	50	95	92	92	59	59	60
	Both	58	59	59	100	97	97	62	61	62
	GPI	0.72	0.69	0.72	0.90	0.90	0.90	0.92	0.95	0.94
Sindh	Male	67	69	71	88	87	93	56	55	57
	Female	42	42	45	68	72	75	43	46	49
	Both	55	56	59	79	80	84	50	51	54
	GPI	0.63	0.61	0.63	0.77	0.83	0.77	0.77	0.84	0.80
Khyber Pakhtunkhwa	Male	67	68	69	96	94	102	56	55	58
	Female	28	33	31	67	71	70	41	41	45
	Both	47	49	50	82	83	87	49	49	52
	GPI	0.42	0.49	0.45	0.70	0.75	0.69	0.73	0.75	0.64
Balochistan	Male	58	66	62	89	88	93	49	47	51
	Female	22	23	23	52	59	54	32	35	36
	Both	42	46	45	72	75	75	41	41	44
	GPI	0.38	0.35	0.37	0.58	0.67	0.55	0.65	0.74	0.64

Source: Pakistan Social & Living Standard Measurement Survey 2008-09

**Table 13: Literacy Rate 10 yrs+, GER & NER Trend in Pakistan & Gender Parity Index (GPI)**

Source: Pakistan Social and Living Standard Measurement Survey, 2009.

The MoE estimates that the enrollment in public, but also increasingly in private sector, will continue to increase. Of the total number of secondary education schools, only 38% are the responsibility of the public sector, whereas 62% are operated and owned by the private sector. Overall, the total enrolment of students in schools is 69% in public sector schools and 31% in the private sector. In other areas, the private sector educational infrastructure fares better than public schools. According to survey<sup>9</sup> sponsored by the MoE, of the total number of teachers,

<sup>9</sup> The Pakistan Social and Living Standards Measurement (PSLM) initiated in 2004 (and to be continued up to 2015) has been an initiative designed to provide social and economic indicators at provincial and district levels. The data generated through multiple surveys have been used to assist the provincial governments in formulating

only 38% teach in the public sector while a majority of teachers, almost 62%, prefer instructing in the private sector. In high schools alone, the total number of teachers exceeds 439,000, out of which only 47% teach in the public schools but a majority of them (53%) teach in private schools.

### **4.3 Summary: Research Findings**

What has been observed from the case studies from both the developed and the developing countries is that design, finance, and function are intrinsically interlinked components of educational infrastructure. However, in practice, most educational infrastructure, particularly in developing countries, has followed a conventional method in the provision of education. These methods have proven to be wasteful, unsustainable, or irrelevant to the economic development requirements of modern times. Consequently, increasing investments in educational infrastructure in developing countries has not yielded necessary economic development. The missing link between investments in educational infrastructure and the desired results has been the integrated approach to design, finance, and functionality. In order to improve the effectiveness of schools, governments may need to look increasingly towards an integrated approach to the three components of educational infrastructure. Alternatives in terms of better design, sustainable financing, and optimal functionality are possible when the provision of educational infrastructure becomes more inclusive in nature.

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the poverty reduction strategies, help strengthen the development plans to be taken at district levels, and make assessments in the overall context of the Millennium Development Goals as initiated in the program in Poverty Reduction Strategy Paper (PRSP).

## **Chapter 5: Research Analysis and Recommendations**

### **Educational Infrastructure: the inclusive way**

*This Conclusion and Recommendations section draws the link between research objectives and the resulting analysis. The following text reviews the research objective, links the prevailing concepts pertaining to educational infrastructure practice, identifies the underlying challenges and opportunities, and lessons learned from case studies, and recommends ways to strengthen the sustainable functioning and output of public school systems. The research concludes that an integrated approach to design, finance and function can help achieve better results and also bring all stakeholders into a durable and mutually beneficial arrangement for successful delivery of educational infrastructure.*

#### **Improving the design, finance, and functionality of schools**

The research set out to recognize the prevailing models of educational infrastructure with a view to identifying the underlying challenges and has resulted in finding ways to strengthen the sustainable functioning and output of public school systems. The paper's objective was to determine the most appropriate strategy in terms of design, financing, and operational functionality in order to enhance the functionality of public education. The research relied on an objective evaluation of existing models, and focused on two case studies, one in a developed country (USA) and the other developing country (Pakistan).

