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Mobile Apps Marketing Along with Web Mining Techniques in E-Commerce Applications

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Abstract

Online marketing via internet on mobile apps (which includes android, ios and windows app) along with web mining is an essential part of e-commerce. In the recent years, with the more use of mobile devices usage trends that grow exponentially, providing online marketing services for mobile users has been becoming business opportunities. Despite these opportunities, mobile marketing system using mobile apps along with web mining for e-commerce has not been widely studied. As mobile devices are personal tools, mobile marketing systems along with web mining must be properly designed such that users will accept the systems. Nowadays online business breaks the barrier of time and space as compared to the physical office. Big companies around the world are realizing that e-commerce is not just buying and selling over Internet, rather it improves the efficiency to compete with other giants in the market. This paper presents the design and prototype of an e-commerce mobile marketing system using mobile apps and also how web mining helps resolving user acceptance criteria, such as information personalization, privacy protection, up-to-date content, payments, statistics and analysis of usage of e-commerce market on the internet. The proposed system integrates a marketing provider website and mobile applications used by shoppers. The design and prototype are provided for the web mining, website, mobile app applications and the communication between both sub-systems that employs web services and a cloud service. Prototype testing and evaluation have been performed to ensure that the proposed system works properly. Business over internet provides the opportunity to customers and partners where their products and specific business can be found. For this purpose data mining sometimes called as knowledge discovery is used. Web mining is data mining technique that is applied to the world wide web. There are vast quantities of information available over the Internet.

General terms: Data mining techniques, e-commerce applications and web mining.

Keywords: Electronic marketing system, mobile marketing system design, e-commerce marketing, publish/subscribe system, Electronic commerce, data mining, web mining, android, iphone (ios) and windows apps.

Introduction

Electronic marketing (e-marketing) has been viewed as an essential part of e-commerce [9][14]. With the trend of mobile devices usage on android, ios and windows that grows exponentially in the last several years [26], providing e-marketing services for mobile users along with web mining has been becoming business opportunities [1].

The web is becoming much accepted over the last decade, bringing a strong platform for information distribution, retrieval and analysis of information. These days the web is much popular for a large data repository containing a broad variety of data and knowledge base, in which information are hidden [32].

Users face problems due to the huge volume of information that is consistently growing. In particular, Web users have issues in getting the correct information due to low precision and low recall page. For example, if a user wants to get any information by using Google and other search engines, it will provide not only Web contents dealing with this topic, but a series of irrelevant information, so called noise pages, resulting in difficulties for users in obtaining necessary information [32].
All these pose a challenge to researchers to discover the web management methods and effective extraction of information from the web. To understand the web mining we should know all about the data mining techniques available.

![Diagram of Web Mining](image)

**Contribution:** Despite the opportunities, so far the authors have only found very limited results related to mobile marketing system design for e-commerce. Wium in [23] presents the design of mobile applications supporting tourists with travel information that use information of user's location, time and personal preferences to provide personalized recommendations. Balan et al. in reports design and evaluation of a near-field communication-based mobile P2P payment application that is designed to replace cash-based transactions. Therefore, this paper is intended to contribute in the designs of mobile e-marketing systems for e-commerce.

In our previous research presented in [15], we have proposed a conceptual model of a mobile marketing system resolving user acceptance criteria (customer permission, usefulness, relevant content, up-to-date content, social network, privacy protection and so on). In the proposed model, the components of the system with their required services have been defined. In this paper we present the results of our next work, which is the design and prototype of the system by highlighting the techniques to resolve information personalization, privacy protection, up-to-date content, and market targeting.

**Research methods:** Based on the conceptual model in our previous work [15], we studied related technical literatures, developed the detailed design of the system, coded the designs, conducted some testing and evaluated the prototype.

This paper is organized as follows: The next section presents the related literatures, followed by the excerpts of the proposed conceptual model, the techniques for personalizing information and protecting privacy, website design, mobile application design, design of communication between the website and the mobile application and some part of its implementation, prototype testing and evaluation, and conclusion.

Web content mining is the process of extracting knowledge from documents and content description. Web structure mining is the process of obtaining knowledge from the organization of the Web and the links between Web pages. The following figure gives an idea about Web mining research which is divided into three categories: (i) mining the Web content (Web content mining), (ii) mining the web structure (web structure mining) and (iii) mining the Web use (Web usage mining).
**Related literatures**

**E-commerce and e-marketing**

In [9], a many-to-many communication model used in e-commerce marketing is proposed. With this model, consumers can communicate with the medium (such as website) and with each other, firms can provide content to the medium and interact with each other, firms can also interact with consumers, and so on. Consumers may collaborate in the marketing communication effort itself. It is stated that the web as both medium and market is more likely to be successful if it frees consumers from their traditionally passive role as receivers of marketing communications, gives them much greater control over the search and acquisition of information relevant for consumer decision making, and allows them to become active participants in the marketing process.

On the other hand, [14] defines that e-commerce e-marketing refers to a new comprehensive marketing model which is based on e-commerce and uses every kind of e-marketing methods and means to achieve online business activities. So, the content of e-commerce e-marketing should insist e-marketing, make e-marketing as the core business activities of e-commerce and combine e-commerce and e-marketing that will give e-commerce new contents as well as create integrated and comprehensive modern new marketing model which is e-commerce e-marketing.

E-marketers can select among four targeting strategies, which are mass marketing, multi-segment marketing, niche marketing (when a firm selects one segment and develops one or more marketing mixes to meet the needs of that segment), micromarketing/individualized targeting (when a firm tailors all or part of the marketing mix to a very small number of people) [22]. Market segments can be designed based on the geographic, language, psychographic and behavior. Consumer psychographics comprise personality, values, lifestyle, activities, interests, and opinions. There are few e-marketing tactics that can be adopted,
such as permission, viral, email, search engine, partnering marketing, banner advertising, online promotion campaigns

**Publish/subscribe system for mobile network**

One option in designing an event-based communication system on mobile ad hoc networks is publish/subscribe system, a loosely-coupled paradigm for communication between entities [11]. In this architecture, two new roles are defined: Subscriber (or Consumer) on one side and Publisher (or Producer) on the other side. Subscribers are nodes who express their interest in an event or group of events with specific pattern and submit these interests to event service (or Broker node). On the other hand, the publishers are nodes who generate the events and dispatch them to the broker node. Then, the broker node notifies the subscribers of the published events in an asynchronous communication model (Figure 1).

![Figure 1. The publish/subscribe system components and basic diagram [11].](image)

**Mobile user’s acceptance criteria and proposed system model**

In our previous research result [15], we have identified 13 mobile users acceptance criteria searched from literatures, which are: Cr-1 customer permission [1]; Cr-2 ease of use ([20], [19], and [24]); Cr-3 usefulness ([20], [19] and [25]); Cr-4 relevant content ([1] and [13]); Cr-5 compelling content ([11], [7], [20], [19]); Cr-6 timely and up-to-date content [19]; Cr-7 personalized content [12]; Cr-8 location-aware advertising [3]; Cr-9 increasing gains in shopping performance [24]; Cr-10 incentive, rewards ([1], [3], [7], [19]); Cr-11 enhancing customers image ([20] and [19]); Cr-12 services providing interpersonal and external influence, social network ([20], [25] and [24]); Cr-13 security and privacy protection ([20], [7] and [13]).

We have also proposed a model of an integrated information system that provides services/functions resolving all of the criteria, which is similar to the Publish/Subscribe system [11], adopted the concept depicted in [9] and [14]. The system consists of a website and mobile application where both communicate directly via http as well as via cloud services (see Figure 2. (a) and (b)). The website acts as both Publisher and Broker while the mobile application functions as Subscriber system component.

Website: This will be used by the mobile marketing provider administrator and merchant members (with free, silver, gold and platinum membership). The services provided are: Managing product catalogs; managing ads, deals and market segmentation variables used in computing the targeted market segment for the corresponding ads and deals; updating/adding product categories, catalogs, ads, deals (customers will be updated promptly each time new data is posted); managing stores location.

Web Mining: As mobile devices are personal tools, mobile marketing systems must be designed properly such that the systems will be accepted by users and also the data collected back using web mining technology helps the business to project what type of items needs to be marketed on the mobile application so at to make more profits.

Mobile application using apps: It is used by shoppers (as free members) by first downloading the application from the website and then installed in their mobile devices. This application provides 16
services, such as: Sign up/registration to become a free member; viewing personalized product catalog receiving up to date (real time) personalized ads and deals/coupons based on customer profile where the deals can be redeemed in the merchant store; displaying the location or map of each merchant; comparing products; marking favorite products and receive notifications if the products are on sale; asking opinions from peers regarding the products of interest; sharing information of products, advertising and promotions/deals to peers; filling shopper profile that will be stored in the local mobile database and are not accessible by other parties (the profile will be used to filter the incoming ads and deals); storing favorite products and deals taken in the local mobile database.

![Diagram](image-url)

**Figure 2.** (a) Network topology of the system [15]; (b) Diagram context of the system.

The selected cloud computing service: In this design and prototype, we select a PaaS (platform as services) provided by Google, namely Android Cloud to Device Messaging (C2DM) that allows third-party application servers to send lightweight messages to their Android applications [27]. This service is not designed for sending a lot of content via the messages. Rather, it is used to tell the application that there is new data on the server, so that the client application can fetch it. In our case, this service is adopted to provide push notification services or broadcast events.

**Personalizing information, targeting market and protecting privacy**

In order to facilitate the services that resolve the criteria associated with security and customer privacy (Cr-1 and Cr-13) and content (Cr-3 usefulness, Cr-4 relevant content, Cr-7 personalized content, incentive and Cr-10 rewards) that must also be timely and up-to-date (Cr-6) and to provide niche marketing (see Section 2.1) for merchants we propose the following techniques.

First, we design two separate databases: One is the database in the provider server that is accessed by the website and the other is the local database in the mobile devices accessed by the mobile application. The database in the server stores a variety of large data needed by the mobile marketing system while the local database stores small private data belonging to the shoppers.

Among other things, each of the database stores the data as shown in Figure 3. The product categories stored in the mobile database will be used to “filter” the product catalogs that can be viewed as well as ads
and deals received by the shoppers (mobile users). The user profile in the mobile database also contains data of the market segmentation criteria and their values used to personalize ads and deals received.

![Diagram of two separate databases](image)

Figure 3. The two separate databases

Secondly, we design the following communication scheme to maintain data synchronization between the server and mobile database, and send ads/deals in real time: The scheme of data synchronization (Figure 4.(a)): (1) The product categories and market segmentation data in the server database are updated/added; (2) The data is stored in the server database; (3) The website sends notification to mobile devices via C2DM service; (4) C2DM service broadcasts the notification message to mobile devices; (5) Upon receiving the notification, the mobile application, requests the complete data to the website by executing certain web service functions; (6) The website sends the requested data; (7) the mobile application stores the received data into the mobile local database;

The scheme of broadcasting new ads/deals (Figure 4. (b)): (1) Merchant creates an ad/deal and define its market segmentation criteria, its values and the minimum confidence level; (2, 3, 4) The steps are the same with the data synchronization steps; (5) the mobile application requests the complete data of market segmentation criteria, its values and the minimum confidence level to the website by invoking web service functions; (6) The website sends the requested data; (7) By using the market segmentation criteria and its values, the mobile application computes the confidence of the shopper (that determine whether the ad/deal is suitable for the shopper), then, if this value if greater than or equal to the minimum confidence (defined by the merchant), the ad/deal notification will be stored in the mobile database, otherwise the ad/deal will be ignored.

![Diagram of sequences of updating and broadcasting](image)

Figure 4. The sequences of: (a) updating and synchronizing market segmentation criteria and its option values between the server and mobile client; (b) broadcasting new ads/deals

Ads/deals confidence level computation: While [10] proposes a formula for computing user interest of an item using common taste of the population and individual taste of a set of items, here, we proposes a formula for computing user confidence of an item using shopper profile (defined by the shopper) and market segmentation criteria (defined by the merchant in creating an ad or deal of a product).

My proposed formula is:

\[ i = n \]
the weight of \( si \) and \( pj \) is the value of \( j \)th shopper profile. With this formula, if a market segment does not equal with any of the shopper profiles, it will not be used in the confidence computation. Hence, the more the market segment equal to the shopper profile, the higher confidence will be. In the proposed system, if the confidence is equal or higher than minimum confidence defined by the merchant, then the ad/deal will be passed through the shopper.

**Website design**

The provider website is further divided into two modules, namely Phost A and Phost M (see Figure 5), and where each module consists of several sub-modules that are used by certain users and each sub-module has functions materializing the services designed (see [15]). In the context of the Publish/Subscribe system, Phost M is the Publisher while Phost A is the Broker, which in this case, utilizes C2DM service to dispatch messages.

![Figure 5. The architecture of the website owned and run by the provider [15]](image)

Some examples of user functions provided by the modules are listed below:

- **Phost M** module with merchants as the users:
  - M-3. Ads: View, insert, update and delete product advertisings including their market segments, minimum confidence and period of the advertisings;
  - M-4. Deals: View, insert, update and delete product deals offered to shoppers/customers including their market segments, minimum confidence and period of the advertisings; Process deals taken by shoppers.

- **Phost A** module with provider Administrator as the users:
  - A-4. Market Segmentations: View, insert, update and delete market segmentations (market variables and values). Examples of variables: age (values: <20, 21-30, 31-40), gender (values: male and female);
  - A-7. Deals: View and verify product deals posted by merchants. After the deals are verified by Administrator, notifications are promptly broadcasted to shoppers’ mobile devices via a cloud service.

**Database Design** All of Phost A and M functions access a single database where its relational design is depicted in Figure 6. There are 20 relations and 4 views (shown without attributes). As can be seen, the database stores system configuration, merchants, shoppers, category of products, products, market segmentation variables and their value options, also data and transactions/notifications related to ad and deal. Relation ad_criteria and deal_criteria are used to store the criteria that define the targeted market segmentation for the corresponding ad and deal. Relation ad_deal_notification stores the notification of ad and deal sent to shoppers, while taken_deal stores the transactions of shoppers of taking/booking deals in responding to deal notifications received (in shoppers mobile devices).

**User Interface Design** The user interfaces designed for Phost A and M are mainly forms and reports needed by the administrator and merchants to conduct their tasks. The forms and dialogs are designed by providing self-explanatory menus and pages having buttons and list of choices, simple navigation between pages and using few button colors such that the function of each button is easily recognized. Some of Phost
M user interfaces designed is shown in Appendix (Figure A1). It is shown in the figure that for providing personalized product ads and deals, the administrator manages product category and market segmentation variables and their value options, while each merchant uses these variables with their values in creating a product ad or deal intended for a certain market segment.

**Proposed model**

![Diagram](image)

**Figure.** System model to integrate web mining in e-commerce applications

The model shown in figure 4, consists of important components like business data, data obtained from consumer’s interaction, data warehouse and data analysis. In case of business data it means the data obtained from the business entities. It may be product & service details and the description. It can provide some important metadata about the product and services. Business data can be collected from RSS feed of particular website or we can read the contents of web page and then data can be extracted from the read contents. In .Net technology there are Http Web Request and Http Web Response classes in Base Class Library which makes it very easy to request the web pages. Request can be executed like below code:

```csharp
HttpWebRequest request = (HttpWebRequest)WebRequest.Create("http://www.mypage.com").
HttpWebResponse response = (HttpWebResponse)request.GetResponse(); and after the request data can be read via the response stream code given below: Stream resStream = response.GetResponseStream();
```

From the streaming we can extract the desired data. Second element is interaction with consumer which provides details about the consumer and their choices, their visiting styles, their preferences, forwarding of products and services to friends, number of hits and clicks on particular page and link, nature of consumer and many more. All these information can be collected and inserted into the database or data warehouse. If required, data can also be collected from product ratings page which prompts to the customer to rate the particular items which they recently purchased. These ratings data can be used as input to an analysis engine to help the consumer to find other items that they likely to like.

**Mobile application design**

In this section, we present the design of the subscriber system component in Publish/Subscribe system (see Section 2.2), which is a mobile application, namely Phost C, in the form of use-case model, packages and classes, mobile database and user interfaces. The use-case, packages and classes are presented using UML [5] that is commonly used in designing object-oriented application such as application in Android platform.

**Use case model**

The functions of Phost C are designed and depicted in UML use-case diagram. The top level of use-case showing the main functions of Phost C is presented in Figure 7.(a). Each of the use in Figure 7.(a) is then broken down into a detailed use-case which represents the use-case of a sub-package (see Section 6.2 for
the package design). The detailed functions are extension of the main functions. For instance, Figure 7.(b) and (c) show the extensions of manage catalog and deal. The extensions of other main functions are: (a) manage account: sign-in/out, set profile, set preferred product categories (product filter); (b) manage ads: view ad content, delete ad, share ad to shopper peers, view product information having the ad; (c) manage inbox and shopper: view list of notifications in inbox, view notification, delete notification, view list of shopper peers, add shopper peer, delete shopper peer.

The scenario of the use-case is constructed for each detailed function. For example, the scenario of take deal use is as follows: With the pre-condition that User is already log in and view a deal, User press “Take Deal” button, the application updates the status of the deal in the database table as “taken” and sends a message to the provider website stating that the deal is taken by this user, the website then notifies the merchant who posted the deal. Exception: (a) If the products offered are out of stock, the provider website will notify User that the deal cannot be taken; (b) If the deal is expired, the application will reject the request of taking the deal.

**Package design**

It is known that MVC (Model, View and Controller) pattern is suitable to separate data, engine and user interfaces for better organization and maintainability of the applications. In MVC, Model contains the data that users work with, View is used to render some part of the model as a UI and Controllers processes incoming requests, performs operations on the model, and selects views to render to the user [6]. In designing the package of Phost C, we first define two packages, namely controller and model. The model package has classes used to access and update database tables. The controller package, which combines the Controller and View component of MVC, is further broken down into several sub-packages (see Figure 8) to better organize the classes into modules.
Classes’ designs

Basically, Android applications consist of components of activity (a single screen of user interfaces), intent (a message sent between components), service (a process run in the background and does not have any user interface components), content provider (an interface for sharing data between applications), broadcast receiver (an Observer pattern, which is dormant codes, that gets activated once an event to which
it is subscribed happens) and application context (the application environment and the process within which all its components are running, hence, an application context gets created whenever the first component of this application is started up) [8]. Android provides libraries for the components such that the designed application classes can simply be the children of them. Currently, only the content provider library that is not used in Phost C as it does not share resources with any other application yet.

![Diagram](image)

**Figure 7.** Use case diagram of: (a) Phost C that shows its main functions; (b) Detailed use-case of manage catalog in Digital Catalog sub-package; (c) Detailed use-case of manage deal in Digital Deal sub-package.

![Diagram](image)

**Figure 8.** Packages designed of Phost C mobile application.

The design of classes and their relationships of Phost C is constructed for model package and each sub-package of controller package. However, due to space limitation, this section can only present brief description of model package, general sub-package and digitalDeal sub-package.

Classes in model package as the classes in model package are used/instantiated to access the local mobile database and its tables, most classes contain attributes and constructors declarations only. There are 13 classes designed in model package, which are DB Manager, Profile, Profile Item, Ad, Ad Deal Notification, Category, Comment, Criteria, Deal, Notification, Product, Product Detail (sub-class of Product) and Segmentation. Some highlights of DBManager class: Has attributes and methods used to create, access and update database tables; has methods used to synchronize data (such as product categories and market
segmentation variables) stored in mobile database and provider’s server database; defines static variables and their values used commonly across class objects.

Classes in controller package Controller package contains purely engine classes as well as classes which are sub-classes of Android classes, such as Activity, Intent, Context, Broadcast Receiver and Intent Service. In designing classes, the name of each class in sub-packages is defined such that it is semantically meaningful. For example, C2DMCommandHandler class tasks are handling incoming push messages sent by C2DM service. In sub-packages, there are a number of classes which are derived class of Android Activity class to provide many screens in the application that support easy navigation between screens and ease of use of the application.

Classes in general sub-package there are 11 classes defined in this sub-package. It contains “base” classes that will be instantiated by other classes in other sub-packages. While most classes are sub-class of Android Activity class, this sub-package also contains classes to handle incoming push messages coming from C2DM service (see Figure 9). Some highlight of the classes and their tasks/functions is as follows:

(a) Main Menu Activity (child of Android Activity class): This class is instantiated when Phost C application is first launched and provides “home page” of Phost C, then allows users to navigate among its pages.

