HURRICANE KATRINA, THE EDUCATION OF AFRICAN AMERICANS

LeeRoy Bronner, Ph.D., P.E., Olusola Laniyi

Morgan State University

Background

Hurricane Katrina hit the gulf coast in August 2005 with devastating effects along the coastlines of Alabama, Mississippi, and Louisiana. The city of New Orleans was almost completely flooded. Katrina is estimated to be responsible for $81.2 billion (2005 US dollars) in damages making it the costliest hurricane in US history, and killed at least 1,836 people, also making it the deadliest U.S. hurricane since the 1928 Okeechobee Hurricane [1]. The people who remained left behind in New Orleans to suffer the brunt of the hurricane's consequences were disproportionately African Americans who were unable to leave the city on their own due primarily to their level of poverty. Government response was slow and inadequate causing those left behind to be without food and water for a couple of days. The devastation caused by Hurricane Katrina exposed the severity of the problems facing the African American community, whose population remains largely uneducated, poor and unemployed [1].

Social scientists have known for years that many young black men between the ages of 18 and 34 in America are in trouble, without higher education, without jobs, and without hope. These groups of young men are at the bottom of the education spectrum, very large numbers of whom grow up in pretty racially segregated and low income neighborhoods, and usually attend relatively segregated and low income schools [2]. Harry Holzer, a professor of public policy at Georgetown University and a visiting fellow at the Urban Institute, has co-authored a report called "Reconnecting Disadvantaged Young Men" which makes the scope of the crisis clear. He says, "We're mostly talking about that group of young men at the bottom of the education spectrum, very large numbers of whom grow up in pretty racially segregated and low income neighborhoods, and usually attend relatively segregated and low income schools." He adds that many of those youth don't get high school diplomas, "and even when they do, many don't have the skills that employers expect to go along with that." According to some estimates, up to 75 percent of America's black inner city males with only a high school education or less are jobless, meaning they are looking for work, or have given up the search. During much of the last century, many urban blacks - even those without skills - could earn a decent living in the manufacturing sector. Now, the technology sector offers the most job opportunities. But without technical training or college education, many young blacks are shut out [2].

This paper explores ways of improving the education of African Americans by significantly increasing the number of college graduates from Historically Black College and Universities (HBCU) as a way of increasing the number of opportunities available to them. The HBCUs are institutions of higher learning, whose principal mission is to educate African Americans, and these institutions have evolved since their beginning in 1837 when their primary responsibility was to educate freed slaves to read and write. At the dawn of the 21st century, along with graduate and post-graduate degrees, HBCU's offer African American students a place to be educated and earn a sense of identity, heritage and community. For decades after their establishment, HBCUs were virtually the only institutions providing tertiary educational opportunities for African Americans, and for students from Africa and the Caribbean desirous of an American college or university education. Today, there are 105 HBCUs enrolling almost 300,000 students or about 24 percent of all African Americans attending colleges and universities. In recognition of their powerful role in educating African Americans for well over 100 years, President Jimmy Carter signed Executive Order 12232, which established a federal program "... to overcome the effects of discriminatory treatment and to strengthen and expand the capacity of historically black colleges and universities to provide quality education." in 1980 [3]

During their existence, HBCUs have; Provided undergraduate training for three-fourths of all Blacks holding a Doctorate; three-fourths of all black officers in the armed forces; and three-fourths of all federal judges; Graduated more than three-fourths all degrees conferred to African Americans in dentistry and medicine; Accounted for 50 percent of black college faculty in traditionally white research universities; Led institutions awarding baccalaureate degrees to black students in the life sciences, physical sciences, engineering, and mathematics. HBCUs have greatly contributed to the nation's workforce by producing a multitude of notable graduates. According to the Research Policy Information Center's 1999 study, "Students at Historically Black Colleges and Universities: Their Aspirations and Accomplishments," HBCUs accounted for only 4% of all 4-year U.S. colleges and universities and 21% of all African-American collegians, but awarded 28% of all baccalaureate degrees to African Americans. When considering degrees in science and engineering, this percentage jumped to 31%. This same study cited three reasons that African Americans continue to attend HBCUs: 1) Significantly lower cost of living, tuition, and more generous financial aid packages. 2) Higher retention rates. 3) More likely to enter a program in sciences, engineering, and business.

Benefits of increasing the number of college graduates

Increasing the number of African American college graduates would provide many tangible economic and social benefits to the nation and the individuals involved. Education is the single most important factor in providing the skills and knowledge needed by the nation's economy and in determining the level of individual income. Higher levels of education are also associated with better health, better job satisfaction, and participation in civic and commercial activities [4]. Other benefits include savings in public welfare and health programs, increased tax revenues, and decreased income inequalities between racial/ethnic groups. In addition, an ethnic community would gain a cumulative number of leaders, role models, and mentors for African American youths to emulate, further increasing the educational attainment of future generation. Finally when faced with situations similar to Hurricane Katrina, African Americans would not

rely solely on the government for survival if there is a drastic improvement in their economic situation. Meeting the goal however will require proactive interventions at all levels of education: in high school, at the transition between high school and college, and in college such as; raising public awareness of the need for greater investments in HBCU education, increasing the capacity of the HBCUs, supporting evaluation of existing programs and experimentation with new programs, and focusing as much attention on keeping students in college as is currently given to preventing students from dropping out of high school.

An object-oriented methodology for analyzing large complex software systems (i.e., the Unified Modeling Language (UML)) will be used to analyze the problem and proffer a solution. Another very important part of this research is Information Design (ID) which involves defining, planning, classifying, storing and presenting the research information. The results of this research will be delivered as an internet site. This will ensure that the report will be communicated with clarity, precision and efficiency to the stakeholders who can effect the necessary changes required to significantly increase the number of graduates from the HBCUs.

2. **Objective**

The primary objective of this study is to research ways of improving the education of African Americans by significantly increasing the number of college graduates from Historically Black College and Universities (HBCUs) using object-oriented software analysis and design methodologies. HBCUs are institutions of higher learning, whose principal mission is to educate African Americans. Based upon this objective, there are two significant questions to be addressed by this research:

a) Is it possible, through innovative measures, for the current set of HBCUs throughout the United States to educate African Americans on a massive scale?
b) What is the best way to design the format and presentation of the education information solution such that the target audience and the stakeholders can fully comprehend the problems and also act decisively to implement the necessary solutions?