What has been observed from the case studies from both the developed and the developing countries is that design, finance, and function are intrinsically interlinked components of educational infrastructure. Governments throughout the developed and developing countries have acknowledged that investments in educational infrastructure can yield sustainable economic development. However, in practice, most educational infrastructure, particularly in developing countries, has followed a conventional method in the provision of education. These methods have proven to be wasteful, unsustainable, or irrelevant to the economic development requirements of modern times. Consequently, increasing investments in educational infrastructure in developing countries has not yielded necessary economic development. The missing link between investments in educational infrastructure and the desired results has been the integrated approach to design, finance, and functionality. In order to improve the effectiveness of schools, governments may need to look increasingly towards an integrated approach to the three components of educational infrastructure. Alternatives in terms of better design, sustainable financing, and optimal functionality are possible when the provision of educational infrastructure becomes more inclusive in nature.

Based on the concepts and theories of these three interlinked components, the case studies highlighted certain variances embodied in the educational infrastructure of developed and developing countries. These variances consist of not just the level of resources, but also the socio-cultural factors and the organizational patterns. More significantly, the studies also suggest that the key to improvements in educational infrastructure lies in the integration of design, finance, and functionality, rather than solely on an individual factor alone. For instance, as observed in educational infrastructure in the City of Lahore, ineffectiveness of schools is primarily due to the lack of adequate linkages between various factors. In some cases, inefficiencies in educational infrastructure were attributed to poor design and not due to lack of financing which was readily available either from local or foreign sources. In most cases, the problem lay with dysfunctional organizational structuring. In only rare cases, the

three factors came together to produce good results. Consequently, it was evident that a better coherence and coordination was required in creating and then maintaining the educational infrastructure.

Transitioning from a conventional approach of provision of educational infrastructure system to an integrated one is essential. Currently, the most common form of delivery of educational infrastructure is carried out by public sector. This arrangement is subject to government budget, civil service procedures and normal codes and regulations. As observed from the case studies, governance of schools in developed and developing countries has consisted of a conventional method which, when implemented, has not been optimal in terms of efficiency and functionality of schools. The most common means is the ownership and operation of educational infrastructure projects by a public entity. A majority of schools are owned and controlled by the national or local governments. With both ownership and operation by the public sector, the conventional approach evokes little competition with private run schools. Consequently, incentives for any improvements in the performance and functionality of schools have been limited. As a result, public schools, particularly in developing countries, have become inefficient and lost their popular appeal.

The case studies also illustrate that school governance does not conform to a single “best-practice” approach. Regardless of whether governance of schools is centralized or decentralized, distinct social and political contexts of various urban regions, and the combination of the three interlinked factors, affects the outcome and the functionality of educational infrastructure. An integrated approach calls for governments to take a greater regulatory role in the provision of education, and delegate other operational tasks to the private sector. Educational infrastructure can be facilitated by the private sector in terms of designing of schools, to operation and management of certain facilities.

## **5.1 Design of Public Schools**

Design of schools ought to be capable of meeting modern day educational requirements and be result-oriented in terms of physical aspects. As observed in the case study of Pakistan educational infrastructure, paying closer attention to the design of schools can significantly improve the overall quality and provision of education, and make better use of the available resources. An ideal school is one that promotes linkages of better design, sustainable operation and optimal functioning and creates a space that is conducive to learning, collaboration and innovation.

Design of schools in urban cities of developing countries need to bear in mind the local conditions and be integrated with the urban core. For instance, the programmatic layout in a large number of schools in Lahore is organized such that it creates pockets of open spaces within the site that cannot be used efficiently. There is a large imbalance of academic versus non-academic ratio of spaces in school properties, with non-useable spaces a large percentage of available space. Thus, a majority of schools in Lahore are sometimes missing even the most basic infrastructure elements, which further impede the urban flow of activities. In the City of Lahore, it was observed that thirty-eight percent of schools up to secondary levels do not have adequate boundary walls, which resultantly creates security concerns and permits illegal squatting of street vendors on school’s properties. With the limited funds available to schools, the priority of construction of boundary walls is less in relation to other academic functions. A design must provide for a layout that maximizes the use of open surface area and align the spaces in accordance with adjacent buildings, thus reducing the surface area where