(b) Application Context (child of Android Application class): Defines the application environment and the process within which all its components are running. This is instantiated whenever the first component of Phost C is started up, regardless of whether that component is an activity, service, or something else. The object/instantiation lives as long as Phost C is alive.

(c) C2DMReceiver (child of Broadcast Receiver class): Processes incoming messages from the cloud service, C2DM.

(d) C2DMCommandHandler (child of Android Intent Service class): Handles various incoming commands passed via intent and passes a message to the appropriate activity or activities to perform further actions (i.e. if the command is equal to “0112”, then “create active notification” message will be sent to object of Notifier and “update product category” message will be sent to object of DB Manager).

(e) Notifier: Handles notifications for users, such as show and hide notifications.

Classes in digital Deal sub-package this sub-package, among other classes, contains Deal Engine class having the tasks to handle deals as well as activity classes (children of Android Activity class) providing user interfaces related with viewing, taking and claiming deals offered by merchants. Classes of model package that are instantiated and used in accessing and manipulating database records are DB Manager and Deal (see Figure 10).

Classes design in other sub-packages, namely digital Catalog, digital Ad, account Management, social Management, generally are analogous to the classes in digital Deal sub-package. The sub-packages contain classes having tasks to handle incoming messages, provide user interfaces as well as access the local database.

**Mobile database design**

In designing the database for a mobile application, it is suggested that the database only manage small size of data most needed by the application [18]. If the data stored must be up to date from time to time, the data must then be synchronized with the source database (that manage the current data). In this context, the mobile database must be synchronized with the provider website database.
Figure 9. Class diagram of general sub-package.
Figure 10. Class diagram of digital Deal sub-package.

Some highlights of the relations are: (a) shopper: Storing peers email address and mobile device identification; (b) notification: Functioning as the user “inbox” storage; (c) segmentation: Storing variables and their options used in the confidence level computation of every incoming ad and deal (the confidence level determines whether the ad/deal is matched with user profile); (d) filter: Storing product categories that used to filter product information, ads and deals received by the user; (e) configure: Storing the application configuration; (f) compare_list: Storing product IDs being compared; (g) profile: Storing user profile used to personalize ads and deals received.
User interfaces

The user interfaces are designed in such a way to resolve ease of use criteria (Cr-2) as well as to support all of other criteria. The ease of use is resolved by providing self-explanatory menus and pages, simple navigation between pages, using semantically meaningful icons, providing list of choices (using drop down list and toggle button) if users must fill forms and using various elegant colors in pages such that information and menus are easily recognized.

Some of Phost C pages are shown in Figure 12, where the descriptions are presented in the figure caption. It can be seen in the figure that all of user functions shown in Figure 7 (the use-case diagram) are materialized by the designed menus.

Systems communication designs and implementation

In materializing real time communication between the website (Phost A and M) and mobile application (Phost C) via C2DM service, some designs must be constructed thoroughly and implemented properly. This section presents the design results and some example of communication source codes.

The designs or implementation include: (1) Systems interaction scenarios that are presented in sequence diagrams; (2) Messages structure sent from Phost C to the website; (3) Messages structure sent from the website (Phost A and M) to the cloud service, C2DM; (4) Web services in the website (Phost A and M); (5) Classes/methods in Phost C having tasks to remotely call functions in the web services; (6) Functions in Phost A and M having tasks to send messages to C2DM; (7) Classes/methods in Phost C having tasks to receive and process push messages sent by C2DM.
Figure 12. Some user interfaces of Phost C

(a) The home page showing the menus that can be selected; (b) The form of setting user profile which will be used to personalized incoming ads and deals; (c) Product sub-categories that can be set on-off as desired by the user such that she/he will only receive ads and deals in this sub-categories; (d) Product detailed information and the related menus (the user then can find related deals, more information, view comments for this product, compare with other products, ask peer opinions, mark it as product favorite, share with peers and show the merchant location); (e) Product deal page where the user then can view the related product and “take” it; (f) Form for adding a shopper peer; (g) Inbox page where the user can view and reply the messages.

(1) Systems interaction scenarios

The systems interaction design is presented in the diagram sequence as depicted in Figure 13.

(2) Design of messages sent from phost C to the website (Phost A and M)
Each of the messages sent by the mobile application has the structure as a collection of strings, {"c", MESSAGE_TYPE, variable1*, value1*, variable 2*, value2*, . . . , variable n*, value_n*}, where * denotes optional variable/value. There are 27 message types, which are grouped in five categories as follows:

(a) Mobile App call a web service with return value; (b) Mobile App call a web service with no return value; (c) Website broadcasts short messages to Mobile App via C2DM; (d) Mobile App call a web service triggering Website to send message to the Mobile App that makes the call.

(a) Shopper messages (3 message types: 1121, 1221, 1321), for example: “1121” means adding a shopper peer in the server database and the message format is {“c”, “1121”, “t”, MOBILE_DEVICE_ID, “i”, EMAIL_ADDRESS};

(b) Inbox messages (4 message types: 2221, 2321…2421), for example: “2221” means synchronizing notifications data stored in the server database and client (local mobile) database and the format is {“c”, “2221”, “i”, MOBILE_DEVICE_ID}; “2321” means requesting newest notifications data and the format is {“c”, “2321”};

(c) Ad messages (6 message types: 3121, 3231, … 3621), for example: “3121” means requesting market segmentation criteria of an ad and the message is {“c”, “3121”, “i”, AD_ID}; “3621” means sharing an ad to one or more shopper peer(s) and the message is {“c”, “3621”, “t”, MOBILE_DEVICE_ID, “i”, EMAIL_ADDRESSES, “i”, AD_ID};

(d) Deal messages (9 message types: 4121, 4221, … 4921), for example:

“4621” means taking/booking a deal and the message is {“c”, “4621”, “d”, MOBILE_DEVICE_ID, “i”, DEAL_ID}; “4821” means claiming a deal and the message is {“c”, “4821”, “d”, MOBILE DEVICE_ID, “i”, DEAL_ID};

(e) Catalog messages (5 message types: 5121, 5221 . . . 5521), for example:

“5221” means asking opinion about a product to one or more shopper peer(s) and the message {“c”, “5221”, “i”, MOBILE DEVICE_ID, “t”, SHOPPER_ID, “i", PRODUCT_ID}; “5421” means notifying a merchant that one of its product is being marked, f, i, product ID {“c”, “5421”, “f", MOBILE DEVICE_ID, “i", PRODUCT_ID};
(3) Designs of messages sent from the website (Phost A and M) to the cloud service, C2DM: There are two groups of messages designed as the following:

(a) System configuration messages (message type: 1121…1321): “0112” means notifying a mobile application to update their product category; “0212” means notifying a mobile application to update their market segmentation variables and the values.

(b) Inbox message: “2112” means notifying mobile applications that there is a new notification (there are 14 notification types, i.e. 001: new request of adding a shopper; 006: a new deal offer; 009: opinion request).

(4) Designs and implementation of web services in the website (Phost A and M)

The main web service function, which is called by the client (mobile application) with or without parameter (depending on the service invoked), is `csportal.php`. The libraries included in `csportal.php` are as follows:

(a) `catalog.php` (5 functions): `share_product, ask_product, reply_ask_product, mark and unmark handle incoming messages sent by the mobile application with type of 5121, 5221, 5321, 5421 and 5521.

(b) `ad.php` (6 functions): `return_ad_min_point, return_ad_criteria, add_ad_notification, return_unread_ad_notification, set_ad_notification_received and share_ad handle incoming messages with the type of 3121, 3221, 3321, 3421, 3521 and 3621.

(c) `deal.php` (9 functions): `return_deal_min_point, return_deal_criteria, add_deal_notification, return_unread_deal_notification, set_deal_notification_received, get_deal, take_deal, claim_deal, and share_deal handle incoming messages with the type of 4121, 4221, 4321, 4421, 4521, 4621, 4721, 4821 and 4921.

(d) `shopper.php` (3 functions): `add_shopper_request, accept_shopper_request and delete_shopper handle incoming messages with the type of 1121, 1221 and 1321.

(e) `inbox.php` (3 functions): `return_last_notification, return_all_notifications, and delete_notification handle incoming messages with the type of 2221, 2321 and 2421.

(5) Implementation of classes/methods in Phost C having tasks to remotely call functions in the web services

Web Service class (see Figure 9 for its design) provides functions to invoke services in the website. The `WebService.webGet` method code, which is called whenever the mobile application invoke a service, is depicted in following code base:

```java
package com.phost.c.controller;
import com.google.gson.Gson; public class WebService{
    DefaultHttpClient httpClient; HttpContext localContext; private String ret;
    HttpResponse response = null; HttpPost httpPost = null; HttpGet httpGet = null;
    String webServiceUrl;
    //Constructor
    public WebService(String serviceName){ . . . }
    //Method for invoking a service from the website
    public String webGet(String methodName, Map<String, String> params) { String getUrl = webServiceUrl + methodName; int i = 0;
        for (Map.Entry<String, String> param : params.entrySet()) { if(i == 0) getUrl += "?"; else getUrl += ";";
            try{ getUrl += param.getKey() + "=" + URLEncoder.encode(param.getValue(),"UTF-8");
        } catch (UnsupportedEncodingException e) {e.printStackTrace();} i++; } httpGet = new
            HttpGet(getUrl); Log.e("WebGetURL:" , getUrl);
        try{ response = httpClient.execute(httpGet);} catch(InterruptedException e){ . . . . . . }
    }
```
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Some part of WebService.webGet method implementation.
Example of invoking a service from the website which is some part of the codes in
AdEngine.isAGoodAd(String) method is as follows:
//get market segmentation criteria from the website server
WebService webService = new WebService(DBManager.getInstance().
getConfigValue(DBManager.SERVER_ADDR)+"/cserver.php"); Map<String, String> param = new
HashMap<String, String>(); param.put("c", "3121");
param.put("i",ad_id); String response = webService.webGet("", param);
The variable SERVER_ADDR is declared in the method initApp() in DBManager class, where it is
executed only once (when the mobile application is launched):
public synchronized void initApp(){
String isconfigured = getConfigValue(CONFIGURED)+""; updateConfig(SERVER_ADDR,
"http://xwantodn.com/phost/C"); . . . . }
(6) Implementation of functions in Phost A and M having tasks to broadcast messages via C2DM There
are two functions declared in C2DMMan.php having tasks to broadcast messages via C2DM:
sendMessageToOnePhone sends a message of a certain type to a mobile device, while
sendMessageToPhone sends a message to active mobile devices where their IDs are stored in the server
database (see Figure 15).
function sendMessageToPhone($msgType, $messageText){ $conn = connect();
$devices = rquery("SELECT deviceToken FROM shopper where is_blocked='0';"); if($devices){ //--send notification to every active registered mobile device
foreach($devices as $p)
sendMessageToOnePhone($p['deviceToken'], $msgType, $messageText);}
disconnect($conn);
}
function sendMessageToOnePhone($deviceRegistrationId, $msgType, $messageText) { //--- construct
the message being sent
$headers = array('Authorization: GoogleLogin auth=' . $GLOBALS['authCode']);
$data = array('registration_id' => $deviceRegistrationId, 'collapse_key' => $msgType, 'data.message' =>
$messageText);
$ch = curl_init();
//--- use C2DM service
curl_setopt($ch, CURLOPT_URL, "https://android.apis.google.com/c2dm/send"); //--- configure cURL
session and send data to a mobile device if ($headers) curl_setopt($ch, CURLOPT_HTTPHEADER,
$headers);
curl_setopt($ch, CURLOPT_SSL_VERIFYPEER, false); curl_setopt($ch, CURLOPT_POST, true);
curl_setopt($ch, CURLOPT_RETURNTRANSFER, true); curl_setopt($ch,CURLOPT_POSTFIELDS,
$data);
$response = curl_exec($ch); curl_close($ch); return $response;
}
PHP codes of sendMessageToPhone and sendMessageToOnePhone function.
Example code for calling the function with the intention to broadcast a deal notifications is as
follows: sendMessageToPhone("payload".time(),"2112#006<sepa>".$_POST['id'].
"<sepa>".$id."<sepa>".$category."<sepa>".$pid);
(7) Implementation of classes/methods in Phost C having tasks to receive and process push messages
sent by C2DM
Whenever there is an incoming push message detected in the mobile device, C2DMReceiver

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object processes the message by creating an intent object associating with C2DMCommandHandler then start the service (see Figure 16). Method of C2DMCommandHandler.onHandleIntent then handles the message accordingly (see Figure 17). It is shown in the figure, how a message having type of “2112” is handled.

```java
public void onHandleIntent(Intent intent) { String command = intent.getStringExtra("command"); // process the command if(command.equals("0112")){ .... } else if(command.equals("2112")){ DBManager.getInstance().updateNotificationFromServer(); if(intent.getStringExtra("data") != null){ String[] buff = intent.getStringExtra("data").split("<sepa>"); if(buff[0].equals("004")){ ade = new AdEngine(); ade.doIncomingAd(buff[1],buff[2],buff[3],buff[4]); } else if(buff[0].equals("006")){ de = new DealEngine(); de.doIncomingDeal(buff[1],buff[2],buff[3],buff[4]); } } } else if(command.equals("004")){ if(command.equals("006")){ // Some part of C2DMCommandHandler.java implementation
```

**Test and evaluation**

**Prototype testing**

During the prototype development, two types of test were performed, which are white and black box test. The white box was conducted mainly in the design phase to ensure that the databases, algorithms,
functions and user interfaces were designed properly. Then, after the prototype was fully developed, the black box was performed to test the functionalities of the prototype. A brief description of the black box test is as follows:

The website prototype was installed and launched in a host available in the Internet while the mobile application was installed and launched in Samsung Android mobile devices. Phost A URL was http://xwantodn.com/phost/A and Phost M was http://xwantodn.com/phost/M. Phost C was installed in a few mobile devices. In testing every function, positive (accepted) and negative (unaccepted) cases were used (the steps in performing the tests were in accordance with the system procedures depicted in [15]). Ten groups of functional test were performed, which were: Managing merchant and shopper registration, product categories, products, market segmentation variables; creating ads and deals; updating products, deals and ads; taking and claiming deals; managing shopper peers and sharing ads/deals with peers. All of the tests produced results as expected. For instance, after merchants created ads/deals with certain market segment defined and the administrator approved them, the website broadcasted the ads (via C2DM) and the ads/deals notifications showed up in the Phost C inboxes in the mobile devices (detailed test result is presented in [4]).

Prototype evaluation

Among the services designed and depicted in [15], the service that has not been materialized is location-aware advertising as collaboration with telecommunication companies is needed to implement it. Another service that has not been fully supported is providing fun/funny/entertaining content of products, ads and deals. Collaborations with web content designers are required to design such content.

During the system test, we did not perform stressed test yet. Therefore, it is not known how C2DM service would deliver/broadcast messages if the number of shopper reaches thousands or even millions.

Conclusion

A mobile marketing system for e-commerce implementing information personalization, privacy protection, up-to-date content, market targeting as well as social network has been designed and prototyped. The system involves two sub-systems, which are the provider website used by the provider administrator and merchant members, and the mobile application for Android mobile devices used by shoppers. C2DM service is employed to broadcast messages.

In designing and prototyping the system, the works involve: Personalizing information, targeting market and protecting privacy; designing and prototyping the provider website, the mobile application in Android environment, and the systems communication between the website and mobile application.

For the website, the functions, database and user interfaces must be designed in such a way to provide required functions for the provider administrator and merchants. As for the mobile application, packages, classes, local database as well as user interfaces must be designed and coded carefully to meet the mobile services criteria. Then, in designing the communication between the website and the mobile application, scenarios and messages format must be constructed. Web services that can be invoked by the mobile application are provided in the website.

In the future, further works are needed to provide location-aware advertisings, fun/entertaining content as well as to perform stressed test to ensure that the cloud service can handle high volume of traffic. It is also suggested to enhance the market segmentation algorithm (to personalize ads/deals), possibly by employing data mining techniques (some techniques are described in [16] and [17]. In e-commerce systems, the proposed mobile marketing system can be implemented as a standalone system as well as a sub-system of an integrated e-commerce system as suggested in [14].

In the proposed model web mining integrated with the electronic commerce application to improve the performance of e-commerce applications. First we have discussed some important mining techniques which are used in data mining. After that we explained the proposed architecture which contains mainly four components business data, data obtained from consumer’s interaction, data warehouse and data analysis. After finishing the task by data analysis module it’ ll produce report which can be utilized by the consumers
as well as the e-commerce application owners. In future this model can be improved more users interactive and applicable in peer to peer applications [29, 30, 31].

The paper also recommend to work on the semantic web and domain ontology for the purpose of site designing, creation and content delivery semantic web mining was first given by Berendt et al [28]. In future there is requirement to effectively integrate the semantic knowledge from domain ontology which should be able to deal with complex semantic objects.

References

[5]. Criswanto D. Nugroho (2012), Development of Android-Based Mobile Commerce System Providing
[17]. Mobile Marketing Services, Final Project, Informatics Department, Parahyangan Catholic University.


ICT Infrastructure Management of Rural and Community Banks in Ghana
the Role of ARB Apex Bank

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Abstract
Technology has become the bedrock on which all organizations thrive. Rural and Community Banks are no exception from this rule, as such to leverage on the current technological advancement, Rural and Community Banks (RCB) must invest heavily in highly sophisticated Information and Communication Technology (ICT) systems. As part of the Core functions of the ARB Apex Bank which serves as a mini central bank, is to provide ICT services and Training of IT staff that manage Rural and Community Banks. This paper highlights on the core mandate of the supervisory bank of the Rural and Community banks, ARB Apex bank on the Management of the ICT infrastructure of RCBs in Ghana, the modalities, the challenges as well as the successes in taking secured and reliable banking services to rural communities in Ghana. ARB Apex Bank has progressively introduced high level technology into Rural and Community banking making them very competitive even on the international space.

Keywords: Rural and Community Bank, ICT infrastructure, ARB Apex Bank, Electronic Banking, Technology Management.

Introduction
Information and Communication Technology (ICT) is currently the highway on which the success of each organization depends and cruise on. The level of infrastructure investment determines how seamless or rugged this highway may be and as such determine the success of the organization. ICT Infrastructure development determines the rate of growth of an organization however as stated by Lucas (2008), the ability to manage the ICT infrastructure effectively is key to the success of the organization or industry. The main aim of ICT infrastructure investment in most organization is to increase accessibility, availability, flexibility without compromising on security of the organization’s data which is an essential and integral part of the survival of the organization. The ICT infrastructure of each organization encompasses all the methods of collecting data, storing and accessing data, processing data and disseminating the information generated from the data. Data loss of any form is detrimental to an organization, but data loss due to intentional breaches from hackers or unauthorized users or breaches in ICT infrastructure management policies is disastrous and destructive to an organization.

Ghana currently has about fifty percent (50%) of her population living in the rural areas around the ten regions. Though Ghana's urban population is on the ascendency with a 3.4% annual rate of urbanization according to 2015 estimates from the 2010 national census, Ghana continued to be a nation of rural communities with a lot of people living in urban areas having close associations to their rural communities. In an attempt to perpetuate this pattern of rural urban residency and thereby to lessen the consequent socioeconomic impact on urban development, the "Rural Manifesto", which assessed the causes of rural underdevelopment, was introduced in April 1984. Development strategies were evaluated, and some were implemented to make rural residency more attractive. As a result, the Bank of Ghana established more than 120 rural and community banks to support rural entrepreneurs, and the rural electrification program was intensified in the late 1980s.
Ghana established her first Rural and Community Bank in 1976 primarily to provide banking services to the rural population, providing credit to small-scale farmers and businesses and supporting development projects (Tsamenyi & Shazad, 2008). Ghana currently has over one hundred and thirty-five rural and community banks spread over the ten regions. Most of the Rural and Community Banks (RCBs) are locally owned and managed with ARB Apex Bank serving as the supervising clearing bank under the regulation of the Bank of Ghana, which owns shares in the rural banks (Ansah, 1999).

This research paper seeks to highlight on the core mandate of the supervisory bank of the Rural and Community banks, ARB Apex bank on the Management of the ICT infrastructure of RCBs in Ghana, the modalities, the challenges as well as the successes in taking secured and reliable banking services to rural communities in Ghana.