3. **Project Scope**

This research project has the possibility of becoming an enormous effort. Therefore, it is imperative to analyze the problem and set bounds on the research. The project scope defines the boundaries (figure 1) of the project. Also, the scope defines the aspects of the system that are outside the project boundaries.

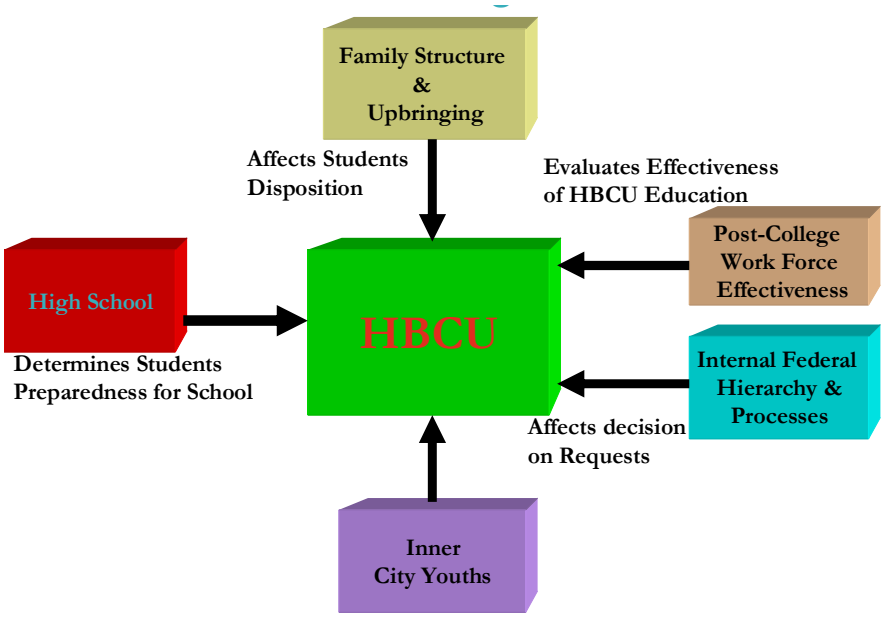


Figure 1- Context Diagram

To more clearly define the scope of this research, a diagram defining the key functions of the research model is outlined below in figure 2.

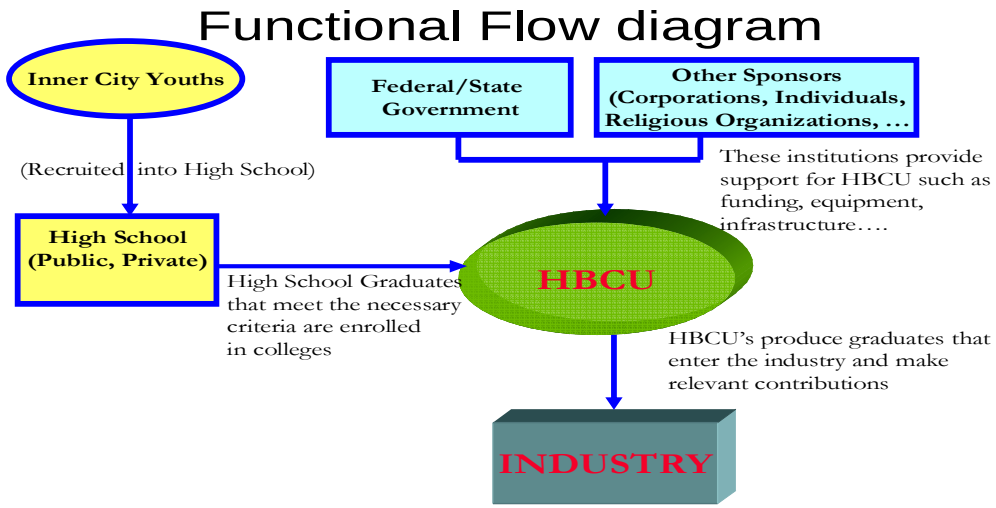


Figure 2-Functional Flow Diagram

4. **Object-Oriented Methodology**

Object oriented analysis and design (OOAD) is a visual language for specifying, constructing, and documenting the artifacts of systems for analyzing large complex systems. OOAD applies object modeling techniques to analyze the requirements for a context (e.g., a system, system modules, organization, or business unit), and to design a solution. Most modern object-oriented

analysis and design methodologies are use case driven across requirements, design, implementation, testing, and deployment. The behavior of the system is achieved through collaboration between these objects, with the objects sending messages to each other. The key theme of OOAD is that objects represent encapsulated sets of services (data plus functions) performed by the system. System requirements are represented in terms of interacting objects. That is, both the world of the client, and the world of the developer are modeled in terms of objects that collaborate with each other. One of the strengths of the OOAD approach is the lack of real distinction between problem analysis and solution design [5].

Benefits of Object-Orientation:

1. Problem domain is modeled in terms of real-world objects.
2. Technology is designed to support abstraction, encapsulation, and generalization. These are key to managing complexity and achieving reuse.
3. No real distinction between analysis and design terminology and tools, thus improved communication between all stake holders.

4.1. Object-Oriented Analysis (OOA)

Object-oriented analysis (OOA) is concerned with developing software engineering requirements and specifications that expressed as a system's object model (which is composed of a population of interacting objects. OOA can yield the following benefits: *maintainability* through simplified mapping to the real world, which provides for less analysis effort, less complexity in system design, and easier verification by the user; *reusability* of the analysis artifacts which saves time and costs; and depending on the analysis method and programming language, *productivity* gains through direct mapping to features of Object-Oriented Programming Languages [6].

An object is a representation of a real-life entity or abstraction. OOA specifies the structure and the behavior of the object- these comprise the requirements of that object. Different types of models are required to specify the requirements of the objects. The information or object model contains the definition of objects in the system, which includes: the object name, the object attributes, and object relationships to other objects. The behavior or state model describes the behavior of the objects in terms of the states the object exists in, the transitions allowed between objects, and the events that cause objects to change states. OOA views the world as objects with data structures and behaviors and events that trigger operations, or object behavior changes, that change the state of objects. The idea that a system can be viewed as a population of interacting objects, each of which is an atomic bundle of data and functionality, is the foundation of object technology and provides an attractive alternative for the development of complex systems [6].