walls are needed. Additionally, it must maximize the useable spaces that extend to the roofs of schools. The spaces are a hybrid between the built structure and the landscape. Similar to how the programmatic relationships (academic versus non-academic) intertwine with existing physical spaces, the landscaped roofs are an extension of open spaces where students can learn and play. A majority of schools in Lahore do not have adequate supply of electricity, the expenditures and overheads are high, and the physical building itself consumes and wastes a bulk of energy that is provided. The added value of these landscaped areas is that it not only brings about a positive aura to the inner spaces through natural light and fresh air, but their placement facilitates the programmatic flow, maximizes space, and reduces unintentional operational expenditures. In addition, this integration of spaces does not disrupt the traffic flow of adjacent streets and increase efficient accessibility to the schools spaces.

The 21<sup>st</sup> Century educational infrastructure requirements call for new ways of designing schools in both developed and developing countries. A lot of students in both developed and developing countries currently learn in standard designed rooms – spaces that are organized, are similar in performance, and resemble almost uniformly with all schools across urban regions. Almost every classroom is distinctively rectilinear in shape, with a blackboard hung on one, and not all classrooms (particularly in developing countries) are fitted with a window. Poor ventilation, over-crowdedness, lack of useable spaces is the norm. These are some of the most pressing issues faced by many learning spaces today. Innovative and integrative approaches are needed. Although, the role of technology today has played a significant role in advancing societies, much of the technological advances need to be benefitted by schools today. Unfortunately, with limited financial resources omnipresent in schools today, the installation of technological equipment (computers, media, wiring) in all classrooms become difficult. As observed in the schools of Lahore, roughly thirty-two percent, are overcrowded, cramped, and have poorly ventilated classrooms that limit the output and quality of education. As an alternative approach, the integrated design methodology suggests creating synergy from available resources by constructing learning spaces that can are larger, can accommodate multiple students and teachers, and is resource efficient. Shared spaces reduce the need for additional partition walls and conduits that consume bulk of schools resources. As in the case of developed countries, where true learning is a process, the schools contain spaces where students not only learn in classrooms, but throughout all spaces. Schools in developing countries need to be designed as such. Starting from the reception area, shared academic spaces such as media and technology spaces, ought to be allocated as a large continuous area where information gathering, student meetings, and knowledge sharing can take place. This large area would serve not only as an access to all other academic spaces, but it is here where all the flows of students, teachers, knowledge seekers, and media would intersect equally -- thus reducing the need for additional corridors, finishing, and construction. Students of all grades would collaborate on projects, work on activities, and learn from peers in common space with comprehensive access to technology and information sharing. Resultantly, the information and knowledge is linked inclusively with technology, building organization and programmatic requirements in supplement to the teaching and student learning.

Educational requirements of primary, secondary, and high school education have similar internal logic, where unique freedom of movement, interaction between program and subjects, are required. True learning is a process, as most schools in the United States suggest. Schools in developing countries, in contrast, need to acclimatize the understanding that the effectiveness of educational infrastructure and conduciveness of its spaces meant for learning transcends beyond the conventionality of a typical classroom. Successful design of spaces facilitate adaptive academic curriculum, provide flexibility for students and teachers to work

together, and manifests various opportunities where organizational structuring functions through an inclusive way. Academic spaces and non-academic spaces for each grade level need to have share spaces and be allocated adjacent to each other to encourage peer collaboration, and also play a greater role in the educational process. These innovative and inclusive approaches to design of educational infrastructure manifest collaboration not only between school administrators and student participants, but also promote integration of academic programs, and fusion of building resources, organizational structuring.

## **5.2 Strengthening Financial Arrangements of Educational Infrastructure**

Finding the most appropriate and sustainable financing mechanism for educational infrastructure is critical. Bulk of financing for educational infrastructure throughout the developed and developing countries is sponsored by the national governments which seek cost-effective methods in the delivery of public education. At times, whenever possible, the smart governments incorporate private sector to provide for educational infrastructure.