**General functions of ARB apex bank**

As the supervising clearing bank of the rural and community banks in Ghana ARB Apex Bank which was established in January, 2000 has as its vision to “leverage on leading edge technology to increase the satisfaction of Rural and Community Banks and their customers and expand access to financial services in the rural economy”. To be able to effectively achieve this vision they have a mission “To provide sustainable banking and non-banking support services to the Rural and Community Banks with the aim of improving their operational efficiency and customer service, thereby transforming them into efficient financial institutions, which can effectively address the banking needs of the communities in which they operate” with their core values curled in the acronym SERVICE; that is Speed in delivery, Efficiency, Respect, Versatility, Integrity, Commitment and Effectiveness.

A critical look at the vision, mission and core values of ARB Apex Bank indicates or suggest an unavoidable mention of ICT infrastructure investment and management to be able to successful as a corporate entity. As a supervising bank, their core functions are:

- Keep accounts and maintain primary cash reserves.
- Monitor, inspect, supervise and ensure compliance.
- Lend funds.
- Handle cheque clearing activities.
- Provide specie services.
- Supply cash and receive excess cash.
- Render funds management services.
- Guarantee payment instruments.
- Provide audit and inspection services.
- Develop credit assessment procedures and monitor loans and advances.
- Provide ICT services.
- Provide training for staff and directors.
- Provide a deposit insurance scheme to protect deposits of customers.

**Technology dependent product**

ARB Apex bank over the years have introduce several technology dependent products to move CBs almost parallel to urban international banks. These technology dependent products have made the RCBs very competitive. Some of such products include Remittance Services and E-Banking.

**Remittance services**

ARB Apex bank operates both international and local funds transfer services through the RCBs, the remittance services offered are:

a. Apex Link: an instant domestic money transfer product developed to address the money transfer needs of people within the rural communities and peri-urban centres. It provides an opportunity to transfer money to all parts of the country through the network of rural and community banks dotted all over Ghana with over 800 outlets.
b. Foreign Remittance: ARB Apex bank also offers international remittance services such as Western Union and MoneyGram.

Method

The research paper was conducted as an exploratory research to understand the role of ARB Apex Bank in managing the ICT infrastructure of Rural and Community Banks in Ghana. It was intended to highlight the strengths that the Rural and Community banks accrue from the management of the ICT infrastructure by a supervisory Bank as well identify the potential challenges and the gray areas. Open ended questionnaire was administered to the Deputy ICT director of the supervisory bank. The workflow and chain of command from the IT director to the grass root managers of the ICT infrastructure at the rural and community banks was also studied critically.

Results and discussion

ARB Apex bank operates a private cloud system that runs all the applications as well as the infrastructure of the Rural and Community banks. Prior 2009, all the Rural and Community Banks operated their single servers with different software and hardware architecture. The bank had to do all the networks to their various branches. IT staffs from ARB Apex Bank only visited the banks to aid in. This was quite expensive, difficult to manage and supervise. This brought a lot of long down times since personnel had to be sent from the supervisory bank to solve sometimes very minor problems. This meant customers would be cut off from accessing their funds for the period of the down time.

Rural financial services project (RFSP)

The Ghana Rural Financial Support Project (RFSP) was a project co-financed by International Fund for Agricultural Development (IFAD), the World Bank and the African Development Bank (AfDB) as was aimed at promoting growth, reducing poverty and deepening rural financial intermediation. The project’s objectives were building the capacity of the informal sector; building the capacity of Rural and Community Banks (RCBs); and building a supervisory institution (Apex Bank) to for institutional Support.

The RFS Project started in 2002 and was completed in 2008. RFSP was a sub-sector specific and country wide project with interventions at macro, meso and micro level. The overall objective was to complement government efforts in reducing poverty by broadening access to rural finance. The total cost of the Rural Financial Support Project was USD 22.9 million. According to the Project Performance Assessment report, the RFSP was consistent to national policies, IFAD’s country strategy and rural finance policy, as well as to the national micro and rural finance development need. The report further stated that the project design had two (2) shortcomings; firstly, even though the design aimed at introducing linkages between informal and formal financial institutions as observed in India, it did not adapt the linkage model to the Ghanaian context. Secondly, the RFSP design did not articulate well the linkages with the other existing interventions in Ghana that could benefit from enhanced access to Rural Finance Services.

The report noted that the Ghana RFSP made lots of strives in its support to the rural and community bank network. Through the project the ARB Apex Bank was established as an umbrella organization of rural and community banks. According to the Project Completion Digests – 2010, the RFSP contributed significantly to the expansion of rural financial services and a more robust finance sector.
Under the RFSP, IT staff from the supervisory bank (ARB Apex Bank) would visit each rural or community bank to do the computerization on the premises of the bank. The Rural or Community bank will network all its branches to the headquarters as shown in figure 1 above. ARB Apex bank staffs were in charge of all the Installations, Configuration and Training of the RCBs IT staff. Each of the RCBs used its own servers and banking software. The computerization of the RCBs to their various branches made banking or financial services easily available and assessable to rural communities and boosted the rural economy. However, this brought pockets of installations all over the country and managing all the installations by the supervisory bank became tedious and a daunting task.

**Millennium development authority (MiDA)**

The Millennium Development Authority (MiDA) in its bid to accelerate the growth of the rural economy, sponsored the rural banks computerization project in 2009. The project intends connect all the over 130 rural and community banks through the provision of Information Communications Technologies (ICT) to improve financial service delivery and support to local enterprises. The USD 25 million project is under the under the Ghana Rural Banks Computerizations and Inter Connectivity Project. The project involved the construction of a central data centre at ARB Apex Bank, the distribution and installation of electric generators, local area network, satellite-based Wide Area Network, personal computers and accessories.

The project was staggered into several phases, with the first phase focusing on infrastructure development. The first phase was the development of the infrastructure of the data centre at the ARB Apex Bank in Accra. This was to serve as the data centre for the private cloud on which all the branches of the rural or community banks would be connected to. The second phase was the deployment of an eMerge Banking Software (Temenos T24 Core Banking Application Software). This involved the deployment of the Temenos T24 Core Banking Application Software on the client computers of the over seven hundred
(700) rural and community bank branches of the over one hundred and thirty (130) RCBs scattered all over the ten (10) regions of Ghana. Each of the client computers of the RCB branch connected directly through a simple web server located at each branch.

At the inauguration of the first RCB to be connected to the ARB Apex Bank; that is Dangme Rural Bank, the then Deputy Governor of the Bank of Ghana, Mr. Millison Narh, urged the Rural or Community bank's management as well as the IT staff at ARB Apex bank data centre to ensure the security of the system and training of staff to enhance customers' confidence indicating that the expected benefits of the project was to ensure easier access to more varied and cheaper banking services, efficient customer service delivery and making the needs of customers central to the banking business. The Head Internal Control, ARB Apex Bank, Mr. Hyginus Zon tasked the board and management to institute a risk management policy to identify, assess, monitor and control operational and credit risks and reiterated that the bank must also strengthen its internal control mechanisms to ensure that adequate and effective measures were in place to enhance standards and improve performance.

The ICT infrastructure and management under the MiDA sponsored project as such connected all RCBs branches to a centralized data centre, as depicted in figure 2.

![Figure 2. ICT infrastructure network of RCBs to data centre of ARB apex bank.](image)

**Benefits of the MiDA project**

The use of the private cloud system under the MiDA project with ARB Apex hosting the data centre has brought lots of benefits to the Rural and Community banks in particular and the Ghana as a whole through its rural development. Some of the benefits include;

- The total cost of ownership (TCO) of the IT infrastructure has drastically reduced. Even though the project was initiated with the first two years being fully funded, the RCBs started paying to the use
of the IT infrastructure from 2011, this increase the financial commitment on the RCBs but the overall TCO has reduced.

- ARB Apex bank now has more control over the RCBs infrastructure data and, allowing it to intervene promptly. IT department is able monitor application deployment and use advanced analytics to predict and prevent bottlenecks and downtime. This has made the supervisory bank more efficient in its supervision.

- ARB Apex Bank has been able to rollout several products unto the rural and community banking industry. SMS alert was initially implemented to alert customers of all on bound cash deposit. After successful implementation of the SMS-alert, the Apex Bank introduced the e-Susu. The e-Susu is an App that runs on android, iOS as well as windows operating systems, making it accessible on almost all smart phones. The e-Susu App can also be executed using Unstructured Supplementary Service Data (USSD) code. This makes it possible to operate the e-Susu app on even feature phones. The mobilization agents visits the customers at their locations and receive funds. The agents capture the funds received using the e-Susu app, once the transactions is completed the customer receives an SMS notification.

- This system has increase data security and limited fraud. The use of the data centre has reduced the vulnerability of the RCBs when each of them had their own servers and operated from their headquarters. Other electronic products that has been rolled out by ARB Apex bank such the SMS-Alert, e-Susu has almost eliminated fund suppressing by tellers and mobilization agents.

- The ARB Apex Bank is in the final stages of implementing a new e-Product know as u-connect which would make it possible for customers to have access to their funds electronically. Customers would be able to transfer funds from their account to any other rural or community bank account all over the country and also transfer funds from their account to mobile money accounts. The u-Connect like the e-Susu runs on all the major smart phone operating systems as well as running on a USSD code.

- Overall, it has made the RCBs very competitive.

Challenges

The ARB Apex Bank has made lots of strive but there has been some few challenges as outlined by the Deputy ICT manager. One of the major challenges has been financial commitment. The cost of running the system has over the years not changed in dollar terms but the cedi equivalent has appreciated over 400%. Secondly, some of the RCBs have grown bigger and demand more services, however since all the RCBs are connected to the system, it has become almost impossible to roll out services for only some RCBs without the others. Hence there is no technological leverage between the RCBs. Lastly, since most of the commercial banks in the country use the same Core Banking Software as used by the RCBs currently, the turnover rate of the IT staff is very high. This means the Supervisory bank keeps training new IT staffs only for them to move to the commercial banks.

Conclusion

With the support of Government of Ghana and International development Partners, ARB Apex Bank has served effectively as the supervisory bank for the RCBs and the management of the ICT infrastructure of the RCBs.

ARB Apex Bank has progressively introduced high level technology into Rural and Community banking, revolutionizing the rural and community banking industry and making them very competitive even on the international space. Some of the RCBs have been able to compete favourable with other well-known commercial banks in their operational area.
References


Increasing Human Security to Disaster Risk Targeting Vulnerable Communities in the North of Haiti

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Abstract

Human Security was never a concept used in Haiti in the past. As disaster in this country remain a critical factor, the concept become more important than ever. Human Security can respond to the complexity of emerging security threats in an integrated manner. Human security protect the vital core of all human lives. It is important to use processes that build on people’s strengths and aspirations. It means creating, social, environmental, economic and cultural systems that together give people the building blocks of survival, livelihood and dignity. This project work respond to those needs. It is all about empowerment and protection. With this concept, institutions are reinforce with a focus on capacity development of keys partners locally and regionally. The North department was a key focus to build that capacity targeting vulnerable communities. By addressing the full range of insecurities faced by the targeted communities in the North, the project promotes responses that are community-driven, preventive and sustainable in the long run.

Introduction

To date, much of the work on human security has focused on threats emerging from war and conflict. Disasters have largely been overlooked, despite being now identified by the international community as a major threat to human security. They cause many of the same problems as conflict - such as large scale destruction and extensive displacement and contribute to Human Rights violations and heightened vulnerability, especially of the most marginalized groups and individuals.

Haiti is one of the most vulnerable countries to disasters in the world and the North Department is one of the most disaster prone areas in Haiti. In such a highly disaster prone country, preparedness and risk reduction are critical components of human security.

From 1909 to 2013, Haiti has faced over 100 disasters primarily caused by hydro-meteorological hazards of which 30 cyclones, 47 extensive floods, 7 droughts and 2 earthquakes. Cyclones, landslides and droughts are the phenomena that most impact the agricultural sector, which represents the most important source of income for Haitian households. Since 1963, approximately 240,000 people have been killed and over 9,000,000 people have been affected by disasters in the country.

Haiti has in recent years experienced rampant urbanization, at a rate of approximately 3.9% per year since 2001. Haitian urban development has been characterized by anarchic occupation of high-risk areas and the lack of application of building codes, aggravating environmental degradation and human insecurity. The January 12, 2010 fatal earthquake was a sharp reminder of the country’s extreme vulnerability to seismic risk.

The effects of disasters and lack of appropriate protection mechanisms have a significant impact on pre-existing vulnerabilities, which are exacerbated if the needs of the most affected individuals cannot be met.

There is also a clear link between disasters and food insecurity. In 2012, the prevalence of food insecurity was up to 43% in the rural areas that had been affected by Cyclone Sandy; the next year the rate had diminished to 27%. Food insecurity is more relevant in rural areas (12, 9%) than in urban areas (8,3%).

Among the 10 departments of Haiti, the North Department is one of the most disaster prone areas in
Haiti. Due to its proximity to the "Septentrionale" fault, earthquake risk is highly elevated. More than 73% of the municipalities are at risk of flooding, 36% at risk of landslides, and 21% at risk of tsunami.

The high population density in urban and peri-urban areas is an exacerbating factor of the environmental insecurity, especially of the poorest communities. The absence of a risk-sensitive urbanization plan is an environmental factor that must be addressed. Moreover, the unplanned urbanization has led to the creation of urban areas that have no access to basic infrastructure and public services, increasing the health insecurity of individuals.

Epidemics in general, specifically cholera and malaria, see increasing peaks during the rainy seasons especially as a result of the absence of infrastructures, lack of household latrines, and weak awareness around the behavioral preventive measures. The most vulnerable municipalities are Bas Limbe, Acul du Nord, Limonade and Plaine du Nord. Throughout the department, 31% of the population has no access to potable water and adequate sanitation infrastructures.

Rationale

Since the creation in 2001 of the National System for Disaster Risk Management (SNGRD), Haiti has made significant progress in increasing its capacity to prepare for and manage the impact of disasters especially on the environmental and economic security. However, millions of Haitians are still face high degrees of insecurity due to disaster risk — significant efforts are still required to strengthen capacities to prepare for and recover from disasters. In such a highly disaster prone country, preparedness and risk reduction need to be a priority in order to increase human security.

An assessment based on past experiences and consultations with key stakeholders including the United Nations methodology of Gender Impact Assessment have demonstrated the need to strengthen overall capacities in relation to risk monitoring and assessment, preparedness and response, risk reduction and mitigation, especially at community levels in order to address specific insecurities. Such efforts must be conducted whilst empowering the most vulnerable communities and ensuring appropriate institutional capacities to protect. An adequate response to these needs will build the resilience of individuals that are most insecure to disaster hazards, thereby ensuring that communities will reduce their exposition to disaster risks and recover from sudden shocks.

The institutional coordination mechanisms, that bring together all disaster risk reduction actors (line ministries, UN agencies, NGOs, private sector and civil society), have made significant progress in recent years. However, these coordination mechanisms often lack the technical and financial capacities to appropriately address the needs of the most vulnerable individuals in a holistic manner. This impedes the implementation of adequate strategies to improve the identification and monitoring of risks, define preparedness and response strategies to disasters in a participatory and representative way, while establishing urban planning and risk mitigation initiatives that reflect the specificities of the insecurities of the population.

Moreover, the communities are often not consulted when identifying risks or developing and implementing disaster risk reduction strategies. A genuine prospect of sustainable development and human security can only be achieved if communities are empowered to take on an active role in managing risks and government institutions commit to offering protection for the most vulnerable.

This project was planned to secure community ownership by the most vulnerable communities with a particular focus on women, children and youth - in the North department, thereby addressing the specific insecurities they hold. As such, the project bring together UN agencies, local authorities and local communities through the partnership with UNESCO and Oxfam who have extensive expertise in the North Department and have been working with local communities in this domain.

The Government of Haiti and the United Nations have been engaged since April 2013 in the Political Champions Group for Disaster Resilience initiative. It defined a new approach in addressing disaster risk, by building the resilience of vulnerable populations to disasters through a coordinated and cross-sector integrated program that addresses major insecurities (social, environmental and economic)
that exacerbate the effects of disasters. The initiative is focused on three pilot departments exposed to natural hazards, among which the North department.

In February 2014, the Political Champions Group for Disaster Resilience in Haiti (including government line ministries, UN agencies, NGOs and civil society) conducted technical missions in the pilot departments in view of developing specific investment programs to strengthen the resilience of communities to disasters. The project addresses a number of priorities identified in the investment program for the North department, thereby contributing to the advancement of the disaster resilience agenda in Haiti, with an emphasis on improving human security in a holistic manner.

Moreover, all partners engaged in this project have a thorough understanding and experience in matters related to disaster risk reduction, disaster risk management, and overall reinforcement of human security in relation to disasters in Haiti and in the North Department.

This initiatives integrate elements of on-going projects – and therefore co-funding- such as the project for Seismic Risk Reduction in the Great North of Haiti (UNDP 2011-2015), Supporting Disaster Resilience in the Highly Vulnerable Northern Department of Haiti (UNDP 2015 -2017), Reinforcement of the decentralized National System of Disaster Risk Reduction (UNDP /French Red Cross 2014-2017), and Project DIPECHO Tsunamis in the island of Hispaniola (UNESCO 2012-2014).

The profound expertise of OXFAM and UNESCO with regards to reinforcing the leadership role of women, children and youth allowed this project to address the specific insecurities of the most vulnerable groups, which are often not taken into account.

Human security is meant to entail “freedom from fear” and “freedom from want,” a situation in which people can live their lives with dignity. To date, much of the work on human security has focused on threats emerging from war and conflict. Disasters have largely been overlooked, despite being now identified by the international community as a major threat to human security. This reflects the evidence that disasters cause many of the same problems as conflict such as destruction on a large scale, extensive displacement, violation of Human Rights, and heightened vulnerability in particular those who belong to marginalized groups.

Disasters are almost always the result of both natural phenomena and human action. Nowadays, due to climate change and its impact on the environment, disasters are occurring with increasing frequency and intensity. When disasters - such as a drought, flood, earthquake and tsunami strike people’s livelihoods and ability to continue with day-to-day life are affected, whether directly or indirectly. Disasters exacerbate the underlying social, economic, political and environment insecurities, stalling economic and social progress with results on the human security of those most vulnerable and leading to a reduction in the protection and empowerment of this group.

Due to gender dynamics in the communities, women are the most affected by disasters because they affect their financial autonomy, increase their work load, expose them to violence and sexual abuse. There is increasing evidence that pre-existing social, economic, political and environmental conditions determine the impact of disasters. Their roles are rarely taken into account and valorized during risk analysis and preparedness.

In light of the major vulnerability of the communities of the North department of Haiti to disasters, the project intended to address in a holistic matter all aspects that can contribute in strengthening the security of the most exposed individuals. The North department is the most appropriate to promote the Human Security approach, due to the presence of ongoing programs implemented by the UNDP, UNESCO and OXFAM and the limited empowerment and participation of the most vulnerable communities with regards to disaster risk management measures.

In line with the Human Security methodology and the “Protection and Empowerment” framework, the envisaged initiatives focus on promoting an approach in which the individuals are not only beneficiaries, but real actors of change. Moreover, the project contributed to the reinforcement of the institutional structures that have the responsibility of protecting their citizens and allowing them to appropriately carry out their daily lives without being subjected to unexpected shocks that chronically
endanger the integrity of their lives and livelihoods.

The nature of the constituted partnership for the development of the project is representative of the various aspects that needed to be taken into account in order to ensure human security in relation to disasters. After having carried an in-depth analysis of the human insecurities related to disasters, including the United Nations methodology of Gender Impact Assessment, all partners have underlined the necessity to include actors at all levels and of different expertise in order to ensure that all actions are complementary and contribute to the achievement of the intended result.

The Human Security approach is an exemplary method to address chronic vulnerabilities to disasters and shed light on those specific insecurities that entail a chronic weakness of the lives and development of the most fragile communities. Moreover, the funding of the project gave the opportunity to various UN agencies to approach the communities in a more direct way and not focus the entirety of their efforts on the institutional mechanisms which often do not reflect the difficulties encountered by the most disadvantaged populations in particular women, children and youth.

For this reason, the project contains elements, such as the development of a study on the benefits of the Human Security approach in humanitarian and development programs in Haiti to strengthen disaster resilience. This approach was promoted within the UN System and the international community in general while advocating for the adoption of this method among governmental counterparts.

**Objectives and outputs**

**Objective 1.** The human security of vulnerable communities is improved through an increased participation in the construction of knowledge of disaster-related insecurities and their integration in disaster risk management strategies, at the local, municipal and departmental level.