4.2. Object-Oriented Design (OOD)

OOD is a design method in which a system is modeled as a collection of cooperating objects and individual objects are treated as instances of a class within a class hierarchy. Four stages can be identified:

1. Identification of the classes and objects
2. Identification of their responsibilities
3. Identification of their relationships
4. Specification of the class and object interfaces and implementation

Object-oriented design takes the conceptual model that is the result of object-oriented analysis, and adds implementation constraints imposed by the environment, the programming language and the chosen tools, as well as architectural assumptions chosen as basis of design. The result is code designed in an object-oriented way as a set of classes and objects. The concepts in the conceptual model are mapped to concrete classes, to abstract interfaces in application program interface (APIs) and to roles that the objects take in various situations. The interfaces and their implementations for stable concepts can be made available as reusable services. Concepts identified as unstable in object-oriented analysis will form basis for policy classes that make decisions, implement environment-specific or situation specific logic or algorithms [6]

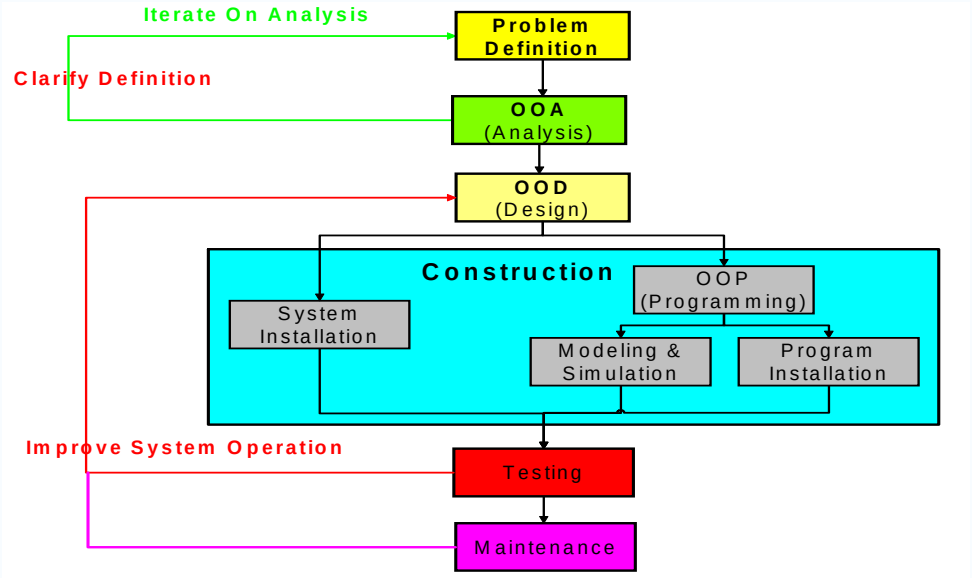


Figure 3-Object Oriented Life Cycle

The object oriented life cycle consists of the following stages: Initial problem definition, use case analysis, final problem definition, design, construction, implementation and evaluation.

5. **System Solution - Methodology**

To address these issues effectively, we will use UML to model the HBCUs to enable us to conceptualize the mode of operation of these institutions. This will aid us in understanding how they operate, are funded, method of recruitment, standard and quality of education they provide, the various challenges they encounter, and a host of other issues.

The Unified Modeling Language (UML) is an attempt to standardize the notation used for describing the products of an Object-Oriented Analysis and Design effort. The goal is to have a notation that is independent of the method used to arrive at the design, in the same way that architectural drawings communicate the design of an architect to a builder independently of how the architect invented the design.

The Unified Modeling Language (UML) has two classes of diagrams; Structural and Behavioral diagrams. Structural diagrams describe the static parts of the system; behavioral diagrams describe the dynamic parts of the system. Behavioral diagrams are further classified into Interaction and State diagrams.
Structural

- Class diagram - Classes, interfaces, collaboration, relationships
- Object diagram - objects and relationships as instances of prototypical cases
- Component diagram - components and relationships to illustrate implementation view of system
- Deployment diagram - configuration of runtime processing nodes and objects that exist on them

Physically an executable UML specification comprises a set of models represented as diagrams that describe and define the conceptualization and behavior of the real or hypothetical world under study. The set of models, taken together, comprise a single specification that we can examine from several points of view. There are three fundamental projections on the specification. The first model identifies, classifies, and abstracts the real or hypothetical world under study, and it organizes the information into a formal structure. Similar objects in the subject matter under study are identified and abstracted as classes; characteristics of these objects are abstracted as attributes; and reliable associations between the objects are abstracted as relationships [6]. This first model is expressed as a UML *class diagram.*

Next, the objects (instances of the classes) may have lifecycles (behaviors over time) that are abstracted as state machines. These state machines are defined for classes, and are expressed using a UML state chart diagram. The behavior of the system is driven by objects moving from one stage in their lifecycles to another in response to events. When an object changes state, something must happen to make this new state to be so. Each state machine has a set of *procedures*, one of which is executed when the object changes state, thus establishing the new state.

5.1. **Static Model Development**

The static characteristic of a system is essentially the structural aspect of the system. The static characteristics define what parts the system is made up of [7]. The static models in UML are: Class Diagram, use case diagrams, object diagrams, component diagram, and the deployment diagram.

Use Case Models and Scenarios

A use case specifies a sequence of actions, including variants that the system can perform and that yield an observable result of value to a particular user or actor. In general a use case is a description of what a system is used for, and who uses it, without getting into details of how it performs its functions. A use case focuses on the externally visible aspects of a system. Use cases capture the functional requirements of the system that users use to perform their tasks. Each type of user is called an actor. Actors can be people or other systems. Actors communicate with the system by sending and receiving messages. Use cases are explained and elaborated through scenarios. A scenario is a specific path through a use-case. A scenario can be used to describe a typical pattern of use, such as add a new customer, or it could be used to describe an exceptional situation, such as customer's order denied by credit card service. A use case can be thought of as a primarily straight line state diagram, where there is a main path forward from start to intermediate to end states, with some alternative routings. Each scenario exercises one of these paths. Thus a use case should describe very closely related scenarios.