Nevertheless, as the case studies also reiterate, focusing solely on the cost factor alone can sometimes reduce the functionality and effectiveness of the education provided. Consequently, it is imperative that the financial resources available are in sync with the most optimal design and vice versa. Additional decisions in financing for educational infrastructure include several other interlinked factors such as tax policies, legal barriers, and social equity. With funds from property taxes and inter-governmental transfers as the primary financial mechanism available to schools, the school administration is constantly striving to reduce expenditures and increase efficiency. As seen in the case of educational infrastructure in Lahore, such practices constrain schools ability in improving the design of the facility, as well in streamlining the organizational structure. It is thus necessary that adequate finance systems be in place that allows schools with the needed flexibility for providing adequacy and quality education.

### **Public-private investments focused on education**

Provision of the education infrastructure need not be central governments' responsibility in entirety; rather the schooling requirements are primarily a local government's responsibility. As observed in the case of developed countries, like that in the United States, financing of education infrastructure varies dramatically between States: from eight percent in the State of New Hampshire to over seventy percent in the State of New Mexico. Of the total share of school district's needs from general budget, states fund approximately fifty percent, while local governments fund an average of forty percent received from local property taxes, and the federal government contributes the remaining ten percent. Furthermore, funds are allocated as either general funds distributed on a per-student basis, or as category wise funds that are allocated for specialized programs/functions. As there are considerable economic and social variances between the different states, the challenge arises in clearly defining the equity of allocation of financing. In the US, this generally implies a relatively identical per student expenditure across different school districts, while the remainder of expenditures for supporting education is dependent on local property tax rates and revenues. Hence, each state at first establishes a minimum required level of funding per student before utilizing states' funds to either subsidize local efforts, or to increase spending to that minimum required level. As there are no legal binding regulations by federal/national government on the amount that need be maintained for minimum level, thus it is widely inferred that more affluent states/communities will spend more on education.

In order to reduce costs for the national government, “funding formulas” can be utilized to drive education reform rather than allocate lump-sum funds to school districts directly. This would ensure that the districts or local communities receive allocated national funds based on student needs and that all schools receive adequate resources. At a local level, the free choice of schools should be retained and not colluded by the interests of the unions and/or educational bureaucracy. Concurrently, finance system need to encompass designed to ensure that all students are afforded equal opportunities. Minimum level of funding per student per student should be determined and ascertained by the national government, but additional funds be the responsibility of the district or the private sector, based on the context specific contract and intensity of services students require (such as students with disabilities, costs of transportation etc.)

Furthermore, local schools and/or communities ought to be trusted with greater flexibility on how funds are used, while holding them accountable for the expenditures. It would be recommended that school funding formulas be more closely linked with finance, governance and course programs to enhance students’ performance in school. Certain examples include allocating funds specifically for professional development, technology programs, and recompenses to schools that exceed performance expectations. Private sector can further be provided financial incentives and assistance for the construction of local schools. Instead of national government, local communities would need to provide additional funds to support the renovation of existing facilities, enhance the technological capacity of the school, and to accommodate for additional number of students.

The contribution of education infrastructure is estimated by the impact it creates on the productivity levels, measured primarily by the social rate of return to investments in education infrastructure. The rates of return attempts to encompass a majority of social benefits such as health and other external effects, however, a number of the indicators measured are qualitative in nature and are thus difficult to quantify. Nevertheless, the concept of the rate of return to investments in education is based on similar methods to investments in other sectors, and is a summary of costs and benefits of such investments over a certain period of time. Expressed in annual percentage yield, the rate of return compares differences in earnings of individual over a specific duration to those with or without a particular education level and to the cost to the national economy in provision of the infrastructure (World Bank 1991). Rate of return to education are drastically high in lower to middle income nations, including many countries in South Asia and Pakistan.

The challenges faced by governments in the provision of educational infrastructure have strengthened the need for development, and allowed for other avenues of needed improvement. The intervention of the private sector is positively utilized by clearly defining the requirements and parameters of the needed service, ranging from the maintenance of the public facility, to extended operation of the facility through use of concessions or leases. Conclusively, to pave the way for governments, the focus may need to shift from monitoring inputs (for instance student-teacher ratio) to monitoring results (graduation rates, students reading at grade level, etc.). Redevelopment in educational infrastructure has the potential to reduce such social conflicts while strengthening the growth in living standards coupled with advancements in newer technologies and access to global market. This restructuring will provide the public schools and related education infrastructure with the level of competition needed to trigger innovation and forward thinking approaches.