It is noteworthy that communities at risk are very often aware of the risks they face. Less frequent hazards as earthquakes and tsunamis may be less known and need to be integrated in a multi-hazard approach. The main objective of enhancing risk knowledge is to understand social representations that are being shaped and influence decision-making and behavior change. It is important to integrate communities in the study and analysis of natural hazards and vulnerability.

Understanding the interaction of hazards, exposure and vulnerability is crucial to effective disaster prevention and resilience. Multi-risk assessments are therefore fundamental to help provide access to analysis and information on risk and vulnerability factors associated with disasters.

The initiatives was carried out through the direct participation of the chronically affected communities that provided detailed and disaggregated data in order to allow the developed assessments to appropriately reflect the specific insecurities that prevail in the target area.

**Output 1.1.** Knowledge on disaster risks is increased among local, municipal and departmental stakeholders, including the specific impact according to gender.

- Developed and disseminated an integrated multi-risk assessment (earthquake, tsunami, marine submersion, flood, land slide, rock falling, debris flow, and storm) for the North department, combining technical and participatory approaches.
- Conducted an assessment of the human, socio-economic and environmental issues of the target area, with a focus on specific vulnerabilities related to gender.
- Conducted evaluation of three main critical infrastructures of the target area;
- Developed Risk Prevention Plans for targeted municipalities on the basis of the Departmental Risk Assessment and the identified human, socio-economic and environmental vulnerabilities of the target area;
- Strengthened the capacities of local authorities to consider the findings and adopt the recommendations of the multi-risk assessment, through a combined technical and participatory approach.
- Disseminated, communicated and raised awareness on the findings and recommendations of the integrated departmental multi-risk assessment Risk Prevention Plans, at the local, municipal and
departmental level with a particular emphasis on empowering people with specific vulnerabilities (including women, girls and those with disabilities).

**Objective 2.** The insecurities towards disasters of the most vulnerable communities are addressed holistically by the main disaster risk reduction stakeholders at all levels.

The departmental and local coordination mechanisms, which focus on disaster preparation and response, do not always have the necessary means to ensure an active coordination with other stakeholders. This causes the initiatives to not take into consideration other long-term aspects, such as a disaster risk reduction, risk mitigation and disaster resilience. Through the project, the formal coordination mechanisms improved the outreach and inclusion of non-governmental actors (NGOs, community based organizations and the private sector) in view of integrating in a holistic way the insecurities of the most vulnerable populations in the disaster risk reduction and management strategies. The initiatives, thanks to its people-centered approach and case studies, lessons learned and testimonies provided new insights on the value of the human security approach in relation to disaster resilience. Through the development of a foreseen study, an advocacy strategy to integrate the human security concept in disaster risk reduction and management approaches implemented towards all relevant stakeholders, at all levels.

**Output 2.1.** Specific insecurities of vulnerable communities are addressed through the strengthening of cross-sector coordination and operation of disaster risk management stakeholders, at the community, municipal and departmental level.

- Strengthened the capacities of cross-sector disaster risk management coordination bodies in addressing human securities, at the community, municipal and departmental level;
- Strengthened operational capacities of the local committee of the Haitian Directorate of Civil Protection with a focus on protection of the most vulnerable

**Output 2.2.** A human security approach, with an emphasis on protecting the most vulnerable, is adopted in disaster risk management programs of key civil society, government, and international actors

- Conducted a study on the benefits of approaches that promote human security in disaster resilience programs in Haiti, on the basis of this innovative project and in view of broadening its impact;
- Promoted and advocated for the holistic integration of specific insecurities of communities that are vulnerable to disasters in disaster risk management interventions (e.g. in the education system), including the protection role of government institutions;
- Strengthened the capacities of the Ministry of Status and Rights of Women, for a greater involvement in disaster risk reduction initiatives with a human security approach.

**Objective 3.** Insecurities are addressed by the targeted communities through their empowerment and participation in decision-making processes and development of disaster risk reduction strategies

Through this project the empowerment targeted vulnerable people was reinforce and manage context-specific and culturally-adapted multi-hazard disaster risk reduction strategies, including Community Action Plans and Community-based Early Warning Systems (CEWS). The implementation of such strategies was a complex endeavor, demanding multisectoral approaches and needed to be anchored in a protective structure implemented by the State. In this sense, the Community Action Plans and especially the CEWS should be linked and provide feedback to the central and departmental level.

**Output 3.1.** Relevant technical capacities are acquired by community-based organizations to further their leadership in designing and implementing disaster risk management activities

- Provided support to communities for the implementation of Community Action Plans;
- Conducted an inventory on good practices on disaster preparedness and response at the community level, and render them accessible to a broader audience;
- Provided training and support for the development and implementation of community early warning systems linked to departmental-level systems, through a participatory approach and a particular focus on women and youth.
Output 3.2. The organizational capacities of civil society organizations and government structures at the local level are strengthened to further the empowerment of communities in disaster risk management.
- Strengthened the capacities of volunteers and other community-level structures, with a focus on protection of the most vulnerable;
- Promoted partnerships and integrate local women’s organizations and network with existing disaster risk management mechanisms.

Output 3.3. The extended school community has a reinforced capacity to address its insecurities and implement tailored disaster prevention and management protocols.
- Conducted trainings and support to teachers and schools inspectors for the development and implementation of tailored protocols for disaster risk prevention and management;
- Conducted trainings and awareness raising initiatives towards teachers, school inspectors, pupils and parents in disaster preparedness and response, through the participation of all stakeholders.

Output 3.4. Women and youth are empowered to address their insecurities through a greater participation in the design and implementation of disaster risk management strategies.
- Conducted training and awareness raising activities targeting women, youth, and men to increase the participation of women and youth in the design and implementation of disaster risk reduction activities.
- Support gender mainstreaming in the development and implementation of community early warning systems

Objective 4. The human security of targeted communities is increased through the reduction of their exposure to natural hazards.

Output 4.1. Communities are empowered to collectively design and implement measures to mitigate risks posed by natural hazards.
- Provided technical expertise and resources to community-based organizations for the design and implementation of small-scale disaster risk mitigation projects.

Target area

The project targeted the communities of the vulnerable urban corridor from Cap Haitian to Limonade in the North department of Haiti. The choice of the North department was in line with the strategy defined by the Government of Haiti as part of their leadership of the Political Champions Group for Disaster Resilience initiative.

The exact number of direct beneficiaries is difficult to express at this stage because the communities that was directly benefit from the project was determined through the development of the departmental risk assessment and the assessment of the human, socio-economic and environmental issues with a focus on specific vulnerabilities related to gender both foreseen in the project.

However, it is safe to say that the entirety of the population of the North department was indirectly benefit from the implementation of this initiatives, especially from those related to the reinforcement of the formal coordination structures, the multi-risk assessment, and public education and awareness raising initiatives:
- Cap Haitian – 155,000 people
- Petite Anse- 89,000 people
- Limonade - 14,000 people
- Coast of de Limonade – 1,000 people
- Commune of Quartier Morin – 3,500 people (urban) + 21,000 (rural sections)

In order to address the assessed gaps in the most appropriate and sustainable way, the global goal of the project was to increase the human security of targeted communities that are vulnerable to disasters in the Cap Haitian- Limonade corridor, with a particular attention to women, children and youth.
Methodology

The project was developed following the evaluation tools provided by the Human Security Unit, in particular “Designing a human security program/project”. The implementing partners (UNDP, UNESCO, and OXFAM) participated in specific exercises to identify the human insecurities in the North Department and decide what changes needed to be obtained through the project.

In particular, the elements included in the project were developed in a two phase process:
1. Secondary data: analysis of lessons learned from current projects.
2. Primary data: identification of disaster risk reduction needs through specific exercises and in-field consultations, meetings with the representatives of the Departmental Committee of Civil Protection, Gender Ministry, other stakeholders and community-based organizations in the target areas. A workshop was organized mainly with civil society organizations in order to identify the current needs on disaster risk reduction from a human security perspective.

These consultations allowed the proposal team to consult various levels and triangulate data on insecurities faced by the target population. This process led to an adequate identification of the needs to be addressed and of the most appropriate actions to undertake.

The project has obtained official validation of the Haitian Directorate of Civil Protection, which is the main governmental counter-part for the implementation of the initiatives.

Implementation

The UN agencies involved in the project have a tremendous amount of experience to support changes in matters related to Disaster Risk Reduction Management in the North Department of Haiti. Moreover, each agency is an active participant of the Political Champions Initiative and therefore thoroughly involved in reducing insecurity of the most vulnerable populations through a holistic approach that addresses all insecurities that threaten the integrity of the most exposed individuals.

To achieve the goals, the existing partnerships of the implementing agencies was reinforced with all relevant stakeholders, in particular the decentralized government instances such as the Directorate of Civil Protection and the Departmental Committee of Disaster Risk Reduction and the community-based organizations in order to ensure the “protection-empowerment” approach throughout all phases of implementation.

To guarantee an appropriate outreach and active engagement of the local communities, the UN Agencies selected an experienced and geographically well-established partner to translate all actions at local and community levels and guarantee the envisaged impact on the human security of the targeted populations.

To do so, the UN agencies decided to partner with OXFAM, an International NGO that has been involved for more than a decade in community disaster risk reduction in the North Department. OXFAM works closely at local and community levels with Community Based Organizations, local NGOs and local authorities to empower them, and most importantly, to add in their agenda the gender equity topic. OXFAM worked to support those actors, men and women, to be able to take part in the decision processes and influence the leaders, authorities to make strong decisions in order to change their lives.

Sustainability and conclusions

The “protection-empowerment” framework that was implemented through the project guaranteed the sustainability of the achieved results through time. The implementation of such framework allowed to strengthen the capacities of the targeted communities to understand and act upon their vulnerabilities. The communities, which are often mere beneficiaries, was the main actors of change.

Moreover, in order to ensure an environment which allows the communities to develop and grow as active citizens, the initiatives also targeted the formal and institutional protection mechanisms that guaranteed an adequate consideration and assistance of the most vulnerable, before, during and after a crisis. The coordination structures that was reinforced through this project enable the continuous revision,
test and improvement of the methodologies and processes developed.

The particular focus given to women, youth and children strengthened the acknowledgement of the central role of these specific groups in the development and implementation of disaster risk reduction strategies, at all levels. This is an imperative factor, given that it has been proved that the active participation of women allows continuity of implementation of activities and behavioral change as they are the main channels of knowledge transfer. The integration of the Women Affair Ministry at all stages of the project and activities reinforced an institutional integration of the gender equity aspect in disaster risk reduction. In the future, much more analytic projects needs to be implemented by the Government of Haiti while involving the media to bring awareness to the population that can bring resilience in disaster situation when they occur.

References


School Leadership in Higher Institutions of Learning: Opportunities for Sustainable Development

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Abstract

Governments of Uganda and schools in Uganda have made great efforts to develop the education sector for quality education through Higher Institutions of Learning. In Uganda, the number of these institutions has increased since almost four decades. Unfortunately, through different tracer studies, statistics show that employments are rare to the African graduates and worse in Uganda. Youth unemployment in Uganda is the highest in Africa. More than 62 % of graduates in Uganda are not employed and the African development Bank says it could be as high as 83 %. The main question was to find out all opportunities in Higher Institutions of Learning that could enable graduates and Mbale District dwellers to induce, maintain, and promote sustainable development. The purpose of the research was therefore to identify those opportunities in Higher Institutions of Learning that can be useful to sustainable development of Mbale. The research was conducted in Uganda in Mbale District. The method of research was qualitative. The researcher used interview as well as moderator guides as tools for data collection. The sampling technique was random and convenient in nature. The findings were critically examined and faithfully reported. Identified opportunities in Higher Institutions of Learning were essentially: guided skills based knowledge, technologies, scientific know-how that can be used to induce, maintain, and promote sustainable development through global education, research, and technology and all findings have to lead to special approaches that will satisfy the needs of people in Mbale, Uganda and the world.

Keywords: School leadership, Higher Institutions of Learning, Integral Development.

Introduction

A history of Higher Education reveals that universities and colleges have been at the forefront of creating as well as deconstructing paradigms. They have led social change through scientific breakthroughs but also through education of intellectuals, leaders and future makers (Cortese et al. cited by Tilbury, 2014). African leaders at independence strongly believed that the economic stagnation of their countries resulted from a shortage of qualified technical and managerial cadres (Musaaizi, 2011). Musaaizi further posits that development is an educational process. The concept of development as a process overtime has important implications for the overall development planning of a country. Trust in the ability of education to promote economic and social development is a common thing in Africa Today. Development must emphasize employment, income distribution, self-reliance and commitment (op. Cit.). This crucial to know if the emphasis is on sustainability and the role higher education can play.

Unfortunately, Statistics show that employments are very rare to the African graduate and worse in Uganda. In fact statistics show that there is job scarcity in Uganda. The Vice Chancellor’s Forum (2016) indicate that more than 400,000 Students (who) graduate from Higher Institutions of Learning (HIL) but only 150,000 get jobs. It is therefore important that HIL organize an education system that will promote job creation for wealth creation.
School leadership

School leadership is the most important factor of success in education. This is a reality that affects school administration from home, kindergarten, elementary, secondary, to university level in both public and private education systems. School leadership is second only to teaching among school-related factors in its impact on student learning according to research (Wallace Foundation, 2016).

The school leader of today must play a panoply of roles, engage in a plethora of activities, and make a myriad of decisions to ensure student learning. During schooling, leaders have to identify opportunities in HIL and in the district that can lead to sustainable development. Identification of opportunities should be one of the priorities of school leadership at all levels but for the sake of this study, the focus is on opportunities in HIL and Mbale District Local Government Leaders (MDLGL). As leaders in HIL and MDLGL have priorities and values that guide their leadership, these will be looked at from a transformational view point.

Leadership, education and political dynamics

Musaazi (2006) indicates that to make education a profitable enterprise and a contributor to social development, planning must come to be accepted as the essential prerequisite. Planning is an activity in which individuals, organizations, communities and countries are always engaged. It is among other things, a professional activity with an area of academic enquiry. For this reason, Mbale as a District is made by a variety of people groups. It is governed by political leaders representing the government at national, regional, and local levels. These leaders are expected to initiate educational planning that must involve HIL. In line with Musaazi’s position, the authors of this article would like to assess to what extent Mbale District Local Government leaders in Mbale District have involved schools in order to educate them on issues concerning the roles schools can play in favor of not only the HIL but also the District development.

Study rationale and purpose

The rationale for this study was to create awareness of the role School leadership in HIL in Mbale district can play in the effort to lead Mbale District to its true development. The purpose of the study was to find out opportunities in HIL that are likely to be used in order to induce, maintain, and promote sustainable development.

Research objectives

For this particular study, the main objective was to determine opportunities in HIL that can enable Mbale District to induce, maintain, and promote sustainable development in Mbale District.

Research question

The research question was to find out which opportunities are there in HL that can help Mbale District take-off as far as sustainable development is concerned.

Scope of the study

This study was limited to school leadership in HIL. It was primarily focused on opportunities, existing in HIL that leaders from both HIL and MDLGL could be used to induce, maintain, and promote sustainable development of both individuals and communities within Mbale District.

Theoretical scope

In this study and from the theoretical perspective, school leadership had focus on both transformational and pragmatic research paradigms. The two lead to intentional and practical application of knowledge in order to induce, maintain, and promote integral development that leads long-lasting development.
Geographical scope

The research work was done in Uganda in Mbale District and did involve HIL that were fully accredited by the National Council for Higher Education and which are completely functioning in the District at the time the research was conducted.

Time scope

The study was conducted in Mbale District from July 1st to July 31st, 2017.

Significance of the study

Kaahwa (2008) indicates that the significance of the study shows the worth, urgency and need for undertaking the study. This study of school leadership was meant to expose opportunities in HIL that could be considered as catalysts of sustainable development. Mbale being a developing District, it is more than urgent to involve HIL in the plans to develop the District so that HIL share the opportunities they have which are indispensable for the holistic development of Mbale for more sustainability.

The significance of this project is that HIL can offer a platform for Mbale District to solve its problems through applied research for development. In fact, Musaazi (2006) says that “The planning process is seen as a professional activity, as well as a social process located at the interface between knowledge and authority.” HIL have both knowledge and authority in different disciplines that Mbale District needs to consider as it plans for its long-lasting development.

Proposed study paradigm

Rapid, sweeping and long-lasting change is altering our planet environment in and unprecedented manner, while societies are undergoing profound shifts in their demographic makeup and social economic fabrics. Political agreements, financial incentives or technological solutions alone do not suffice to grapple with the challenges and sustainable development. It will require a wholesale change in the way we think and the way we act- a rethink of how we relate to one another and how we interact with the ecosystems that support our lives (UNESCO, 2014). To create a world that is more just, peaceful and sustainable, all individuals and societies must be equipped and empowered by knowledge, skills, and values as well as be instilled with heightened awareness to drive such a change (Ibid.). Because of this, the model we are going to use to orient this research is from a pragmatic paradigm dimension of research for positive transformation. Effective leadership should lead to practical application of knowledge for both individual and collective transformation.

Leadership development doesn’t happen overnight. To achieve genuine, sustainable results, leaders in the “Pragmatic leadership” Program are exposed to six different learning dynamics, which, when combined, influence and enable meaningful, longer-term growth (www.pragmaticleadership.ca). This theory is made up with dynamics which represents a force that stimulates change or progress within a system or process (Ibid). The dynamics include: self-reliance, blended learning, coaching, academic theory, applied learning, sponsored accountability. To these six elements, the researchers have added one more key element that it is at the center of the diagram and without which self-reliance cannot take place. That added document was intentional action. All those seven elements are represented in the diagram below:
Future perspectives on school leadership and development

School leadership should come closer to governments and communities in Mbale District so that they work together in the effort to promote holistic, long-term and sustainable development. Development cannot take place without citizens having sound knowledge, appropriate attitudes and useful skills. It is therefore important for us to determine in Mbale District, school leadership opportunities that can lead Mbale to real development which must be integral for more sustainability.

School leadership opportunities in higher institutions of learning

There is an urgent need to study school leadership setting especially in HIL and assess how people and systems are influenced. HIL offer a more reliable platform to exercise leadership. Both students and staff in such institutions can be taught and practice leadership. Topping (2002) says, if we can teach them how to be more effective leaders, even very modest improvements in each person can reap big rewards for the entire organization. So can leadership be taught? Not in the way we can teach mathematics or discounted cash flow, but a heightened understanding of how leadership behaviors affect others and impact performance can help anyone enhance his or her effectiveness. And isn’t any gain in this area worth the effort?

There is no doubt that there is gain in perspective. What is important is to see what is happening and consider it as an opportunity to learn, and analyze the situation and make necessary adjustments for change. But it is important to know that, “All organizations trough history have needed and displayed varying levels of success with their own leadership. And the word does not just consist of Europe and
America. Leadership was, is, and always will be a global issue, one which involves all people, whatever their organizational or social setting (Hooper and Potter, 2001). From a global education perspective, efforts have been made to help countries in the developing world. It is one thing to help a country deliver the right to basic education; it is quite another thing to agree to help secure that right for the foreseeable future (King, 2004).

There is a great need of developing special partnerships that will enable HIL to play their noble role in causing development through educational opportunities. Klees (2001) suggests that, “Education and development rhetoric over the past decade has increasingly focused on the idea of partnerships as central to improving policy. Such policy can help cause and deepen relationship between HIL and the government organizations at different levels of social interactions. Apart from these partnerships, freedom of thoughts is also another opportunity for development. Innovations come from ideas.

In fact, “interplay between the Reformation and the Renaissance was an important moment in history of freedom of thoughts.” (Mazrui, 1979). Such freedom of thoughts can lead to innovations and positive change. Change does occur, however, when local actors with clear ideas of new kinds of education are given authority to act (1997). Local actors can be products of globalization. In this instance, globalization becomes an opportunity for development that institutions and governments in different countries should consider. In relation to this Yang (2003) says, “Nowadays, international contexts have to be taken into account when higher education in developing countries has begun to integrate into the world community to meet with the global demands and even conform to the international practice.” Goldstein, Miller, and Courson (2014) support that, “Whether from financial crises, global competition or disruptive technologies, higher education is irrevocably changing, causing each institution to re-evaluate its mission, practices, and operational model.” This should be done in consideration to local political, economic, social, and cultural dynamics of the communities in which these institutions have been established. In Africa, Musaazi (2011) the sociopolitical objectives of Education in Nigeria, Uganda, and Kenya are relatively unformulated beyond vague invocations to educational institutions to promote democracy, egalitarianism, self-reliance, respect for dignity of labour and to adopt a rural orientation and to install nationalism. The education system in any country should consider what Musaazi is indicating here. A lot needs to be done in order to better the education system in Africa if we truly need to lead true democracy, egalitarianism, self-reliance, and respect for dignity of labour to adopt rural orientation and to install nationalism. For all this to become reality, there is need for political will to create a paradigm that will be more pragmatic in nature and which must lead to a redefinition of sociopolitical objectives of Education in most countries in Africa.