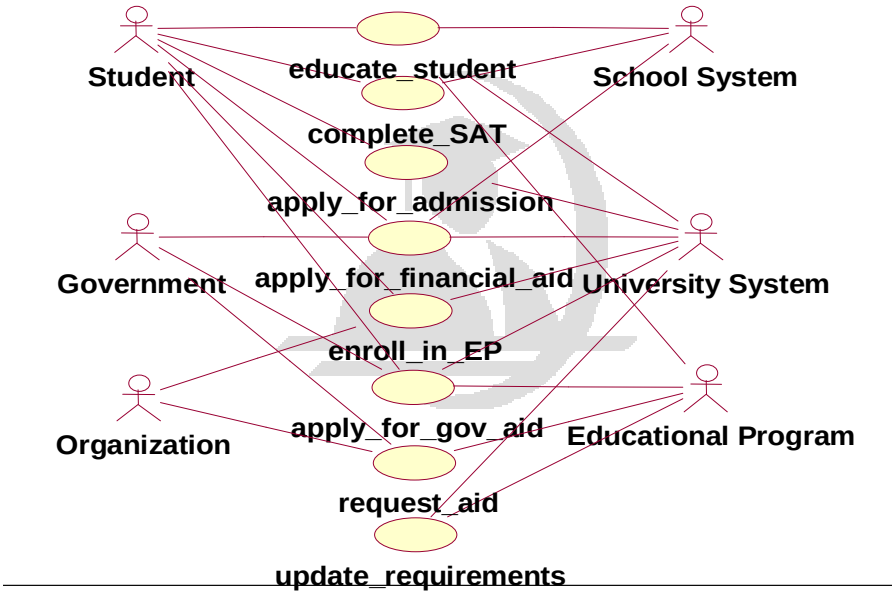


Figure 4-Use Case Diagram

The following actors can be identified in the use case diagram above; Student, Government, Organizations, School system, University system, and Educational program respectively. The

following use cases are shown in figure above; educate student, complete SAT, apply for admission, apply for aid, enroll in educational program, and update requirements

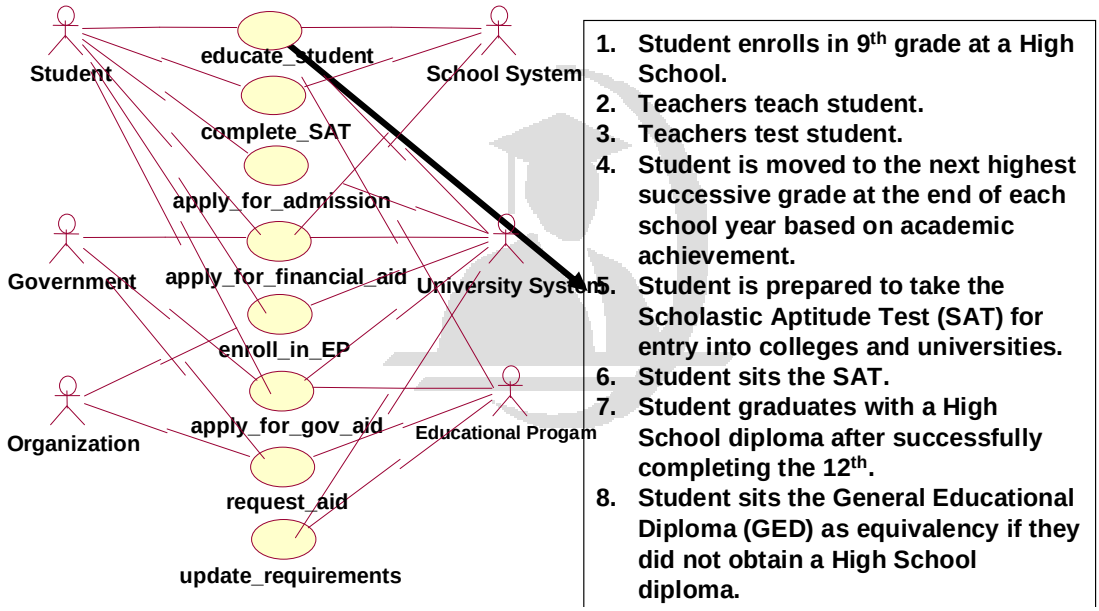


Figure 5-Use Case Scenario (Educate Student)

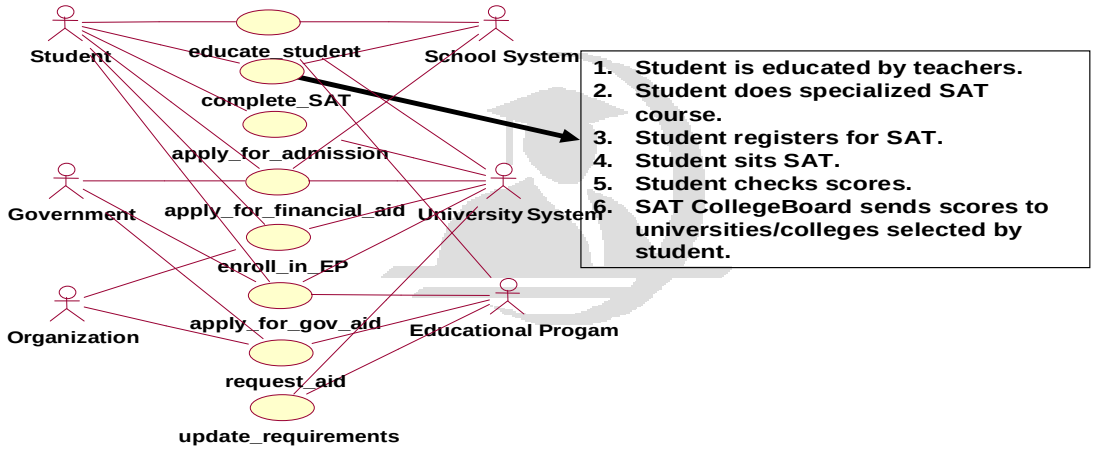


Figure 6- Use Case Scenario (Student Completes SAT)

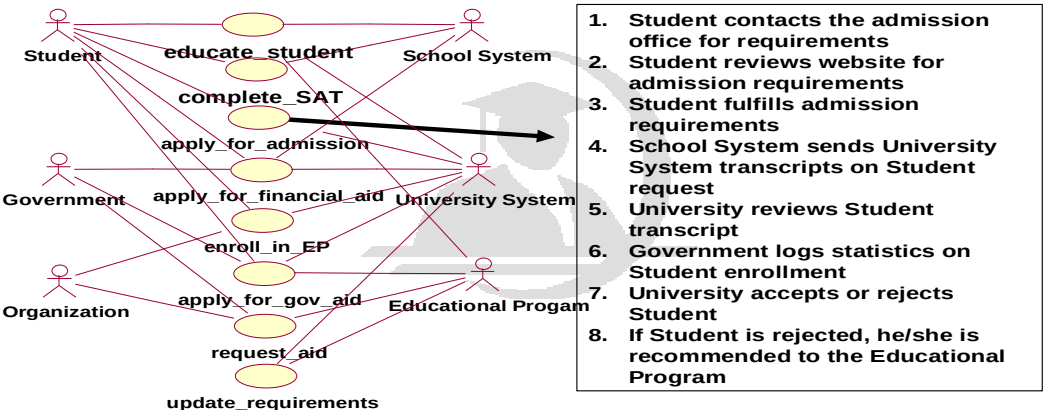


Figure 7-Use Case Scenario (Student Applies for Admission to College)