## **Private Sector Participation**

As observed in the research, the role of the private sector in the provision of educational infrastructure can significantly improve the functionality of schools. As the three interlinked factors are sensitive to schools functional capacity, collaboration between the public and the private sector is critical. In this mode of financing arrangement, the public sector delegates some operations of educational infrastructure to private sector. Leases and concessions will allow for private sector participation in educational infrastructure without significantly changing the nature of existing institutions or crafting any new regulatory framework.

The public-private participation for educational infrastructure takes different forms, and can yield significant benefits in terms of better design and optimal organizational structure. For schools, the most common form is when the government owned schools outsource some of the facilities requirements to a more efficient private sector, such as cleaning, maintenance, computer labs, sports facilities, etc. This allows the public sector educational infrastructure to achieve considerable savings and make optimal use the limited resources for other functions. As observed in the financing arrangements for developing country of Pakistan, in certain instances, some international non-governmental organizations acted as the donor for funding of educational infrastructure in urban cities of Pakistan. Likewise, private sector firms have also voluntarily made philanthropic contributions to public sector institutions.

The problems in educational infrastructure today as presented in the case studies highlight the increasing cost of public education. The existing infrastructure needs fiscal reform of the nature that provides an alternate to dependency on governmental grants. With public-private partnership, a useful role in the provision of educational infrastructure is possible. The existing schools would be able to procure their own sources of funding and target funding where it is needed most. The public-private arrangement suggests that governments still remain involved in the provision of education, but greatly from a regulatory stand-point. With private sector involvement, school governance can achieve efficiency, and consequently reducing expenditure, cost effective, and financially sustainable.

Private sector collaboration can be incentivized. As in the case of developed countries, where government maintains the funding spent per student on education, the funding amount is large enough to cover the costs of a private sector involvement. However, it is important to ensure that sufficient checks and balances are set in place to avoid corruption and bringing the system into disrepute. To enhance public-private partnership, it is essential that no adequate conditions be attached to the partnership contract, enough that does not interfere with the freedom of private companies to innovate in the provision of education infrastructure. Concurrently, public sector can define academic related requirements (in the form of academic standards and assessments) and determine the minimum level of funding necessary to provide an adequate education to students.

## **Contractual Relationships**

Involving private sector without sufficient checks and balance system sometimes leads to corruption cases, which brings the public sector school system into disrepute. Contractual relationships can include sufficient checks and balances on adequacy and equity grounds. Public-private partnerships, like that of PFI-type arrangements have a handful of precedents from which recommendations and opportunities can be drawn from. A number of countries throughout the world and particularly in Europe like that of UK, The Netherlands, and

Germany, Canada and Australia have engaged in PFI model for financing of public schooling. The PFI-type program to this day is among the largest-infrastructure related partnership encompassing more than a hundred and sixty (160) education related projects with a total monetary value of over £5.8 billion. Within the school projects, financing has been carried forward with the development of hostels, sports and leisure facilities. The intervention of the private sector (or private contractors) can be positively utilized by clearly defining the requirements and parameters of the needed service, ranging from the maintenance of the public facility, to extended operation of the facility through use of concessions or leases.

Consequently, engaging private contractors for the delivery of a public service, or binding a partnership between two sectors can prove beneficial for the end users in a majority of ways. By enabling private contractors and developing definitive goals, the services can be based on commercial lines, free from bureaucratic constraints, but subject to government regulations and standards. Furthermore, competition from other private contractors enables providers to maintain a certain level of performance for the delivery of the service. For certain educational infrastructure related services, like that of solid waste collection, contracts can be awarded to service rights. In this situation, contracts are not designed to “exclude” use of the public facility, which implies that leases and concession of this nature improve management and financing of the service, without causing a detrimental effect to existing service. It also prevents a need to drastically revamp the organizational structure within schools pertaining to solid waste management. Hence, contractual relationships can be consistent with the major trends of growth of private participation, and be made such that private sector serve as partners in education. Furthermore, contractual arrangements serve as a link between the financial arrangements to the institutional capacity of educational infrastructure. Strengthening and effectively financing schools requires integration between the financial arrangements and institutional capacity.