Uganda as a country is aware of that change and is making necessary efforts to improve the quality of leadership and education in HIL. HIL are frequently challenged by mandated Education Officers to revisit their mission, practices and operational model in order to comply with set standards for quality assurance that will allow Africa and Uganda in particular to be effective catalysts of educational dynamics as far as globalization and its effects on education and development are concerned.

The youth population is Uganda is a concern for educational professionals in Uganda. As pointed out the youth population in Africa is very high. The Guardian (2014) reveals that Uganda has the world's largest percentage of young people under 30 – 78% – according to the to the 2012 State of Uganda population report by the UN Population Fund (Ibid.). In interview with the Deputy Resident District Commissioner, the Commissioner in a Press Conference on the youth confirmed that actually the youth population in Uganda is now estimated at 78% (Interview, RDC Office in Mbale (2017).

This population is an opportunity that needs to be critically looked at as far as school leadership in HIL and development are concerned. In this youth, lies the future of Mbale District, Uganda and Africa. Research should continue to dig deep and plan for the youth so that this opportunity may not soon become a threat for development. Unemployment of the youth is a kind of latent bomb that has to be deactivated without delay.
In the past decade, Uganda has experienced strong GDP growth, averaging 7% annually, but this has not generated jobs, a trend seen across the continent. Lack of employment is causing some young people to take risks. Last July, 36 young people, who had been running motorcycle taxis, were burnt to death as they tried to siphon fuel from a truck that had been involved in an accident (The Guardian, 2014). And some young women are taking jobs overseas only to find themselves forced into prostitution, according to Ugandan police. "Every month, we get reports of over 20 Ugandans stranded seeking help. If the figure is multiplied in a year, it comes to over 250 Ugandans stranded abroad every year," says Moses Binoga, Coordinator of the Anti-human Trafficking National Task Force (Ibid). Other young people are involved in drug trafficking. Dr. Paul Nyende, a Senior Lecturer at Makerere University's School of Psychology, says young people with nothing to do are more easily lured into crime. "They can easily be lured into drug trafficking on promise of big pay," he says. "Many young people don't want to go back to the villages and do farming after campus. They want to stay and enjoy city life." (Ibid). Yet the city cannot support them. It is estimated that more than 40,000 young people graduate from Ugandan universities each year. Yet the market can provide only 8,000 jobs annually (Ibid).

This report is given for Uganda in general and the authors would like to analyze this trend in the context of Mbale District. How can HIL and MDLG sit together and critically think about the youth and discuss how this youth can be seen more as an opportunity rather than a threat? There is a need for HIL and the District to plan and see how this opportunity can be used for integral development that leads to more sustainability.

The same report indicates that worldwide, there are about 1.2 billion 15- to 24-year-olds. About 200 million are in Africa. This portion of the world’s population needs to be considered as a reliable springboard for sustainable development for the world but more urgently for developing countries, Uganda included. The NCHE has developed a quality framework for effective governance in HIL but at the same time other indispensable bodies have been established to ensure quality such as the UQUAFAF give a significant path that will lead to relevancy of education vis-à-vis needs. This enables the establishment of strategic plans for sustainable development.

In relation to Mbale District, the educational system is in place. It counts quite a number of Public Universities and Private Universities and Tertiary Institutions. Educational efforts are seen in Mbale. Research shows that new universities are coming up such LivingStone International University, the latest established University in Mbale. If it is not new, old existing universities are extending themselves by establishing extension campuses in Mbale.

The researcher believes they have seen great opportunities through HIL. But the question remains: which opportunities are there in Mbale that are causing HIL to target Mbale District? Is Mbale District aware of such HIL opportunities? How can HIL work together with government so that sustainable development is promoted? Here is where education, research and technology can be used to pave true way to sustainable development. Embracing it from a global perspective will be absolutely the blood system of sustainable development for Mbale District.

**Study methodology**

This study used a qualitative research approach; Interview and Focus Group Discussions.

**Location of the study**

The study was conducted in Mbale District, Uganda as it was pointed out in the scope section of this study report.

**Population and sampling technique**

The population was made by administrators and leaders at different level in three HIL in Mbale District: LivingStone International University (LIU), Uganda Christian University (UCU), and Uganda Martyrs University (UMU). The sampling technique was convenient and purposive in nature.
Data collection instruments

For the Interview, structured interview was used and for the Focus Group Discussion, a moderator guide was used to orient discussions.

Data analysis

Data was collected; analyzed, recorded, and categorized in relation to the object of the study. A recording has been secured for whomever would like to use it for one or another reason and was saved under an audio file called “Buregea Henry”

Ethical considerations

The research topic and objectives were thoroughly explained to respondents before answering the study questions for both interviews and focus group discussions. Participants were clearly informed that the information that was to be collected was meant to be used only for academic purposes. Authors made sure consents were got from participants before interviews and Focus Group Discussions were conducted and recorded. From start to the end, the works of others were systematically recognized.

Findings of the study

Participants during both interviews and focus group discussions pointed out the following as being significant opportunities that MDLGL should see in HIL and which can enable development take-off:

- HIL are considered to be source of any knowledge that can be used to address all needs of Mbale District. For this very reason, HIL are indispensable for the District’s development.
- HIL’s opportunities give chance to the District to revisit its development policies and other policies in favor of HIL so that District leaders involve leaders of HIL in the District policy formulation.
- HIL are centers of Capacity Building for any potential applicants for capacity building and these can be either nationals or internationals; individuals or groups; governmental or non-governmental. Mbale District could fall into the category of national and government organization. This is an opportunity to train for sustainable development.
- HIL and Local Government (Mbale District) for instance can work together to do research within the District and these research will be operational in nature so that needs within the District can be addressed basing on a scientific road to sustainable development.
- HIL is where technology is developed and knowledge created and innovated. There is technological know-how in HIL that needs to benefit Mbale District for any innovation they would like to initiate and or promote in the District.
- HIL can organize trainings for Local Government Employees. Such training should target sustainable development.
- HIL and MDLGL are opportunities to train the youth for sustainable development. Actually Ugandan population is very young and should be seen as a golden opportunity for targeted training for sustainable development. If global and national education initiatives realize that, investments can be attracting the youth first and secondly the other categories of the population.

Conclusion and recommendations

In Conclusion, Opportunities are there and it is only a matter of Leaders of HIL and Mbale District Local Government to work together. Thus, the following recommendations are formulated:

- HIL and MDLGL should come together and create a development platform that will allow regular meetings to discuss available opportunities and possible means to use in order to find a way to induce, maintain, and promote integral development of both individuals and communities who live in Mbale District.
- Using the Pragmatic Leadership Model proposed by the authors, leaders of HIL and MDLGL will not only discuss but they should come to substantive resolutions that will lead to the planning of
different activities, and do a thorough opportunity analysis, identify relevant means and potential national and international development partners that will support both HIL and Mbale District Local Government at all phases of the Mbale District development process.

- Establish a development consortium composed of leaders of HIL and MDLG to follow up on development resolutions and significantly engage key stakeholders students, staff, youth, community leaders, cultural leaders, religious leaders, District member of Parliament as well as other administrative and political leaders and development agencies who have Mbale at heart.
- Develop partnerships with national and international organizations who strive to combine education, research, technology and development for more sustainability.

References


The Role of Wisdom in Good Instructional Leadership: A Thematic Analysis of Views from Educational Leaders

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Abstract

The study seeks to find out the role of wisdom about good instructional leadership in the classroom. The first thing that came to mind when the issue of wisdom came up as the topic was why we should be concerned about a concept that is very complex to understand. However, a broader perspective about wisdom reveals that wisdom entails features such as understanding the consequences of our actions. Again, wisdom entails having the knowledge and ability to understand and recognize the right decisions to make. While also recognizing that a good leader must have the courage to abide by their actions and accept their failures. These features constitute the hallmark of an effective and efficient teacher as far as instructional leadership is concerned. The topic is significant because wisdom plays a critical role in good leadership. Wisdom makes it possible for the achievement of goals when it comes to the role of leaders in influencing positive change among their followers. Three research questions were set to guide the study. Purposive sampling was used to select 105 members to participate in the research. A questionnaire was used to collect data, and thematic analysis was adopted together with descriptive statistics to organize data gathered from close-ended and open-ended questions for interpretation. The results show that wisdom plays a crucial role in the teaching and learning process and must not be undermined. Again, it beholds on every teacher to apply whatever wisdom they have in the classroom to ensure that every pupil benefits from their lessons.

Keywords: Wisdom, Leadership, Instruction, Classroom, Head teacher, Develop.

Introduction

When teachers plan to take jobs in schools, some forget they have become role models and must live up to that expectation. Identifying your role as a leader is as important as building a critical mind that will serve as your source of wisdom to operate effectively and efficiently in the school and classroom. However, most teachers do not notice this and that ignorance has created a gap in the understanding of the role of leadership in the classroom. The role of leadership in the classroom can be widened to include a variety of task and activities such as the choice of methodology to apply in the classroom, the choice of teaching and learning materials that can enhance the teaching and learning process, and how to manage individual differences in the learning process. One crucial element in this regard is the application of wisdom.

The understanding of wisdom as a concept comes in different forms and can be used by people in a variety of ways. In many cases, people begin to analyze the word wisdom to mean ultimate reality, a situation whereby we align wisdom with God because it is only God who has the ultimate wisdom. Therefore, to have wisdom means you can live in harmony with your creator. That notwithstanding, it also means that you need to live in harmony with yourself and your environment. Situations that will call for appreciation and respect for others because all are God’s creation and we need to live in harmony with others to enable us develop ourselves (Sternberg, 2005). Despite the important role wisdom plays in good leadership. It is very obvious that some teachers are not concerned about developing a critical mindset. Thus, the aim of the current study is to put that believe in context as against the views of leaders in the field of education.

According to Danmole (2011) education is an instrument of change and for national development. Teachers are major players in the education sector, and any attempt to achieve the objectives of the national agenda for education without involving teachers is bound to collapse.
The role of the teacher, who is the classroom leader, is to create an enabling environment for teaching and learning to take place. The approach to training of teachers is a determining factor in the choice of instructional leadership. A particular instructional leadership style may favor some group of students depending on the circumstance. The complex nature of leadership Johannis (2014), demands a thorough approach to achieve the best results in instructional leadership. If we associate instructional leadership to how wise a teacher should be it will be a daunting task because the criterion for measuring people that are wise is varied. In other words, there is no particular measure for evaluating those that are wise because what makes people wise are subjective (Plews-Ogan, 2013). People may understand that wisdom is an abstract entity, but can also manifest in our characteristics and approach to life situations. It becomes much simpler when we measure wisdom in the context of the standards society has put in place. Again, we can only understand what it means to be wise when society measure our actions as against the standard rules governing what is wisdom, or what wise people does in the community.

It is not an easy task to distinguish people that are wise because according to Plews-Ogan (2013), people with wisdom will not accept they are wise (Plews-Ogan, 2013). That is why persons like William Shakespeare, Aristotle, and Socrates said great things about wisdom without thinking they would be considered as wise people for many centuries to come and pass. William Shakespeare said the fool will think they are wise, while the wise believes they are fools. The implication here is that believing that one is wise is an obstacle to gaining further knowledge because you think you know it all. The other side of the matter is that once you think you are limited in a way is a motivation to seek for further knowledge. Aristotle, on his part said the beginning of all wisdom starts with knowing one’s self. The educational implication here is that we build from the known to the unknown. The principle does not apply to the students alone, but also the teacher as well because every teacher needs to understand their potential, capabilities, and strength before they can impact their students positively. Socrates also believes a life that is not examined is not worth living. Socrates idea can be likened to that of Aristotle because to examine your life implies to know yourself.

It is important to appreciate that the curriculum does not make provision for the teaching of wisdom in the classroom. Acquiring wisdom in school is a culmination of many experiences. For example, there are unintended outcomes of education. As students go through the teaching learning process and they learn from their peers and form perception about things. Thus, out of the many perceptions and experiences, students build while in school, what among them can be considered as wise a buildup of wisdom? Here researchers have outlined some qualities to be considered as wise. According to Plews-Ogan (2013), they are but not limited to compassion, tolerance of diversity of nature, ability to appreciate the different perspectives about life, and knowing that the individual is a part of the whole (Plews-Ogan, 2013). The idea about what can constitute wisdom will enable program designers to factor in content that will develop the various characteristics that form wisdom.

Statement of the problem

The role of wisdom to enhance the work of teachers cannot be over-emphasized. The reason is that teachers need to know themselves before they can positively impact on the lives of their students. Blending instructional leadership with wisdom will enable a teacher to select the best resources and techniques to achieve educational goals. Teachers in their capacity as leaders in their classroom have the responsibility to select the best methods to transfer knowledge and skills to students. Therefore, the researcher is confronted with the challenge of examining the role of wisdom in good instructional leadership with particular reference to views of educational leaders.

Purpose of the study

The purpose of the study is to examine the role of wisdom in good instructional leadership. Again, the study will examine what educational leaders' views are on what constitute wisdom and whether teachers need to apply those aspects of wisdom in the teaching and learning process. It is the researchers’ believe that the application of wisdom to the teaching and learning process may
have a positive influence on the performance of teachers. Thus, the study seeks to identify how wisdom impacts on the instructional leadership role of teachers.

**Research questions**

The following research questions will guide the collection of relevant information for the study.

1. What can be termed as wisdom?
2. Do you think wisdom plays a role in instructional leadership?
3. Must teachers apply wisdom in the teaching and learning process?

**Significance of the study**

The study is Significance because it will enlighten the reader on the role of wisdom in the teaching and learning process. Finally, the findings will call for further studies in other areas of good instructional leadership.

**Delimitation and limitations**

The study is delimited to educational leaders in the Upper West Region of Ghana. The only limitations that confronted the researcher is the inability of the researcher to include other stakeholders of education in the municipality.

**Theoretical framework**

The contingency theories of leadership are a guide to the current study. The theories are a class of behavioral theory that holds the view that there is no one best way of leadership. One leadership approach may be effective in some situations, but fail to be successful when applied to other different situations. The implications of the contingency theories of leadership are that school heads must not think leadership skills come by chance. It can be acquired through training and practice. Therefore, school authorities must organize educational leadership training for teachers as a way of enhancing their performance and ability to think wisely given different circumstances (Johannsen, 2014). The contingency leadership theory is a good frame work because it takes into consideration a leaders’ ability to perform rightly given any circumstance and not what skills a leader possess.

**Literature review**

According to Dawidowicz (2010), literature review involves the systematic search of information relating to the research problem. The sources of information used for this exercise include articles from journals, textbooks, abstracts, and reports (Dawidowicz, 2010).

**What is wisdom?**

It is believed by most researchers that wisdom is developed. In other words, we learn to be wise or we seek wisdom. Thus, once wisdom is acquired we have a responsibility to maintain the wisdom by seeking further knowledge. Experience is believed to form the most part of the process of acquiring wisdom. Hence, some scholars believe that without pain we cannot acquire wisdom. In other words, an individual acquires wisdom after an encounter with adversities. According to Plews-Ogan (2013) adversity results in learning and the growth of the mind. According to the report people become wise when they encounter difficult experiences. The implication is that traumatic situations lead people to find solutions and out the desire to seek solutions people grow the potential to develop wisdom (Plews-Ogan, 2013). General observations of the wise sayings we have in the African tradition were not spoken in an atmosphere of contentment. Rather, they were said during moments of pains to demonstrate a shift from believes and the realities of life.

Jordan (2005) supports the findings of Plews-Ogan (2013) by saying that wisdom is not influenced by easy live styles but by difficult and painful experiences. Thus, according to Jordan (2005) when we encounter difficulties in life, we have the opportunity to acquire wisdom (Jordan, 2005). It is also important to understand that poverty can corrupt the mind. Thus, seeking wisdom does not mean we live in pain, poverty, and difficult life styles.
One of the other issues that confront the concept wisdom is whether wisdom grows with age. The issue is debatable because some people think wisdom cannot be associated with age, while others believe people become wise with age (Brugman, 2006; Jordan, 2005). One of the writers who believe that wisdom is not about age is Sternberg (2005). Sternberg (2005) thinks that wisdom cannot be limited to age; neither is age a predictor of wisdom (Sternberg, 2005). The interpretation is that if wisdom is associated with experience and pain, then it can equally be true that age is a factor when it comes to wisdom. A child of two years cannot be compared with an adult of sixty years old. Definitely, the adult will be more experience than the child and more wise than the child as well. The more we live the more life experience gives us, enabling us to become wise (Jordan, 2005). In other words, people become wise with age because they are better placed and have more life experiences to share (Brugman, 2006).

Spelling out what is wisdom is like saying what knowledge is. The two are very broad concepts. Just like other concepts, there is no one definition of wisdom. In peoples’ daily life they encounter circumstances that lead them to learn because they learn to deal with the situations (Brugman, 2006; Jordan, 2005). The same way they become wiser. According to Brugman (2006), an individual ability to overcome challenges is a measure of how wise the person is because they need wisdom to overcome challenges (Jordan, 2005). If this scenario is liken to an old adage in the African tradition, it can be said that what an elder sees whiles sitting down a child cannot see even if they climbed to the top of the tallest tree. It means that given a child and an adult, the adult has more wisdom than the child because they are more experienced.

**The role of wisdom in instructional leadership**

A look at what wisdom is has identified its role in instructional leadership as offering guidance to interventions educators provide in the teaching and learning process to introduce and sustain a good learning environment. A good learning environment is a good recipe for training students and that enabling environment must be designed by educators to help to bring out the best in students. The ability to generate initiatives, implement the ideas involves extensive use of wisdom. Education is aimed at creating a positive impact on the lives of people and the input of the teacher must be able to create that positive environment for students to study to make a difference in their performance.

It is a common phenomenon to find people opposing to your ideas. However, people rich in wisdom are able to use the criticisms positively. They learn from their weaknesses and build upon their strengths. A deviation from the main focus is a wrong step towards achieving goals in the classroom. Thus, every effective and efficient leader requires wisdom not only to face challenges, but also to develop new ideas that will benefit their followers. Coming down to the classroom level a good instructional leader must face classroom challenges with confidence while developing ideas that will influence the performance of your students positively. The education system at all levels requires leaders with wisdom so that they can focus on dealing with issues other than dealing with personalities. By dealing with personalities they blame their failures on the system and its structures for getting the systems and structures are designed by leaders. Invariably, an inefficient leader blames others for the failure of the system when they are part of the problem. Sternberg (2005) made a suggestion that educational institution must make a conscious effort to teach teacher trainees how to develop wisdom. It is the only way teachers can accept their responsibilities and work hard to achieve their objectives (Sternberg, 2005). Danmole (2011) also suggested that educational institutions have a responsibility to teach students what society needs to grow (Danmole, 2011), and following what Sternberg (2005) said it can best be achieved if educators apply a sense of wisdom in the decision-making process.

The contributions of teachers to the academic achievement of students cannot be overruled because of the leadership role teachers’ play in the classroom. They set the objectives for the day and try to accomplish them. The level of a teacher’s wisdom can influence the objectives they set and their instructional leadership skills. According to Kaufman (2003), the ability of educators to choose the best strategies will enable students to achieve their maximum best in the teaching and learning process (Kaufman, 2003).
Development and wisdom

According to Fletcher, Matschek, Siebert, and Tycer (2003), the concept of wisdom is so complex that when you think you know it appears you are just beginning to know what wisdom is. However, for the sake of associating personality development with wisdom, three things can be taken into consideration. They include the three steps in acquiring wisdom. To gain wisdom begins with acquiring information, processing the information into knowledge, and applying the knowledge to situations effectively and efficiently as a measure of wisdom. In other words, to acquire wisdom means you have to gain knowledge and apply the knowledge to situations beneficial to humanity. The ability to apply knowledge acquired is the beginning of wisdom. The act of developing among humans is also a process that begins and ends somewhere. As individuals progress along the line of wisdom, it is assumed they are also maturing and developing. Therefore, the relationship between the two concepts is a direct one. According to Kareltiz, Jarvin, and Sternberg (2010), the three aspects of personality development are cognitive, affective, and behavioral skills contribute towards the development and growth of wisdom in the individual (Kareltiz, Jarvin, & Sternberg, 2010).