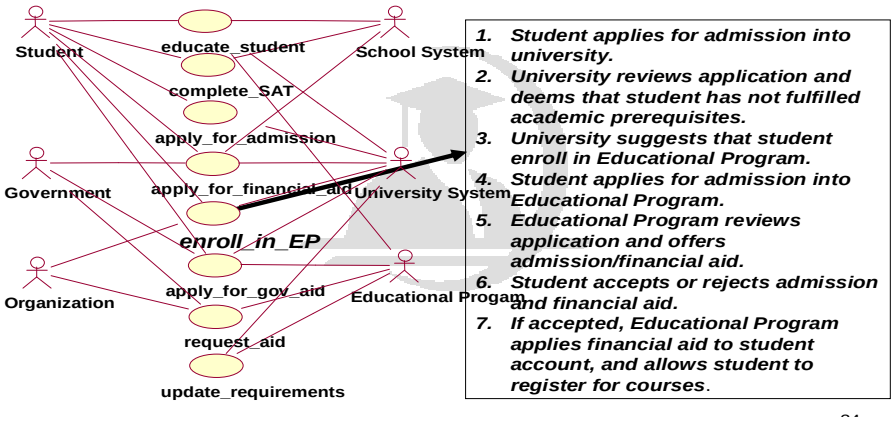


Figure 8-Student Enrolls in Educational Program

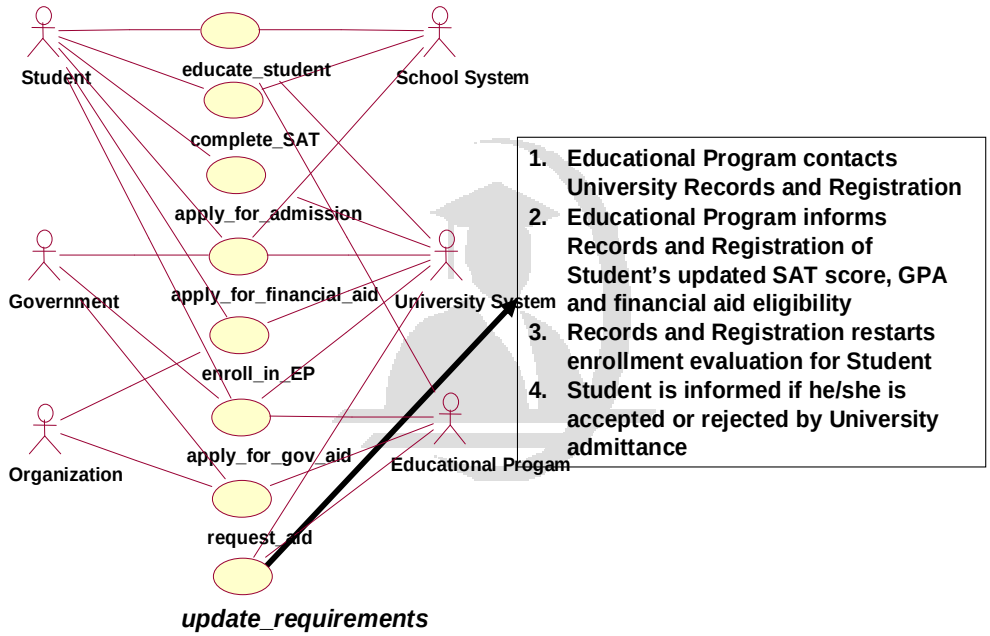


Figure 9- Requirements are updated

Class Diagrams

The class diagram describes the static structure of the system in terms of the classes and relationships between classes. Class diagrams are the mainstay of object-oriented analysis and design. Class diagrams show the classes of the system, their interrelationships (including inheritance, aggregation, and association), and the operations and attributes of the classes. [9]

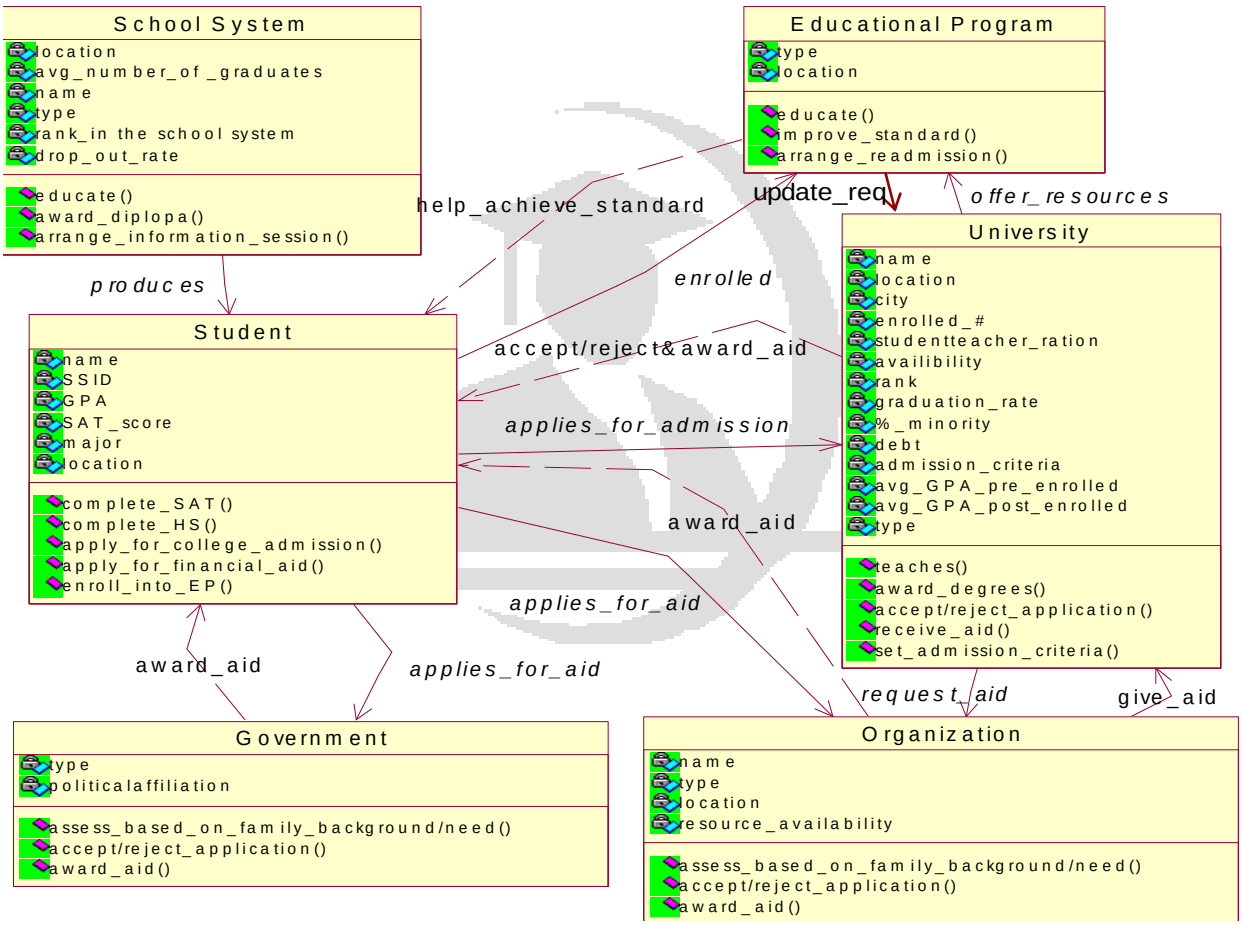
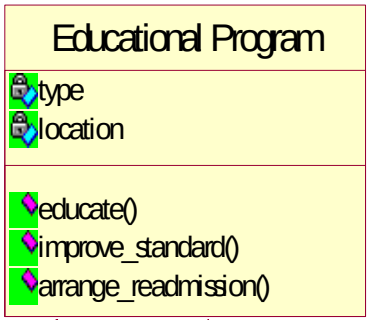