## **Enhancing Functionality of Educational Infrastructure**

Based on the lessons learnt from educational infrastructure models in developed and developing countries, it can be inferred that the way in which the educational institutions are managed goes a long way in enhancing the quality of education delivered. Overcrowded classrooms and poor pedagogy are not just a function of resources but also management. With a better governance model, students’ ability to learn can be vastly improved. On the other hand, underperforming or poorly run institutions continue to struggle and finally may end up in a spiral of failure. This is not beneficial for anyone involved: teachers, parents, students, and the economy receiving lesser than needed engaged minds.

In a world in which the pace of change is increasing, we simply cannot afford to give current and future generation of students anything short of a learning environment and educational infrastructure system that actually gives them what they need to be successful. It is therefore recommended that in order to enhance the functionality of educational infrastructure in developing countries, it is important for schools to revamp their organizational structuring.

## **School Governance and Management**

Governments throughout the developed and developing countries have a common vision to ensure that all students receive quality education and are given the same opportunities for high levels of achievement. However, in order to realize this goal, certain measures in the organizational structuring of facilitates need to take place. Furthermore, management of schools and of its facilities, in terms of leadership, human resources, and competency needs to be addressed. As observed in the cases of developed countries, academic standards have been

developed and used as not only a means to establish tests, but also to measure the schools progress toward meeting those standards. In effect, this arrangement also holds schools accountable for not reaching those standards. However, this system is possible when the responsibility of the national government shifts from the provider of infrastructure to regulation of education service.

In light of management of education infrastructure theories, the two governance systems (centralized or decentralized) draw useful connection to the manner in which schools can increase their functionality. As in the case of developed and developing countries, both governance systems highlight interdependency of resources, cognitive and effectiveness at all levels. In order to enhance functionality of education infrastructure, the governance system has been tailored and approaches taken according to the schools respective requirements. However, this system has not achieved equitable success for every school. As in the case of schools in developed as well as developing countries, certain schools outperform others, while some lag considerably behind. What makes the difference is the organizational structuring which is in accordance with the resources available and the overall physical aspects of the school.

### **Public-private management**

Similar to the involvement of the private sector in terms of financing of educational infrastructure, the private sector can also play a significant role in school governance. An innovative way of management of schools is one that utilizes the New Public Management governance techniques for educational infrastructure. New Public Management is burgeoning global trend that draws various management techniques from the private sector and emphasizes a shift from traditional public administrative practices to decentralizing management within public services. New Public Management is driven by economic, social, and political factors, and places an emphasis on increased use of market-like competition in rendering numerous public services, like educational infrastructure. It further calls for devolving budgets, and accentuating levels on outputs and performance.

As observed in the developed countries, particularly in schools of New York City, parents are increasingly becoming involved in the governance of the schools their children attend. This involvement is slowly progressing towards the developing countries, as observed in the schools in Lahore. According to a recent World Bank report, many schools in developed as well as developing countries today have found that communities who are willing to participate in the governance of the schools are also willing to assist in the financing of schooling (World Bank 2009). Resultantly, educational infrastructure is gradually shifting towards greater accountability for their performance with greater degree of community and parent participation. Parents and communities who are involved in the decision making of the schools are increasingly satisfied and indirectly reduce the costs of education. However, such involvement in school governance is not easily achieved by all schools in both developed and developing countries. Diversity among various educational infrastructures in countries re-emphasizes differing styles of teaching, curriculum, and organizational structures. Although the varying types of programs create a possibility for garnering success for functionality of schools, there are different governance mechanisms that are important to be considered.

Currently, as education infrastructure depends greatly on grants and funding from higher tiers of government, is also subject to lengthy administrative procedures that can prove costly for schools. Governance of schools is affected by the context-specific political, economic and social system values of the societies where the schools are situated. As observed in the case

studies, schools that are owned and operated solely by the public sector have yielded little results partly because the provisions that are rendered are “too overwhelming to be handled alone” (Beauregard 1996; Stoker 1995a; Stone 1989). Thus, New Public Management methodology calls for the need to allow governmental intervention as facilitators, and private sector involvement as increasingly entrepreneurial in their approach to school management. Forming strategic partnerships between public and private sector, from financial arrangements to operation of schools certain functions, an increasingly integrated approach is thus formed. Based on local conditions, partnership and management of schools can be tailored to lead to efficacious use of resources mainly through selective acclimatization of tasks. This would be a step towards a creating functional schools, and rectify organizational structuring related issues in schools in urban cities of developed and developing countries. An integrated approach at the local government can help produce schools which are designed keeping in view the local climatic and cultural peculiarities, financed by mobilizing private resources to augment the limited government funding, and utilize the local human resource in managing those schools. Such an integrated approach would help create maximum ownership of the entire educational infrastructure in a given locality and make it optimally sustainable.