Developing wisdom as a tool for good instructional leadership

According to Kruse (2013) leadership is a process of influencing the mind set of individuals under your care with the sole purpose of effecting changes towards the achievement of goals. It is a common understanding that to be able to influence people’s action requires the application of good judgment and good judgment comes with the application of wisdom. According to Zeitchik (2012) an effective leader is one that is able to motivate people to work towards the achievement of goals. Since good leadership is a recipe of wisdom, it means that it will take an application of wisdom to achieve good instructional leadership. Thus, while it takes good leadership to influence values and vision (Bush, 2010; Bush & Glover, 2014), the same way it takes a good sense of wisdom to achieve better leadership. It beholds, every educational leader to know that leadership works best when wisdom is allowed to play its role in leadership. The simple reason being that there are a lot of choices to make as a leader and it takes a wise leader to select the best among the lot. In other words, it takes a leader with wisdom to make the best of decisions that will fit into the circumstance at that material point in time to achieve maximum benefits. Even the choice of an instructional leadership style (Johannsen, 2014) is influenced by the individual level of wisdom. The level of wisdom will inform the individual that a particular style of leadership will work best under for a given situation.

The central focus of the application of wisdom to instructional leadership is about choosing the right methodologies in the teaching and learning process. A teacher’s inability to select the best strategies in the teaching and learning process can lead to poor performance in the classroom. In most cases, the failure of students is not because of the lack of teaching strategies or materials, but the wrong application of the tools and resources at the disposal teachers. The choice of a leadership style is influenced by cultural factors (Johannsen, 2014) and the same way the application of wisdom must take into consideration the cultural values of the group under consideration. The reason is not farfetched because what may be considered as an act of wisdom in one community may be seen as foolish in another community.

The essence of good leadership is to create an environment for followers to strive or development (Martindale, 2011). One of the hallmarks of good leadership is giving the followers the opportunity to participate in decision-making. It will take an intelligent leader to command an environment that will enable followers to develop their potential for nation building. In other words, good leadership leads to increase morale among the followers and for that matter leads to increase productivity (Martindale, 2011). The implication here for educational development is that teachers need to be good leaders in the classroom to the extent that they can create an enabling environment for students to develop their God given talents. It also implies that every teacher must be competent, creative, innovative, and intelligent to be able to fit into the position of a good instructional leader (Wylie & Hodgen, 2010). It takes a good instructional leader to influence the
mindset of their students, thereby shifting weaker students from the stage of negative self-efficacy to a positive one.

**Methodology**

**The research design**

The methodology section explains the research design adopted for the study, the target population, the sample size and sampling methods. The section also explains the research instruments, data collection process and the data analysis plan (Creswell, 2013; Paton, 2002; Kallet, 2004). The research design for the current study is a survey. A survey design is appropriate because events and conditions needed for the study are naturally in existence. A survey design is also good because the survey has provided all the information needed for the successful completion of the study.

**The site and population**

The site is the Wa Municipality in the Upper West Region of Ghana. The site has the target population features required for the current study. The target population is made up of all leaders in the Municipality. However, the accessible population involves all educational leaders in the municipality. The information the study seeks to gather can best be provided by educational leaders in the municipality. Educational leaders in many ways have worked closely with teachers and can determine the role of wisdom in their teaching and learning activities.

**Sample and sampling procedure**

A total of one hundred and five (105) educational leaders was purposefully sampled for the study. According to Creswell (2009) purposive sampling is accepted in social research as and when the researcher justifies its usage. The current research adopted a purposive sampling because there is no intention of generalizing the results. Again, as suggested by Patton (2002), purposive sampling ensured that members participate, in accordance with their ability to provide relevant information necessary for the study. The researcher also took into consideration the nature of the research questions where the information required can be gathered without manipulating the variables. However, purposive sampling has its limitation because it is difficult to defend the representativeness of the sample due to sampling bias.

**Research instrument and data collection procedure**

The questionnaire is used to collect data for the study. Eight questions were set on the questionnaire with one of the items seeking the biographic data of the participants while another two items seeking the demographic variables of the participants of the study. The remaining five items seek information aimed at finding answers to the research questions. The items on the questionnaire were both opened-ended and closed-ended questions. The closed-ended items help to prevent recording unwanted information and that saves time and space. The opened-ended items enable participants to share their opinion in the most appropriate way they deem fit. Both approaches have their limitations and strengths, but together they were able to provide relevant information that addresses the research questions. A period of three weeks was used to collect information for the study. The participants were presented with the questionnaires to complete same and return to the researcher. Once the questionnaires were not left behind the researcher, achieved a 100% return rate.

**Data analysis**

Thematic analysis of data, one of the aspect of qualitative design methods was adopted for the study. According to Creswell, (2013) a qualitative researcher uses less numeric values, but depends heavily on interpretation of results using words (Creswell, 2013). Very often the interpretation of the research results depends on the researcher’s data management skills. Good data management skills will result in good data presentation and the reverse is true. Descriptive statistics were employed to organize information obtained from the closed-ended questions for analysis. On the
other hand, thematic analysis was used to organize and describe data gather from the opened questions (Frankfort-Nachmias & Nachmias, 2008).

**Results and discussion**

The aim of the current research is to seek the views of education leaders on the role of wisdom in good instructional leadership. Thus, the focus of the research is on finding out from educational leaders how the level of wisdom applied by teachers in the teaching and learning process will impact on the performance of pupils in the classroom. A total number of 105 members took part in answering the questionnaire. The researcher is adopting the thematic analysis of results approach to analyze the data gathered from members. Thus, analysis of results was done according to themes, and the themes were represented by the research questions. The approach is accepted by Creswell (2013) and Patton (2002).

**Data analysis of gender**

Data gathered on gender of members was analyzed using frequencies and percentages (Creswell, 2013). The results are shown in Table 1 and a graphic picture on Figure 1.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>64</td>
<td>61.0</td>
<td>61.0</td>
<td>61.0</td>
</tr>
<tr>
<td>Female</td>
<td>41</td>
<td>39.0</td>
<td>39.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>105</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

**Figure 1.** Graphical presentation of the number of male and female that took part in the research.

Representing both males and females in the current research is crucial because the population is made up of both males and females. Thus, out of the total number of members (105) that took part in the research 64 (61%) are males and the remaining 41 (39%) are females. It shows that both males and females participated in the research.

**Data analysis on role of members**

<table>
<thead>
<tr>
<th>Are you an educational leader?</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid</td>
<td>Yes</td>
<td>105</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>
From the Table and graph it is obvious that all the number of members that took part in the research are educational leaders. All 105 members indicated that they were educational leaders. The question is relevant because the questionnaire was meant for educational leaders and the research must assure the reader that indeed the questionnaires were answered by educational leaders.

**Data analysis on category of leadership of members that took part in the study**

<table>
<thead>
<tr>
<th>Category of leadership</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head teacher</td>
<td>89</td>
<td>84.8</td>
<td>84.8</td>
<td>84.8</td>
</tr>
<tr>
<td>Director</td>
<td>1</td>
<td>1.0</td>
<td>1.0</td>
<td>85.7</td>
</tr>
<tr>
<td>Front Line Manager</td>
<td>6</td>
<td>5.7</td>
<td>5.7</td>
<td>91.4</td>
</tr>
<tr>
<td>Circuit Supervisor</td>
<td>9</td>
<td>8.6</td>
<td>8.6</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>105</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Four common categories of leadership were identified from the data on members that took part in the research. They include Head teachers, Directors, Frontline Managers and Circuit Supervisors. From the total number of 105 Head teachers were in the majority and represents 89(84.8%), a single Director representing 1(1.0%) took part in the research, whereas 6(5.7%) Front Line Managers were represented and 9(8.6%) Circuit Supervisors participated.
Main data analysis

Research questions 1: What can be described as Wisdom?

To answer the research question members were asked to indicate what is their idea of wisdom? There was a showcase of commonalities of views and six main central themes relevant for the current research were identified for discussion. The information is presented in figure 4.

![Figure 4. Graphical presentation of what members think can be described as wisdom](image)

The pyramid list shows a proportional representation of the views of members. The base shows a larger majority view as compared to the tip that shows a smaller presentation of views. To be able to find answers to the research question what can be termed as wisdom members were asked a question to that effect and the following ideas were gathered. As many as about forty-five (45) members think that wisdom is the ability to think and act wisely using knowledge, experience, understanding, common sense and insight. They also suggested that wisdom is the ideology within which one is able to analyze a situation for a perfect conclusion. In other words, wisdom helps us do things or solve problems effectively by using the right mental behavior and judgment of what is good or wrong following conscious reasoning.

The second theme to be identified points to the fact that wisdom is the quantity of knowledge acquired. Twenty (20) members associated themselves with this idea about wisdom. According to members wisdom is the quantity of knowledge acquired in a particular field or area through experience and learning. In other words, wisdom is knowledge acquired through learning. They also pointed out that an individual can be intelligent but without wisdom.

Nineteen (19) members believe that wisdom is a natural gift from God. It helps man to understand and carry out good instruction, differentiate people from one another in terms of ability in the classroom situation. Wisdom is common sense, something that is not learned in the classroom. The viewpoint goes partially to support what the Kerr (2010) said about concepts that certain concepts may have rules but certainly not systematic and people can only derive the best from them when they apply them rightly (Kerr, 2010). Thus, to be wise is the ability to make valued judgments in matters pertaining to life and conduct well. Invariable, wisdom is part of one of an individual's attributes. Therefore, to identify wisdom as an innate character or attribute is debatable. It also means that the ability of teachers to move beyond the content or subject matter in a lesson requires those skills that are not taught the teacher during pre-training but from the teacher's innate ability to do so. It is this ability that many scholars refer to as wisdom.

The next group of members seven (7) stated that wisdom is to be wise. The ability to know what is unwise, knowing the implication of your actions and personal character constitute wisdom.
All these attributes of wisdom entail ways that promote better ways of living and happiness. The idea goes in line with what Brugman (2006) and Jordan (2005) stated that wisdom emanates from our daily life encounter and circumstances that lead people to learn because they learn to deal with the situations (Brugman, 2006; Jordan, 2005). The same way they learn to deal with the situations they become wiser.

The next theme identified by members nine (9) is that wisdom is the ability to lead. The ability to lead includes the talent to lead a group of persons and also come out with solutions to their problems. This idea supports what Kruse (2013) said about the role of wisdom in leadership. According to Kruse (2013) a good leader must be able to influence the mindset of their followers by applying good judgment and good judgment comes with the application of wisdom. Likewise, scholars like Bush (2010) and Bush & Glover (2014) suggests that once good leadership can influence values and vision the same way it will take a good sense of wisdom to become a good leader and for that matter a good instructional leader. According to Johannsen (2014) even the choice of how to teach, what to teach, when to teach and where to teach are influenced by the teacher’s level of wisdom. Similarly, according to Martindale (2011) the teacher’s level of wisdom guides them as to what leadership style will benefit the students given a particular situation. In other words, good leadership builds on the foundation of wisdom will motivate students to learn better, thereby increasing productivity (Martindale, 2011). The implication is that teachers need wisdom to create an enabling environment for students to learn and also develop their talents.

Research questions 2: Do you think wisdom plays a role in instructional leadership?

Again, to answer the research question members were asked to either confirm or disconfirm the statement that wisdom plays a role in instructional leadership.

<table>
<thead>
<tr>
<th>Valid</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>105</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Figure 5. Graphical presentation of the role wisdom in instructional leadership

It is very obvious from the two sets of data presented both in Table 4 and Figure 5 that members agree to the fact that wisdom plays a very crucial role in the teaching and learning process. All the 105 members that took part in the research think that applying wisdom in the teaching and learning process is necessary for a successful lesson. Members were also asked to give reasons for their choice of answers in Table 4. Six themes were identified and presented in Figure 6.
Again, it is also a pyramid list showing the proportional presentation of views supporting the data in Table 4. The majority of views lie at the base, whereas the least views lies at the top. Out of the one hundred and five members (105) thirty-seven (37) thinks that wisdom plays an important role in instructional leadership because it helps instructional leaders to take the right decisions. Once the right decisions are taken it brings about achievements. According to members without wisdom the ability of a teacher in the classroom to think, reason, and comprehend very well will be difficult. In addition, the ability of a classroom teacher to make good decisions and policies, deal with slow learners, set good objectives and select the procedure to use to teach lies on their level of wisdom.

The second theme consistent with the views of twenty-eight (28) members was the ability to be a good instructional leader. Members think teachers need wisdom to enable them to present issues in a clear manner to reflect good leadership skills. The current view confirms what Johannsen (2014) said about leadership and good instructional leadership. According to Johannsen (2014) leadership is complex and demands a crucial approach to achieve results even in the classroom situation. However, Johannsen (2014) also cautioned an attempt to associate good instructional leadership to how wise a teacher should be because the criterion for measuring people that are wise is varied.

The third most populous view identified is summarized as wisdom enables the teacher to teach effectively and efficiently. According to members eighteen (18), the ability to manage resources to teach effectively and efficiently is a hallmark of wisdom. Thus, wisdom helps teachers to carry out their task in the classroom with professionalism.

Next on the list is the ability to think and reason. The level of wisdom each teacher has is manifested in their ability to think and reason during problem solving in the classroom. Fifteen (15) members share this viewpoint. In the light of this Brugman (2006), mentioned that the ability to acquire knowledge is a function of how you overcome challenges, as you overcome challenges you become wiser. In other words, wisdom is the tool to conquer challenges as stated by Jordan (2005). Thus, Sternberg (2005) made a suggestion that colleges of education or educational institutions have a responsibility to teach teachers how to develop wisdom while they are still under training. Danmole (2011) also suggested that educators must apply a sense of wisdom in the decision-making process to come out with the best solutions.

The last two themes represented by four and three members indicated that wisdom produces success and virtues where knowledge disappears and helps teachers to inculcate in students good morals respectively. In that case, wisdom has the ability to distinguish between those who are intelligent from those who have just knowledge.
Research questions 3: Must teachers apply wisdom in the teaching and learning process?

Table 5. Must teachers apply wisdom in the teaching and learning process?

<table>
<thead>
<tr>
<th>Valid</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>103</td>
<td>98.1</td>
<td>98.1</td>
<td>98.1</td>
</tr>
<tr>
<td>No</td>
<td>2</td>
<td>1.9</td>
<td>1.9</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>105</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Figure 7. Graphical presentation of whether teachers must apply wisdom in the teaching and learning process

Again, it is very obvious that members think teachers must apply wisdom in the teaching and learning process. Except for 2 (1.9%) members who think there is no need for teachers to apply wisdom in the teaching and learning process. The other 103 (98.1%) of the members believe that wisdom must be applied in the teaching and learning process for best results. Table 5 and Figure 7 present information on why members think teachers must apply wisdom in the teaching and learning process. A set of six themes was identified.

Figure 8. Graphical presentation of the six themes members identified as the reason why teachers must apply wisdom in the teaching and learning process

Out of the one hundred and five (105) members, forty (40) members stated that it is necessary for teachers to apply wisdom in the teaching and learning process because it will help teachers to apply better teaching skills. The use of their skills will result in better performance among students for better achievement and development. It goes to support what Kaufman (2003) stated that the ability of educators to choose the best strategies will help students to achieve higher results in the teaching and learning process (Kaufman, 2003).

The next theme identified represents the views of twenty-eight (28) members. It states that applying wisdom during instruction will help teachers to understand their students better and also
handle students with fairness. Teachers can play their role well when they act as good leaders. According to Danmole (2011) the role of a teacher as a classroom leader, is to create an enabling environment for teaching and learning to take place. Creating that enabling environment requires living by good morals, by example, and the application of wisdom.

Other members fifteen (15) also supported the idea that the application of wisdom is necessary because it is a teaching tool. A teaching tool that helps teachers to vary their methodologies based on different situations because pupils are coming from different background. It is also a teaching tool because it entails intelligence, experience, skills, knowledge that must be applied in the teaching and learning process to achieve results. Again, the idea is supported by what Kaufman (2003) stated in his work that teachers' ability to maximize their output is the ability to choose the best strategies that will enable students to be successful in the teaching and learning process.

The next benefit from using wisdom in the classroom was identified as helping students to think outside the box. Ten (10) members share this idea. The idea is relevant because once a teacher is able to apply the best of methodologies in their teaching and learning process it will lead to increase performance by students. The other themes include helping teachers to address educational challenges and producing students with good leadership skills. Both viewpoints were represented by six (6) and four (4) members respectively. According to members a teacher with a high sense of wisdom will be able to address educational issues and succeed because good leaders have wisdom (Graham, 2007). The same way they are able to mold students to become responsible adults in the future.

The last and least presented view of members, four (4) is that when the teaching and learning process is not guided by wisdom, teachers are most likely to produce students with poor leadership skills or qualities. Invariably, a teacher that cannot choose the best methodology to facilitate teaching and learning will not impact greatly on the student's academic performance. A teacher may acquire intelligence from pre-teacher training, but unable to meet students' needs in the school or classroom level because of the absence of wisdom. The two members that stated applying wisdom in the teaching and learning process is not necessary could not give any reason(s) for their choice of answer.

Summary

It is not surprising that members have different perception about what they think is wisdom. Two clear cut views were obvious. While some members think wisdom is acquired the others think wisdom is a God given talent or gift. In other words, while one group of members thinks that wisdom is innate others think it is something you must learn to have. Thus, issues like wisdom is the ability to think and act using knowledge, experience, understanding, common sense and insight were raised by members. Likewise, that wisdom is a natural gift from God and that it helps man to understand and carry out good instruction were also mentioned. The natural tendencies of wisdom help to differentiate people from one another. It is not learned and involves common sense, something that is not learned in the classroom directly but can be acquired indirectly. Although there are many different perspectives on the meaning of wisdom, they all zero on the fact that wisdom involves the development of your ability to integrate well with people and think outside the box within your own frame of reference. Self-development is an integral part of wisdom. It involves being a critical thinker, dialectical in thought, and self-regulatory.

The educational implication for those who think wisdom is learned is that educational institutions have to concentrate on developing the cognitive abilities of people to instill in them the ability to do critical thinking. The primary objective of applying wisdom in the teaching and learning process in schools is to ensure students benefit from the teaching and learning process. An application of wisdom in the teaching and learning process will motivate students to learn and acquire useful skills. Teachers can bring success to the door step of students by employing the best methodologies and good leadership styles drawn from the zone of wisdom. A teacher’s sense of wisdom gives them the capability to identify students with learning difficulties and help them to cope in the most effective way. Therefore, from all indications a conscious attempt to teach
teachers how to develop and apply wisdom in the teaching process will be a step in the right direction.

Conclusion

By what members said it is very obvious that wisdom comes in different forms and also applied in different forms to suit various circumstances. Therefore, teachers must be able to identify what pieces of knowledge and skills they will apply to what subject matter and at what time. The definitions offered by members also imply that teachers must move a step further from the established facts to aid students to discover more hidden facts about life and good living. Though members also agree that wisdom is a gift from God individuals can only benefit from it when they put it to practice. Practice will promote intelligence, confidence, good ways of living and good leadership. It means that practice is an essential instrument when it comes to building a good sense of wisdom. Members displayed a complete acceptance that wisdom plays a role in instructional leadership. If wisdom is at all that members said it was then obviously wisdom must play a crucial role in the teaching process. Teachers need wisdom to help them teach effectively and efficiently. They need wisdom to improve their thinking and reasoning skills. They need wisdom to enable them solve problems and also carry out their task in the classroom with professionalism so that they can be fair and firm to all manner of persons in the classroom. Teachers are human and cannot make absolutely wise judgments in the classroom following the complex reality of varied characteristics of students on one hand and that teaching and learning process on the other hand. Once members suggested, that wisdom plays a crucial role in the teaching learning process and they also endorse that teachers must apply wisdom in the teaching and learning process. Applying wisdom during instruction will go a long way to help teachers to understand students better, motivate pupils to learn and increase performance among students.

Recommendations

Teachers need high levels of wisdom to function effectively and that can be acquired through practice. Thus, there is the need to re-train teachers in that perspective to enable them stay clear and focus during the teaching and learning process.