Figure 10-Class Diagram



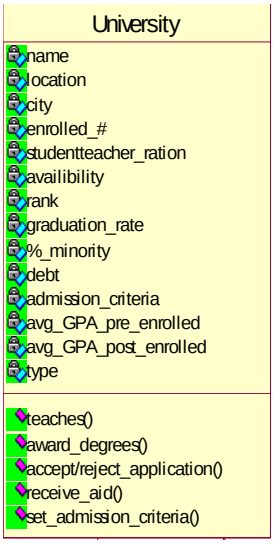
- Many young people find themselves unable to met the qualifications for post-secondary institutions
- The Educational Program will be designed to bridge the gap between high school completion and college admittance
- The Educational Program will be a short training program

Figure 11-Class Diagram Educational Program (EP)

Sequence diagrams represent the behavior of the system as a series of interactions among a group of objects. Each object is depicted as a column in the diagram. Each interaction is depicted as an arrow between two columns [9].

Object Diagrams

Object diagrams are instances of the potential structures described by class diagrams. While the things in a class diagram are generalizations, the things in an object diagram are actual instances. Object diagrams model a snapshot of the system in time; this is especially useful for structures that change over time



- **Name:** Morgan State University
- **Location:** - Region 3
- **City:** Baltimore, MD
- **Enrolled_#:** 6,005 undergraduate students, 58% women, 42% men, 5% transferred in
- **Student/teacher ratio:** 15:1
- **Availability:**
- **Rank:** N/A
- **Graduation_rate:**
- **%_minority:** 91% African American, 0.5% Asian American or Pacific Islander, 0.5% Hispanic American, 0.2% Native American
- **Debt:**
- **Admission_criteria:** Application fee: $25
  Required: high school transcript, minimum 2.0 GPA
  Required for some: 2 letters of recommendation, interview
  Recommended: essay or personal statement
  Application deadline: 5/1 (freshmen), rolling (transfers)
  Notification: continuous until 6/30 (freshmen
  Avg_GPA_pre_enrolled: 3.00
- **Avg_GPA_post_enrolled:**
- **Type:** HBCU

Figure 12-Pilot University Identification

5.2. **Dynamic Model Development**

The Dynamic Model is used to express and model the behavior of the system over time. It describes the behavioral features of a system; for example, the ways a system behaves in response to certain events or actions are the dynamic characteristics of a system [7]. The dynamic model shows communications between objects and follows the sequence of events. Dynamic models can be used to describe or specify the interactions of objects when a use case is invoked or the interactions between entities such as actors and subsystems, as well as the evolution of an object during its lifetime (i.e. object states and their transitions) [9]. There are

four dynamic models namely; activity diagrams, collaboration diagrams, sequence diagrams and the statechart diagram. These four models provide different levels of abstraction of a system and also give an alternative projection of the system dynamics, highlighting some particular aspects while de-emphasizing others.

Activity Diagrams

An activity diagram shows the flow from activity to activity. An activity is an ongoing execution within a state machine. An activity is composed of actions that act on the state of the system. Activity diagrams are used primarily to show how the workflow evolves and are coordinated among collaborating things. Each swim lane represents a single object. A line represents a thread of control for the object. A thick horizontal bar indicates that a thread forks into multiple concurrent threads, or that multiple concurrent threads are merging and synchronizing [9]

Sequence Diagrams
A sequence diagram helps to identify a set of collaborating objects involved in a scenario of a use case. A sequence diagram has two dimensions: the vertical and the horizontal dimensions representing the passage of time and the objects involved in the interaction. Object icons are placed horizontally at the top of the sequence diagram, and messages passed between them [9]