## Conclusion

Education is central to achieving sustainable economic development. A well-managed educational infrastructure, particularly in developing countries, could enable governments to produce the present and future managers of the society. Educational infrastructure – defined for our purposes as the education system in all its aspects, mainly the structures, funding mechanisms, and management, is the foundation that would ensure sustainable quality education for all segments of the population. It has been observed that most developing countries continue to follow conventional methods for the delivery of educational infrastructure. The existing provision of education is either too rigid, unsustainable, or bears no relation to the economic development requirements of the modern times. This has necessitated a critical look at the current educational infrastructure.

The research set out to recognize the prevailing models of educational infrastructure with a view to identifying the underlying challenges and has resulted in finding ways to strengthen the sustainable functioning and output of public school systems. The paper’s objective was to determine the most appropriate strategy in terms of design, financing, and operational functionality in order to enhance the functionality of public education. The research relied on an objective evaluation of existing models, and focused on two case studies, one in a developed country (USA) and the other developing country (Pakistan). The research determined that an integrated approach to design, finance and function can help achieve better results and also bring all stakeholders into a durable and mutually beneficial arrangement for successful delivery of education.

Based on the case study examples from the developed and developing countries, it was noted that the issues of today’s educational infrastructure can be better addressed by exploring alternatives in terms of better design, sustainable financing and optimal functioning. These are three common interlinked components that, as the case studies in this paper also highlighted, affect the overall efficiency and efficacy of educational infrastructure of developed and developing countries. The variances in the factors consist of not just the level of resources, but also the socio-cultural factors and the organizational patterns. More significantly, the key to improving educational infrastructure lies in the integration of design, finance, and functionality, rather than pursuing each component in isolation. For instance, as observed in

educational infrastructure in the City of Lahore, ineffectiveness of schools is primarily due to the lack of adequate linkages between various factors. Not all inefficiencies in educational infrastructure were attributed to poor design alone, or because of lack of adequate financing, or only due to dysfunctional organizational structuring. Rather, the three components collectively impacted the provision of educational infrastructure, positively where these factors complemented each other and negatively where they did not. Consequently, for educational infrastructure to be geared towards enhancing functionality, designing of schools need to take into account the financial and organizational factors. School designs need to make efficient use of the existing available space and resources and achieve the best utility, i.e. relative satisfaction. Likewise, financial arrangements and budget structuring of schools must facilitate the core requirements of educational infrastructure, and allocate resources where they are needed most. This aspect comes out as a useful lesson from the case study of New York City schools, which often rely more on optimum financing mechanisms. In the same vein, school governance and organizational structuring should be tailored to maximize the use of available spaces while not straining school's financial resources.

An integrated approach to design, finance and functionality, has a clear edge over the standardized approach, which is followed in most developing societies, whereby design, financing and management are all addressed in isolation of each other. Consequently, the infrastructure remains paralyzed, either due to lack of better buildings, or want of sufficient financing, or adequately trained teachers and skilled managers. This mismatch between management and financing mechanism creates variances in schools' budgets and organizational structuring which in turn causes disproportionate standards of performance. Thus by employing an integrated approach, governments (of both developed and developing countries) can benefit enormously from the complementarities in these components.

Another important feature is the better use of public-private partnerships in the provision of educational infrastructure. With greater private sector involvement, governments can burden-share their responsibility of providing quality education. It is often noted that private sector by definition is more efficient while the public sector is more concerned about the public welfare. By combining efficiency with welfare, it is possible to achieve optimal results. Public private partnerships have enabled a successful paradigm shift in educational infrastructure thinking, focusing more on results and sustainability.



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