Acknowledgements

I wish to thank my family for the support both in kind and cash towards the execution of the project. I also wish to thank all my coordinators of TAU whose guidance and care brought me this far.

References


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Abstract

Paracetamol, also known as Acetaminophen is widely used as over the counter or prescription pain reliever and fever reducer that is sold over 50+ different countries. Paracetamol is a nonsteroidal anti-inflammatory drug with potent antipyretic and analgesic functions and with very weak anti-inflammatory activity. Paracetamol or Acetaminophen uses diverse brand names, that include not only store brand or generic analgesic but also fever reducers, allergy medicines, medicines for cold, cough, sleeping aids. Other names for Paracetamol include but are not limited to Acetaminodephenol, Acetaminophen, Anacin 3, APAP, Datril, Hydroxyaceta-nilide, Panadol, Tylenol and etc. (1)

At low doses paracetamol is harmless, but it does have direct hepatotoxic potential when taken systematically or as an overdose. It could cause acute liver failure as well as injuries to the extrahepatic tissue due to the transient serum aminotransferase elevations. Paracetamol (Acetaminophen) is one of the most commonly taken and used medications in the United States with more than 25 billion doses sold every year. (15)

Current article will review the main concepts of paracetamol mechanisms of action, will briefly explain characteristics of pharmacokinetics and pharmacodynamics of the over – the counter analgesic. The metabolic activation of acetaminophen with closer look to starvation, malnutrition, delays in treatment, alcohol, medications and genetics will be outlined as well. Hepatotoxicity along with nephrotoxicity will include pharmacology/pathophysiology, histopathology and associated side effects.

Keywords: Paracetamol, acetaminophen, pharmacodynamics, pharmacokinetics, hepatotoxicity.

Concepts

Paracetamol is an over the counter analgesic and antipyretic medication taken primarily for mild-to-moderate pain and fever as an analgesic and antipyretic agent. It is widely used as over the counter or prescription pain reliever and fever reducer that is sold over 50+ different countries.

Paracetamol can be synthesized from Phenol in three consecutive steps: Nitration of Phenol, Reduction of a nitro group to an Amine and Reduction of a nitro group to an Amine.

Acetaminophen has a central analgesic effect and it is mediated through the activation of descending serotonergic pathways. There are doubts about the primary sites of actions, which could be either the inhibition of the prostaglandin synthesis or an active metabolite function that influences the cannabinoid receptors. The absolute mechanism overall remains undefined, but the primary mechanism is believed to be by the process of inhibition of the cyclooxygenase (COX), with a main effect on the COX-2.

When oral acetaminophen is administered, it is quickly and almost completely absorbed from the gastrointestinal tract, mainly concentrated in the small intestine. The absorption process itself happens by passive transportation. The bioavailability of the paracetamol varies from around 85% to 98%. Regular release and extended release of the paracetamol are well known, when orally administered.

Paracetamol is a nonsteroidal drug with potent antipyretic and analgesic functions. It is used for the relief of headaches, fever, and other minor pain associated conditions. It is safe in standard doses, does not have
anti-inflammatory properties and it is not part of the drug group known as non-steroidal anti-inflammatory drugs (NSAIDs).

One of the leading causes for acute liver failure, accounting for more than 56,000 ER visits, 26,000 needs of medical attention and around 450 deaths per year in USA is the administration and overdose of paracetamol (acetaminophen).

**Introduction**

Paracetamol (Acetaminophen) is over-the-counter (OTC) analgesic and antipyretic medication (in United States since 1960) taken primarily for mild- to-moderate pain and fever as an analgesic and antipyretic agent.

Paracetamol (Acetaminophen) is usually suggested for the management of different small colds, viral illnesses and bacterial infections, headaches, toothaches, trauma, menstrual cramps, sinusitis and other slight pains that could be easily controlled. In United States during 2011, an intravenous formulation was approved as well for adults and children above age of 2. The oral dose that is recommended for adults is 660 to 1000 rams every 4 to 6 hours, but it should not exceed 3-4 grams per day. Liquid formulations are also available made for children below certain age, where the concentrations vary from 15 to 100mg/mL. Multiple generic formulations of acetaminophen are currently available on the market (Tylenol, Anacin, Aspirin, Panadol, Neopap) in capsules or tables. In addition to all that, acetaminophen is a common component in many over the counter and prescription mixtures with decongestants, anti-histamines, sleeping aid pills, other analgesics.

**Paracetamol**

**What is Paracetamol?**

Paracetamol, also known as Acetaminophen is widely used as over the counter or prescription pain reliever and fever reducer that is sold over 50+ different countries. Paracetamol is a nonsteroidal anti-inflammatory drug with potent antipyretic and analgesic functions and with very weak anti-inflammatory activity. Paracetamol or Acetaminophen uses diverse brand names, that include not only store brand or generic analgesic but also fever reducers, allergy medicines, medicines for cold, cough, sleeping aids. Other names for Paracetamol include but are not limited to Acetaminodephenol, Acetaminophen, Anacin 3, APAP, Datril, Hydroxyacetanilide, Panadol, Tylenol and etc. (1)

**Synthesis**

Paracetamol can be synthesized from Phenol in three consecutive steps: (3)

**Step 1: Nitrating of Phenol**

Phenol (hydrobenzene) can react with Sodium Nitrate (NaNO3) - an oxidizing agent to create in the presence of Sulfuric Acid (H2SO4) a mixture of isomers of the Nitrophenol.

**Step 2: Reduction of a nitro group to an Amine**

In step two, the oxygen is lost from the Nitro group of 4-Nitrophenol and the hydrogen is added to form the 4-aminophenol.

In this reaction, a catalyst such as palladium or platinum is required.

**Step 3: Formation of an Amide**

During this step, 4-aminophenol (amine) reacts with ethanoic anhydride (acetic anhydride) to produce a precipitate of the amide paracetamol/acetaminophen.

**Mechanism of action**

Acetaminophen has a central analgesic effect and it is mediated through the activation of descending serotonergic pathways. There are doubts about the primary sites of actions, which could be either the inhibition of the prostaglandin synthesis or an active metabolite function that influences the cannabinoid receptors. The absolute mechanism overall remains undefined, but the primary mechanism is believed to
be by the process of inhibition of the cyclooxygenase (COX), with a main effect on the COX-2. Thus in the central nervous system, the inhibition of COX enzymes decreases the concentration of prostaglandin E2, which from here lowers the hypothalamic set-points and participates to reduce high fever. The activation of descending inhibitory serotonergic pathways leads to reducing the pain (analgesia). The latest studies demonstrated that acetaminophen inhibits the COX activity in brain homogenates more than those from the spleen. The experiments additionally supported the idea that variant COX enzymes exist and that the paracetamol acts centrally. \(^{(4)}\)

Recent studies proposed that acetaminophen may be able to work through another mechanism, together with the modulation of the body’s endogenous cannabinoid (CB) system. Two autonomous research groups demonstrated an active metabolite of acetaminophen (AM404) shares the ability of CBs to exhibit analgesic activity and to lower body temperature.

Other on-going research studies suggest that the paracetamol produces direct inhibition of the N-methyl-D-aspartate (NMDA) receptors, blocking substance P-dependent synthesis of Nitric Oxide (NO) through the L-Arginine-nitric oxide pathway and reducing nociception (sensory process that provides the signals that lead to pain). All these proposed pathways are not likely to be neglected; in fact, they may all be components of the series of reactions and responses to acetaminophen management. \(^{(4, 5, 6)}\)

**Pharmacokinetics**

**Characteristics of pharmacokinetics**

**Absorption**

When oral acetaminophen is administered, it is quickly and almost completely absorbed from the gastrointestinal tract, mainly concentrated in the small intestine. The absorption process itself happens by passive transportation. The bioavailability of the paracetamol varies from around 85% to 98%. Regular release and extended release of the paracetamol are well known, when orally administered. \(^{(7)}\)

**Regular release**

24 hours fasting subject who received an acetaminophen 1000 mg as liquid or capsules shows a maximal plasma concentration occurring within 10 to 90 minutes after the ingestion that ranges from 8 µg/mL to 32 µg/mL. An acetaminophen plasma concentration ranges from 1 to 4 µg/mL 6 hours after the ingestion approximately.

**Extended release**

The In vitro data indicated that the two 650 mg extended release caplets containing a total of 1300mg of paracetamol, release from 88% to 95% or the drug itself within 3 to 5 hours. The average maximal plasma concentration occurred sometimes between 0.5 to 3 hours after administration, and ranged from 6.9 to 14.1 µg/mL.

**Distribution**

Paracetamol is widely distributed throughout most of the body excluding the fat. The volume of distribution of paracetamol is around 0.95 L/kg. Approximately 10% to 25% (small part) of the acetaminophen is bound to protein plasma proteins.

**Placental barrier**

When urine analysis was performed, it was established that unconjugated paracetamol passes through the placental barrier. When it is given to mothers in the therapeutic doses, the paracetamol crosses the placenta into the fetal circulation as early as the first 30 minutes of digestion. Furthermore, in the fetus, the paracetamol amounts are effectively metabolized.
Spinal fluid

It is found that the peak concentration of paracetamol in the cerebrospinal fluid reaches maximum after 2 to 3 hours of administration. This quick turnaround is due to the low protein binding and low molecular weight that allows for the paracetamol to pass through the blood-brain barrier.

Breast milk

Current studies established that maternal ingestion of paracetamol in the recommended doses does not present risk to the nursing infants. The measure of paracetamol in the milk range somewhere between 0.1% to 1.85% of the actually ingested maternal dose.

Metabolism

There are three separate pathways for the paracetamol primary metabolism in the liver that are well known and two additional minor pathways that are possibly involved in the paracetamol metabolism:
1. Conjugation with sulfate
2. Conjugation with glucuronide
3. Oxidation via the cytochrome, P450-dependent, mixed-function oxidative enzyme pathway to form a reactive intermediate metabolite.
4. Hydroxylation to form 3-hydroxy-acetaminophen
5. Methoxylation to form 3-methoxy-acetaminophen

Excretion

The established half-life of acetaminophen in adults is around 2 to 3 hours. It is shorter in range in children and somehow longer in neonates and patients with cirrhosis. The paracetamol is excreted by the body completely by the formation of glucuronide and sulfate conjugates where less than 9% of the acetaminophen is excreted unchanged in the urine.

Pharmacodynamics

Characteristics of pharmacodynamics

Paracetamol is a nonsteroidal drug with potent antipyretic and analgesic functions. It is used for the relief of headaches, fever, and other minor pain associated conditions. It is safe in standard doses, does not have anti-inflammatory properties and it is not part of the drug group known as non-steroidal anti-inflammatory drugs (NSAIDs). When taken in therapeutic doses, paracetamol does not bother the lining of the stomach, does not affect the blood circulation, does not distress the kidneys, nor cause the so called fetal ductus arteriosus. (8)

Doses of paracetamol

Paracetamol is shown to be efficient as a fever reducer at serum concentrations of 10 to 20 mg/L. Orally or rectally the recommended dose is 325 to 650 mg every 4 to 6 hours or 1000 mg every 6 to 8 hours. I.V. dose in adults with weight of 50kg and over is 1000mg every 6 hours or 650 mg every 4 hours with reaching a maximum dose of 1000mg and minimum dose of 4000 mg per day. For adults whose weight is under 50 kg, the recommended dose is 15 mg/kg every 6 hours or 12 mg/kg every 4 hours with the maximum dose of 15 mg/kg. The minimum dose interval is shown to be 4 hours and a maximum daily dose is established to be 75 mg/kg per day.

In infants and children that are less than 2 years, the IV form recommendation is 7.5 to 15 mg/kg/dose every 6 hours with a maximum daily dose of 60 mg/kg/day. IV dose for kids from 2 to 12 years recommends 15 mg/kg every 6 hours or 12.5 mg/kg every 4 hours. The maximum daily dose is usually around 75 mg/kg/day without exceeding the 3750 mg/day dose.

Oral doses recommend from 10 to 15 mg/kg/dose every 4 to 6 hours without exceeding the 5 doses per every 24 hours. (8)
Paracetamol and hepatotoxicity

One of the leading causes for acute liver failure, accounting for more than 56,000 ER visits, 26,000 needs of medical attention and around 450 deaths per year in USA is the administration and overdose of paracetamol (acetaminophen). Even though the acceptable daily dose of paracetamol is around 4 grams a day, chronic digestion of this dose is showing to cause increase of the liver enzymes, even in people who do not undergo with any liver associated diseases. Besides the liver, paracetamol tends to affect the kidneys as well, mainly because of its ability to control the liver’s innate detoxification systems. The liver itself uses various enzyme systems that do participate in the metabolism of drugs. (11, 12, 13, 14)

Metabolic activation of acetaminophen

Most of paracetamol is first converted to a toxic metabolite called N-acetyl-p benzoquinoneimine (NAPQI) by phase I CYP (cytochrome P45) enzymes. This middle product then is conjugated with glutathione with the help of phase II enzyme glutathione-S-transferase (GST). The glutathione with time becomes depleted through the process of digestion and NAPQI cannot be sufficiently detoxified. Total hepatic GSH is exhausted by as much as 90%, and this results into the formation of acetaminophen-protein adducts where the metabolite covalently binds to cysteine groups on protein. Increasing levels of NAPQI in the liver starts to cause lipid peroxidation, inactivation of the cellular main proteins, participates in the disruption of DNA metabolism and etc. Furthermore, with the glutathione lost, the oxidative damage increases significantly, and the mitochondria become incapable to produce adenosine triphosphate (ATP-cellular energy). This altogether leads to eventual cell death. Similar toxicity can be seen in the kidneys as well and might to some degree lead to acute renal failure.
Overall, a liver necrosis is primarily caused by an overdose.
There are couple of factors that can lower the paracetamol’s threshold for overdose and/or increase the possibility of liver failure. They are as follows: Starvation/malnutrition, Delays in treatment, alcohol, other medications, age, and genetics.

Starvation and malnutrition

Starvation overall is observed to deplete liver glutathione reserves, as well as precursors for other acetaminophen detoxification pathways. This not only increases the toxicity of the acetaminophen dose, but can be also responsible for the toxicity at lower than the average dose. Animal studies demonstrated a protective effect of calories when optimal nutrition is provided to help against experimentally induced acetaminophen toxicity. Increase in sensitivity and acetaminophen toxicity in animals has been associated with low levels/consumption of dietary proteins that are a main source of sulfur-containing amino acids used in the glutathione synthesis.

Delays in treatment

Delays in treatment of acetaminophen toxic overdose are associated with increased mortality. The common antidote for paracetamol toxicity, N-acetyl cysteine (NAC), begins to lose efficacy in case when administered more than 8-10 hours following acetaminophen overdose.

Alcohol

Chronic consumption of alcohol lowers the threshold for paracetamol toxicity. This is caused by inducing the CYP (cytochrome P45) enzymes and the depletion of the glutathione reserves. (9)

Medications

Antibiotics, antivirals, anticonvulsants, anti-GERD treatments can increase the toxicity of the paracetamol when administered due to the stimulation of the CUP enzymes, the exhaust of the glutathione stores and the oversaturation of other liver detoxification systems.
Genetics

There are couple of mutations that have been recognized in the phase I and phase II of the detoxification genome/genes necessary for the acetaminophen clearance from the body. There are also genetic mutations observed in the production of the toxic metabolite NAPQI.

Biochemical mechanisms of toxicity

The sequence of events that lead to hepatocellular death and the formation of acetaminophen protein adduct is poorly understood. One potential mechanism of cell death is that covalent binding to essential cellular proteins results in continuous loss of activity and/or function and potential cell death and cell lysis. Main cellular targets have been proposed to be the mitochondrial proteins, which leads to energy lost, as well as loss of protein involved in the cellular ion control.

Paracetamol and nephrotoxicity

Pharmacology/Pathophysiology

Paracetamol is known to be a toxin for both liver and extrahepatic tissues. Extrahepatic manifestations are not well studied as the liver necrosis and are not as often as the hepatotoxicity in terms of occurrence. Overall, renal function disruption occurs in approximately 1 to 2% of the patients with paracetamol overdose. Some studies show that nephrotoxicity happens more often in children and adolescents when acetaminophen poisoning is present. Usual sign for that is a creatinine elevation of 2.0 mg/dL in 43–57% of the 275 patients studied with encephalopathy and coagulopathy that are secondary results of the paracetamol-induced hepatic failure. It is known that only 1% of the acetaminophen is excreted unchanged in the urine. With the therapeutic dosage taken by adults, approximately 63% of the paracetamol is metabolized via glucuronidation and around 34% through sulfation. When large doses of the drug are ingested, there is more drastic glutathione reduction, excessive metabolite production and increase in toxicity by producing large amounts of reactive species unbound. There are several possible mechanisms of renal toxicity based on both animal and human data. Some of them include the cytochrome P-450 pathway as well as the prostaglandin synthetase and the participation of N-Deacetylase enzymes. Another potential mechanism of paracetamol toxicity is related to the prostaglandin endoperoxidase synthetase (PGES), an enzyme found in the kidneys that activate paracetamol to toxic metabolites, most probably NAPQI. The enzyme N-deacetylase has also been proposed to play role in the paracetamol-induced nephrotoxicity, although this role is still uncertain. (13,21)

Histopathology

Light microscopy of kidney biopsies done to patients with paracetamol toxicity show a tubular epithelial cell necrosis in both, the proximal and distal parts of the tubules. In some cases, there are normal glomeruli and vessels, but with slight damage to the basement membrane. Urinalysis is usually used to distinguish the form of renal insufficiency, such as hepatorenal syndrome (HRS) or pre-renal azotemia. In the case of acute tubular necrosis, there will be granular casts in the urine sediment along with hematuria or pyuria. Sometimes urine sodium, osmolality testing and urinary sediment measurement could also provide additional information for the kidneys current condition. (13,21)

Paracetamol associated side effects (17)

Rare skin reactions

Recent findings and FDA waning letters announced that paracetamol has been associated with a risk of rare but very serious skin reactions. Those reactions, usually known as Stevens-Johnson Syndrome (SJS), toxic epidermal necrolysis (TEN) and acute generalized exanhematosus pustulosis (AGEP) could often lead to death. Usually those conditions could be associated with skin rash, blisters, and detachment of the upper layers of the skin. These reactions could occur not only to first time use of paracetamol but even when continues treatment is provided.
Dermatologic
Dermatologic side effects have been noticed and were recognized as erythematous skin rashes, bullous erythema and purpura fulminans as well.

Gastrointestinal
A recent study proposed that paracetamol could precipitate and cause acute biliary pain and cholestasis. The mechanisms could be possibly related to the inhibition of the prostaglandins. Gastrointestinal side effects include nausea – around 34%, vomiting (15%) as well as acute pancreatitis.

Hematologic
Hematologic effects are associated with the administration of paracetamol that include but are not limited to rare cases of thrombocytopenia, acute thrombocytopenia, methemoglobinemia with cyanosis associated condition, infusion site pain and peripheral edema.

Hypersensitivity
Anaphylaxis and fixed drug eruptions were noticed rarely with the administration of paracetamol.

Respiratory
Respiratory side effects include dyspnea and eosinophilic pneumonia.

Metabolic
Metabolic side effects were observed with conditions of hypokalemia and metabolic acidosis where the last one was after massive overdose of acetaminophen.

Cardiovascular
Cardiovascular side effects include hypotension and hypertension were observed even with optimal administration of paracetamol.

Nervous system
Usual nervous system side effect includes headache, insomnia and fatigue. The headache counts for 10% of the cases.

Psychiatric
Psychiatric side effects associated with paracetamol have been reported more often as an anxiety.

Musculoskeletal
Typical musculoskeletal side effects associated with paracetamol have included muscle spasms and trismus.

Conventional alternatives for paracetamol overdose

Sulfur containing amino acids
Amino acids that are rich in sulfur usually are known to support liver health especially after exposure to certain doses of acetaminophen. Daily intake of sulfur containing amino acids could potentially support glutathione levels and are known to protect against drug induced toxicity. (17)

Methionine
Methionine is an essential amino acid that is a precursor to couple of sulfur containing anti-oxidants. It helps with the glutathione level maintenance and is used as a conventional antidote for paracetamol.
overdose. Some countries do include methionine as part of the acetaminophen formulation in order to protect against accidental intoxication.

**N-acetyl cysteine (NAC)**

N-acetylcysteine is an effectively used in the treatment of acute liver failure due to acetaminophen overdose. It is recommended that every time a paracetamol is taken, at least 600 mg of NAC should be administered to protect against liver toxicity.