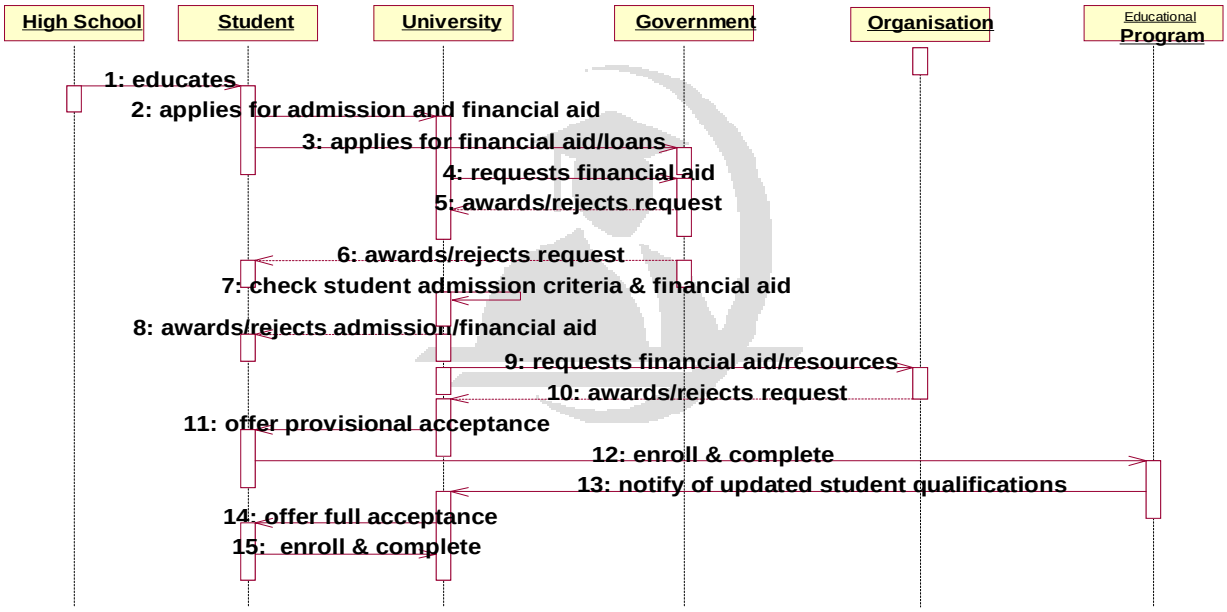


Figure 13-Sequence Diagram

Collaboration Diagram

These provide another way to model a scenario. In a collaboration diagram, each object is represented by an object icon, and links are used to indicate communication paths on which

messages are transmitted. Messages are presented in the same way as those in a sequence diagram. Sequence diagrams and collaboration diagrams are actually semantically equivalent [9]

Statechart Diagrams

Statechart diagrams represent the behavior of an individual object as a number of states and transitions between these states. A state represents a particular set of values for an object. Given a state, a transition represents a future state the object can move to and the conditions associated with the state of change [9]. The diagram shows the different stages the student goes through in pursuit of college education (steps 1-11).

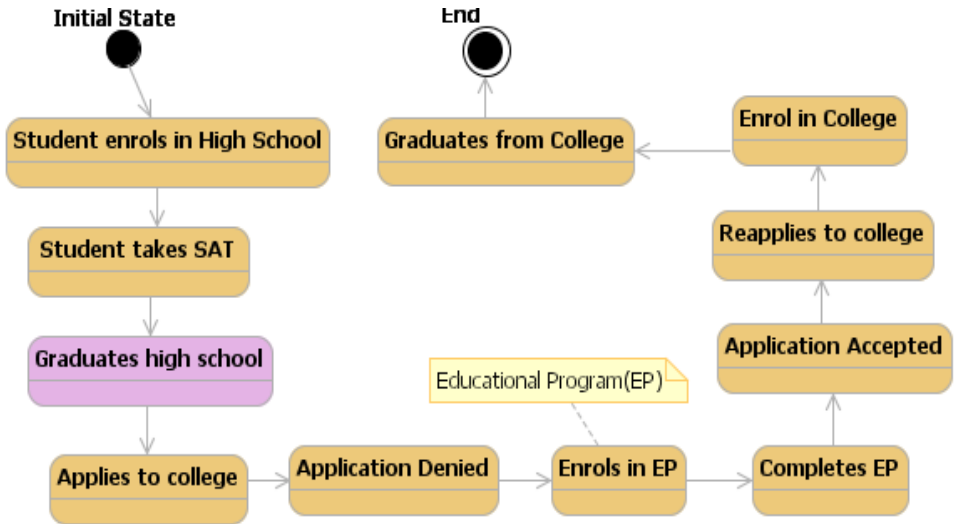


Figure 14-State Chart Diagram

6. System Modeling Tool

The IBM Rational Software Modeler (RSM) is a critical tool that has been used to support this analysis and modeling research effort. IBM Rational Software Modeler is a customizable, UML-based visual modeling and design tool that enables users to clearly document and communicate these system views. Rational Software Modeler simplifies analysis and design, furthering ease of use and development productivity. Rational Software Modeler is built on top of Eclipse, the award-winning, open source platform for constructing powerful software development tools and rich desktop applications. it provides you with an open, highly extensible and customizable tool that supports modeling across your enterprise. Having Eclipse as a foundation allows you to easily extend the features of Rational Software Modeler to meet your specific project requirements. Eclipse also fosters an ecosystem of third-party plug-ins that furthers your choices

in how to best model your applications. And because Eclipse is written in Java, you can outfit your team for modeling across both Windows and Linux development environments [10].

Rational Software Modeler supports UML Version 2 (UML 2), including structured classes and improvements to sequence, activity, and state machine diagrams. These and other revisions to the standard allow users to express their architecture with more clarity and control than ever. The Object Management Group (OMG) has taken this expressiveness to the next level in process guidance with its Model Driven Architecture (MDA) initiative. Rational Software Modeler supports MDA by allowing the user to define multiple levels of models coupled with user-defined transformations between those models, resulting in a clearer separation of concerns across the lifecycle [10]

IBM Rational Software Architect (RSA) is an integrated design and development tool that leverages model-driven development with the UML for creating well-architected applications and services. With Rational Software Architect you can unify all aspects of software design and development. Some of the benefits of the software are as follows It can be used to develop applications and Web services more productively than ever, exploit the latest in modeling language technology, review and control the structure of your Java and service-oriented applications, leverage an open and extensible modeling platform, simplify your design and development tool solution and integrate with other facets of the lifecycle, it supports OMG Reusable Asset specification and supports users in browsing repositories containing reusable assets and Repositories can be structured so that assets can be found easily [11].
Establish traceability links from requirements through design. It assists users in querying design models for traceability relationships from requirements to analysis/design elements found in models, and to Java code. There will be a large number of artifacts developed during the course of the project and all these artifacts will have to be stored and archive properly. IBM Rational Modeler provides a very good place to archive all these artifacts.

7. **Information Design**

Information Design is the detailed planning of specific information that is to be provided to a particular audience to meet specific objectives. The output of Information Design consists of visually delivered information which is highly designed for the benefit of the user. Its principles relate to all communications products and experiences, regardless of medium (print, broadcast, digital, online, etc.). Its mandate is to optimize the layout of information which facilitates navigation, readability and immediate understanding of what the information communicates. [12]The purpose of Information Design is to Simplify, Integrate, Filter and Selectively Emphasize information. The result of the research will be presented as an internet site because of the numerous benefits that can be derived from this media such as:

- Interactivity. This allows readers to submit their own reviews or comments by email, message boards, mailing lists and chat rooms
- Connectivity- Enables on site and off site access to other relevant information, resources and reviews

- Accessibility-Vast number of reviews and materials can be archived, onsite search engines and indices can facilitate retrieval and the website can be periodically updated to reflect current information pertaining to the subject matter.

Figure 15-Multiple Screen

In addition to the internet site, a multiple screen will be used to present the result of the report. Since a lot of information will be presented, using a multiple screen will aid in better understanding of the material by the audience. This has the ability to present different parts of the report simultaneously without having to turn pages back and forth. For example a use case scenario can be displayed on one screen while the corresponding sequence diagram and activity diagrams are also displayed on the other screens. This has the potential of aiding in better understanding of the materials. An example of a multiple screen is shown in figure 15.

8. Conclusion

To achieve a significant increase in African American graduates, HBCUs will have to play a crucial role in educating African Americans. The introduction of the concept of an educational program (EP) is one of the ways that this can be achieved. The EP will serve as a stop gap for students graduating from high school with grades not good enough to secure a place in college. These students will enroll in the EP to improve their grades so that they can reapply and be admitted to colleges and universities. Apart from this other types of interventions from elementary schools to colleges will have to be introduced to ensure that the educational standard of African Americans is improved to ensure that they are competitive with other groups. The concept of Object oriented methodology was used as a tool to enable the target audience and stakeholders to have a better understanding of the problem domain. Although OOAD is primarily used in the software industry for software development, it is applicable to virtually all aspects of life, whether software, sociological, medical, engineering etc. Every system can be modeled and classes, objects and relationships can be identified from these systems. So it is possible to apply object oriented methodology to analyze all types of system. What this does is to give the viewer a better representation of the system, thus giving a better perspective of the problems and challenges within the system. When the problems can be accurately identified by all stakeholders, then it is easier to come up with a solution. Applying the concept of object oriented methodology in looking at the how to increase the number of African American graduates from HBCU has given a better representation of the school system, the different processes in admitting students and also funding issues.

9. Future Work

The project is presently at the conceptualization stage and the models that will capture the system are still being developed using OOAD and UML notations. Information on the components of the system comprising the HBCU, high school, students (current and prospective), government agencies, are still being gathered to fully understand how the system currently runs. This will help us in developing a model that adequately represents the real world (educational system of HBCUs and all factors influencing the system) and then we can proceed to test for completeness and correctness. The project is just commencing with the models being developed and subsequently the project will proceed to the construction phase which involves the system installation, object oriented programming, modeling and simulation and program installation. Finally after this is done the models will be tested for correctness and completeness and then further iteration is done until it is eventually completed (see figure 3). The result of the report will be presented as an internet site and work on the site is presently at its infancy. Also in presenting the results multiple screens will be used instead of the regular single screen, and we are in the process of acquiring a three screen display. This has the added benefit of being able to focus on more than one aspect of the report at the same time which will indeed enhance the understanding and retention of the presented materials especially when you are dealing with a large expanse of information.

The purpose of information design is to be able to present the information in such a way that not only does it capture the interest of the stakeholders and decision makers, but it is presented in a way that they will fully comprehend the enormity of the problems and be able to take corresponding action to turn things around. Action needs to be taken to improve the plight of the African American community and it is hoped that the result of this project will spark off the right response that will result in positive things being done in regards to the African Americans.

Bibliography

1. Wikipedia, The free Encyclopedia, http://en.wikipedia.org/wiki/Hurricane_Katrina

2. ADAM PHILLIPS, Voice of America News, http://www.voanews.com/english/archive/2006-03/2006-03-28-voa62.cfm?CFID=1964349&CFTOKEN=35999077 March 2006

3. US Department of Education-White House Initiative on HBCU

4. W.G BOWEN and D. BOK, the shape of the river: Long Term Consequences of Considering Race in College and Universities Admissions, Princeton, N.J.: Princeton University Press, 1998.

5. H. JAMES, TONY OLESKY, Object Oriented Analysis and Design, A Practitioners Approach. Avra Software Lab inc, 2000

6. BAUDOIN, CLAUDE & HOLLOWELL, GLENN. Realizing the Object-Oriented Lifecycle. Upper Saddle River, NJ: Prentice Hall, 1996.

7. MANDAR CHITNIS, PRAVIN TIWARI AND LAKSHMI ANANTHAMURTHY, UML overview, December 2002. http://www.developer.com/design/print.php/1553851

8. CLINTON PARK, Are HBCUs still necessary? Science Career forum August 2003 – www.sciencecareers.org

9. CURTIS TSANG, CLARENCE LAU, YING LEUNG. Object oriented technology from diagram code with visual paradigm for UML.

10. Productivity through software plc- IBM Rationale Software Modeler- http://www.pts.com/wp3473.cfm

11. IBM Rational Software- http://www-306.ibm.com/software/awdtools/architect/swarchitect/

12. LUIGI CANALI DE ROSSI. What is information design, Masters Views International, November 2001

13. JD FLETCHER, SWAGATHA PRAMANIK, RICHARD QUEEN JR, OLUSOLA LANIYI, Morgan State University Urban Education Model, May 2005

14. ANIELLO BOVE. DM Review - Using IBM Rational Software Modeler in a Highly Integrated Development Environment by July 2005

15. RANDY MILLER Practical UML. A hands on introduction for developers, http://bdn.borland.com/article/0,1410,31863,00.html

Biographical Data

LEEROY BRONNER

Dr. Bronner is a Research Associate Professor at Morgan State University in the department of Industrial Manufacturing and Information Engineering. He has been a instructor at Morgan State University for the past 7 years. Dr. Bronner spent 25 years at the IBM Corporation and brings to academia experience in systems and software engineering, analysis, design, modeling, programming and systems implementation.

OLUSOLA LANIYI

OLUSOLA is a Doctoral student in Morgan State University's department of Industrial Manufacturing and Information Engineering. He is currently doing research on applying object oriented methodology to solve and explain sociological problems.

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