**S-adenosyl methionine (SAMe)**

SAM, as a methionine derivative, is also very important for the synthesis of proteins and phospholipids.

**Selenium**

Selenium is a trace element, naturally found in some foods. It acts as a cofactor for numerous enzymes that synthesize the glutathione and therefore participates in the detoxification of paracetamol. Studies show that injecting rats with Selenium around 24 hours before the paracetamol overdose contribute to a significant increase in glutathione levels and lowered levels of ALT and AST.

**Curcumin**

It is suggested that curcumin may increase the efficacy of NAC as a paracetamol antidote. It is also proposed that when administered it prevents the microscopic appearance of kidney damage and maintains glutathione levels in comparison to control objects (studies done in rat models).

**Co-enzyme Q10 (CoQ10)**

Testing rats before and after paracetamol overdose with CoQ10 showed certain level of liver damage protection. Reduced serum ALT and markers of the oxidative stress were remarkably obvious.

**Vitamin C**

High doses of ascorbyl palmitate (not as a free vit C ascorbic acid) were given and noted to prevent the elevation of serum liver enzymes in mice models. Free vitamin C did not show protection against hepatic or kidney damage.

**Paracetamol awareness**

In 2008, the Acetaminophen Hepatotoxicity Working group in the Center for Drug Evaluation and research (CDER) within the Department of Health and Human Service, FDA (Food and Drug Administration) came up with a report that represents the recommendations for FDA interventions that could potentially decrease the number of cases of deliberate and accidental overdose of paracetamol leading to liver and extrahepatic injuries. CDER did recognize that the paracetamol related-hepatotoxicity is a significant public health problem and that certain measurements need to be taken to avoid product overdose and subsequent side effects. Here’s list of some of the steps that FDA described and took to steps to implement:

- a. Enhance public education efforts and make them aware of all the possible effects that an overdose or systematic administration could cause
- b. Develop concise clear messages
- c. Improve labeling of drugs to reduce intentional overdose in suicide gesture.
- d. Improve FDA’s own educational efforts
- e. Highlight the name of the paracetamol on the display panel of the drug’s container
- f. Include warnings that when taken above the recommended dose it could cause severe liver injuries and extrahepatic damages.
- g. Include warnings for people with liver diseases
h. Include warning for alcohol use with the medication and incorporate suggested dose when you take more than 3 alcoholic drinks every day while using the product.

i. Put limits on the daily recommended dose for adults for immediate-release formulations to a maximum of 325 mg and a single adult dose of 650 mg.

j. Limit table strength for extended-release formulations

k. Limit pediatric liquid formulation

Despite all the efforts, recent research showed that the unintentional and intentional overdoses that are leading cause for severe hepatotoxicity are continuing to take place. In a study published by the Acute Liver Failure Study Group (ALFG)(16), was shown that acute liver failure cases caused by paracetamol overdose increased from 28% in 1998 to 51% in 2003. Severe adverse effects connected to hepatobiliary damage are still reported to FDA with increasing frequency.

Conclusion

Patacetamol (Acetaminophen) in comparison to other alternative pain reducing medications, such as NSAIDS and narcotics, is relatively safe when used in accordance with the recommended dosage. The ability of paracetamol to cause hepatotoxicity and secondary nephrotoxicity when it is improperly used is not a reason to discourage the public from employing it as a drug.

FDA recent interventions to address the toxic effects and reduce the paracetamol–related hepatotoxicity are only steps for decreasing prospect occurrences of paracetamol (acetaminophen) associated toxicity and avoidance of severe drug related side effects.

References
[17] June, 2003; LAURA P. JAMES, PHILIP R. MAYEUX and Jack A. Hinson, , Departments of Pediatrics (L.P.J.) and Pharmacology and Toxicology (L.P.J., P.R.M., J.A.H.), University of Arkansas for Medical Sciences,Little Rock, Arkansas.
[18]. March 2008, Volume 4, Issue 1, pp 2-6; “Acetaminophen-Induced Nephrotoxicity: Pathophysiology, Clinical Manifestations, and Management, Maryann Mazer, MD, PharmD, and Jeanmarie Perrone, MD, Department of Emergency Medicine, University of Pennsylvania School of Medicine, Philadelphia, PA; http://downloadv2.springer.com/static/pdf/624/art%253A10.1007%252FBF03160941.pdf?token2=exp=1429232436~acl=%2Fstatic%2Fpdf%2F624%2Fart%253A10.1007%252FBF03160941.pdf*~hmac=595930926b556e2635dbb2b037eeb0b238e14c27801ec68b2809c4e62756bddd4.
Cyber Crime in a World without Borders

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Abstract

Technology has created a world governed by computers and computer networks. Today's world is a world of a machines. This world of machines evolves and work 24/7 without pausing. This is a man-made world without geographical boundaries. Technology has created a dynamic world out of nowhere. This dynamic world is called the cyberspace, a world without borders. A new world connected by means of computer networks. A virtual space created by networks of computers and the Internet. With cybercrime in a world without borders, a criminal no longer needs to be at the actual scene of the crime. This advanced form of crime is perpetuated by means of computer networks and the Internet.

Keywords: Cyberspace, borders, cyber-crime.

Introduction

Cyberspace is a world created by the Internet. The word became popular in the 1990s when the use of the Internet, networking, and digital communication were all growing dramatically and the term "cyberspace" was able to represent the many new ideas and phenomena that were emerging. Strate, Lance (1999). The parent term of cyberspace is 'cybernetics', derived from the Ancient Greek κυβερνήτης (kybernetēs, steersman, governor, pilot, or rudder), a word introduced by Norbet Wiener for his pioneering work in electronic communication and control science. This word first appeared in the novel Neuromancer by William Gibson. Vakul Sharma (2010). With time the term cyberspace has become a conventional means to describe anything associated with the Internet and the every activity associated with the Internet. Although you can find several definitions of cyberspace both in scientific literature and in official governmental sources, there is no fully agreed official definition yet. Strate, Lance (1999).

According to Chip Morningstar and F. Randall Farmer, cyberspace is defined more by the social interactions involved rather than its technical implementation. In their view, the computational medium in cyberspace is an augmentation of the communication channel between real people; the core characteristic of cyberspace is that it offers an environment that consists of many participants with the ability to affect and influence each other. They derive this concept from the observation that people seek richness, complexity, and depth within a virtual world. Morningstar, Chip and F. Randall Farmer (2003).

The most recent draft definition is the following: Cyberspace is a global and dynamic domain (subject to constant change) characterized by the combined use of electrons and electromagnetic spectrum, whose purpose is to create, store, modify, exchange, share and extract, use, eliminate information and disrupt physical resources. Marco Mayer, Luigi Martino (2014). Cyberspace includes: a) physical infrastructures and telecommunications devices that allow for the connection of technological and communication system networks, understood in the broadest sense; b) computer systems and the related (sometimes embedded) software that guarantee the domain's basic operational functioning and connectivity; c) networks between computer systems; d) networks of networks that connect computer systems (the distinction between networks and networks of networks is mainly organizational); e) the access nodes of users and intermediaries routing nodes; f) constituent data (or resident data). Often, in common parlance (and sometimes in commercial language), networks of networks are called Internet (with a lowercase i), while networks between computers are called intranet. Internet (with a capital I, in journalistic language sometimes called the Net) can be considered a part of the system a). A distinctive and constitutive feature of cyberspace is that no
central entity exercises control over all the networks that make up this new domain. Marco Mayer, Luigi Martino (2014).

Methodology

The paper is a comprehensive review of literature on the concept of crime in the cyber space, a world without borders.

Literature review

Cyberspace and the Physical World

The contours of physical world are fixed. Figure 1, shows the physical world. This shows the earth surface and its climate, countries, people and natural resources. But cyberspace is as vast as human imagination and thus cannot be given a fixed shape. As millions of neurons exist in human brain creating a spectre of life, similarly cyberspace represents network of millions of computers creating a spectre of ‘digital life’. Thus, cyberspace can be treated as a natural extension of physical world into an infinite world. Vakul Sharma (2010).

![Figure 1. This is the physical world with its fixed contours (Google image).](image)

Cyberspace is a digital medium and not a physical world. It is limitless, constantly changing its shape, attributes and characteristics. It is an interactive world and cannot be referred to as an Xerox version of the geographical space. Such a version exists only in the films like Matrix. The physical world is static, well defined and incremental, but cyberspace is dynamic, undefined and exponential. Vakul Sharma (2010). This is shown on figure 2.
A world without borders

Figure 2. Cyberspace showing networks of communication links, such as blue tooth, WIFI etc., A digital world of communication networks (Google image).

Citizens of cyberspace

Cyberspace has introduced a new kind of world and citizens called Netzens. A Netizen is an inhabitant of the worldwide world (Internet). He is the one, who inhabits the Net and uses it as an extension of his day-to-day physical world. He replicates his physical world actions, like socializing, buying, selling etc. in an online medium. He transcends geographical space and time by a click of a mouse. He recognizes no man-made or geographical boundaries. There is no end to what a netizen can do. The most interesting facet of being netizen is that he could be anonymous, nameless and faceless person, if he wants to and yet can indulge in all kind of activities. Vakul Sharma (2010).

A netizen differs from a citizen in the sense that a netizen unlike a citizen, has no constitutional guarantees. No Constitution recognizes netizens as citizens and grant them constitutional rights and duties. Constitution of a country is meant for a specific geographical area. It is meant for the people that reside within that geographical area. Netizens being the traveller of digital highways are basically nameless, faceless nomads crisscrossing the worldwide for convenience. But one should not forget that in cyberspace, netizens exist, citizens don’t! It is for these netizens, cyber laws have come into existence. Vakul Sharma (2010).

Connecting to the world

With computers and computer networks, one can easily connect to the world in a split second. The internet has made the world smaller, bringing countries, people and businesses close together. Computer devices have become smaller and portable and are able to carry large amount of data/information across the globe. The ever-increasing connectivity of computer technology has brought the world closer. With access to a computer and a modem, you are connected to the world. Today a simple mobile phone is enough to connect you to people in other parts of the world.
Figure 3. This is how one connects to the world today. With a modem and a computer one is connected to the rest of the world (Google image).

Figure 4. These people are connected to the world without borders. With access to an android and any smart phone a person can easily be connected to the world (Google image).
The people behind the cyber crime

Crime is now associated with the use of computers, these types of crime are referred to as computer crime or cybercrime. It is committed by using the computer as a tool, or the computer itself being the subject of the crime. Computer crime is committed by a broad range of people; students, amateurs and professionals. Technology has introduced a host of gangsters with ideological beliefs with the potential to commit all kinds of crime.

Cyber criminals are categorized based on their objectives to commit crime. Children and teenagers between the ages of eight and eighteen are in one category. This group by nature, are anxious to know and explore the world of technology. By this act of exploration, they intend engage in cybercrime. Professionals’ criminals have taken their schemes of committing crime online. They have digitised most of the conventional crimes. Today a lot of software tools are developed to perpetuate crime. The crime ranges from stealing simple information to cyber terrorism. These crimes are committed 24/7, making it difficult to crack down on activities. Technology has made it easier for criminals to launch an attack from any part of the world with the means of a simple computer device. These attacks are launched at governments, business organisations, security services and individuals. The difficulty in arresting and persecuting cyber criminals is as a result of different criminal laws in different Countries. These differences in laws have also complicated the fight against cybercrime and increased the activities of the gangsters. In some jurisdictions, cyber criminals are having field day. The pace of crime is a step ahead of arrest and persecution. Typical examples of cybercrimes are; computer hacking, piracy, Internet fraud, identity theft, cyber stalking, credit card information thefts, , spamming, phishing scam, and infecting computers or mobile devices with viruses, spyware, ransomware, Trojan horse and malware. The nature of crime keeps increasing as technology advances.

![Figure 5](image)

Figure 5. Pictures depicting how the criminals work. They work from remote places (Google image).

Crime scene

Crime scene, the place where an offence has been committed and forensic evidence may be gathered has gone beyond the conventional methods. The continuous evolving of the techniques by cyber criminals is making it difficult for governments and security agencies to track their activities. With traditional crime, the location of a crime scene can be the place where the crime took place, or can be any area that contains evidence from the crime itself. Scenes are not only limited to a location, but can be any person, place, or object associated with the criminal behaviours that occurred. Today the scene for crime is the computers, laptops, mobile phones and other emerging technological devices. Figure 6. shows a picture of a crime scene. The widespread use of mobile devices has created
unprecedented challenges in legal proceedings as the courts decide how to properly authenticate digital information under the current judicial rules and procedures.

Crime Scene

Figure 6. Today a crime scene is the computer or mobile devices and other emerging technology (Google image).

Reasons for cyber crime

Cybercrime is promoted by many factors, such as Computers and computer networks. These technologies with its speed has added another dimension to crime. Today almost all the conventional crimes have been digitized. Skills in computer programming has also added a new dimension; where tools to perpetuate crimes online have all been developed. These tools are either free and does not cost much. Some of these tools can be downloaded free on the internet. The cybercrime is 24/7 and this is as a result of the following factors.

The coding nature of computer operating systems makes it complex. Criminals are taking advantage of these complexity to carrying out all kinds of fraud. The millions of coding makes it difficult to identify vulnerabilities in a programming. Sometimes before a vulnerability is noted, criminals might have taken advantage to steal millions of cash or crash a system.

New designs in computer technology has made access to computer very easy. With access to a computer and a modem, one is connected to the internet/world. Criminals are taking advantage of this easy access, to commit all kinds of fraud and develop schemes to rob computer users.

The capacity to store data and information has changed with the advent of computing technology. Devices like the pen drive can store a large amount of data. The carrying of data by simple and small devices makes it vulnerable for criminals to steal. It doesn’t take a lot of energy to carry data today.

Criminals always take advantage of vulnerability and the negligence of users of computer systems. A lot of users are not security conscious and will not keep and protect their passwords. Computer technology exposes a lot of users to all kinds of attack.

Another challenge in the criminal justice systems is the finding of evidence to support criminal case. Sometimes the evidence will be hiding in a computer devices in a remote site. Access to it can be difficult and expensive. Some other evidences can be on small and simple devices like the pen drive and mobile phone, which can easily be disposed of by the criminal, making access to it to support a criminal case very difficult and in some case impossible.
Practical international challenges

The growing trend of computing technology has not kept pace with the criminal justice systems of the world. Very few countries have adequate laws to address the problem of cyber-crime. Cybercrime is a new form of transnational crime and addressing it requires a concerted international cooperation. The United Nations has identified some challenges in addressing these international cooperation in fighting cyber-crime. The following are the challenges in addressing the legal and criminal justice system according to the United Nations:

- The lack of global consensus on what types of conduct should constitute a computer-related crime;
- The lack of global consensus on the legal definition of criminal conduct;
- The lack of expertise on the part of police, prosecutors and the courts in this field;
- The inadequacy of legal powers for investigation and access to computer systems, including the inapplicability of seizure powers to intangibles such as computerized data;
- The lack of harmonization between the different national procedural laws concerning the investigation of computer-related crimes;
- The transnational character of many computer crimes;

The lack of extradition and mutual assistance treaties and of synchronized law enforcement mechanisms that would permit international cooperation, or the inability of existing treaties to take into account the dynamics and special requirements of computer-crime investigation. (United Nations Manual on the prevention and control of computer-related crime).

Conclusion

The forgoing analysis indicates that the internet has made the world smaller than we thought. Computer devices have become smaller and portable and are able to carry large amount of data/information across the globe. The ever-increasing connectivity of computer technology has brought the world closer. With access to a computer and a modem, you are connected to the world. Today a simple mobile phone is enough to connect you to people in other parts of the world. Fighting cyber-crime in a world without borders needs a concerted efforts by all stakeholders in the Law enforcement, civil society and governments. Cyber-crime is a new form of transnational crime and effectively addressing it requires concerted international cooperation.

References

The Role of Information and Communication Technology in Sustainable Development Goals in Africa: A Review

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Abstract

Technology plays a critical role in transforming societies and economies through enhancing efficiency, connectivity and access to resources and services. Sustainable development goals require harnessing technological innovation through utilization of information and communication technology. However, the challenge remains of how Africa can harness technologies to achieve sustainable development goals. This paper is a review of journal articles on the role of information and communication technology in sustainable development goals in the African context; it discusses challenges and opportunities in the light of youth employment, financial inclusion and health care. It identifies existing appropriate forms of technology that could enhance sustainable development goals and demonstrates the role of information and communication technology in achieving sustainable development goals in Africa. The paper concludes that Africa will need to vigorously utilize appropriate technology to achieve sustainable development goals.

Keywords: Technology, Sustainable Development Goals, Youth Employment, financial inclusion, health Care, ICT in Africa.

Introduction

There is a great recognition that utilization of information and communication technology is at the heart of achieving sustainable development goals. “Technology plays a critical role in transforming societies and economies through enhancing efficiency, connectivity and access to resources and services” (Al-Jayyousi, 2017). Sustainable development goals (SDGs) require harnessing information and communication technology. However, the challenge remains of how Africa can harness information and communication technologies to achieve sustainable development goals.

While, Africa has made great strides in adopting information and technology communications in its quest to advance development, challenges and opportunities exist for Africa to fully harness appropriate technology to address youth employment, financial inclusion and health care. DESA (2008) observe that Africa still lags behind in its pace of [technological] innovation. Recognizing the role of information and communication technology in achieving sustainable development goals in Africa, this paper attempts to review existing articles on the role of information and communication technology in sustainable development goals in Africa.

The paper does not analyze the impact of sustainable development goals, but rather endeavor to highlight the role of information and communication technology in achieving SDGs. The paper, firstly, discusses the method used in examining the role of technology in sustainable development goals. It then, presents definition and concept of ICTs and its link to sustainable development goals.

In details, the paper gives an overview of SDGs and discusses the role and impact of information communication technology in sustainable development goals in general. Specifically, the paper discusses utilization of ICT in Africa to achieve SDGs and highlights challenges and opportunities in the light of youth employment, financial inclusion and health care in the African context.
Method

This paper conducted a review of articles published on the role of technology in sustainable development by undertaking a search of keywords in scholarly databases and internet sources. Article reviews were undertaken in three specific areas: the role of information and communication technology in sustainable development in Africa and developing countries, how can Africa harness technology to achieve sustainable development goals, debate about information and communication technology in youth employment, financial inclusion, health care and agriculture.

The paper focused its review of articles around appropriate technologies for Africa required to contribute to sustainable development goals. In addition, the paper used published case studies on the role technology in sustainable development based on NGOs’ reports and international development agencies. It should be noted that while the review aims to summarize the relevant literature on the topics outlined above, it does not provide an exhaustive representation of the literature on each topic. Rather, prominent, widely cited and insightful literature was selected to inform the wider research.

The rationale for the selection of articles for inclusion in the review was those which intersected the issues of the role of information and communication technology to development in an African context. Articles related to concepts and definitions were limited to those with multiple citations and regularly noted as prominent pieces within this field. Articles which covered similar narratives, lines of argument have been included, with each article aiming to add new insight and value to the review and findings.

Definition and concept

Information and communication technology (ICTs)

Arug and Chigozi (2016) cited Hawkridge (1983) in defining ‘ICTs as a generic term referring to technologies that are used for collecting, storing, editing and passing on (communicating) information in various forms. French defines information and communication technology as “a broad based technology (including its methods, management and application) that supports the creation, storage, manipulation and communication of information” (French, 1996). OECD refers to information and communication technologies as a full range of electronic technologies and techniques used to manage information and knowledge (OECD, 2012).

ICTs are regarded as information-handling tools and they include a diverse set of goods, applications and services that are used to produce, store, process, distribute and exchange information (UNDP, 2003). Accordingly, these are part and parcel of the “old” ICTs of radio, television and telephone, and the “new” ICTs of computers, satellite, mobile phones and wireless technology and the Internet (United Nations ICT Task Force, 2003). United Nations ICT Task Force argue that these different tools are now able to work together, and combine to form our ”networked world” - a massive infrastructure of interconnected telephone services, standardized computing hardware, and television, which reaches into every corner of the globe (United Nations ICT Task Force, 2003). ICT therefore covers the cabling infrastructure e.g. fiber optic cables, which carry voice, data and video communications (Mohammed and Sadiq, 2015).

This paper considers ICTs as platform to exchange data, information, knowledge and tools to implement applications (e.g. e-commerce, e-schools, e-health etc.). It is important to note that recent developments of technologies, particularly, reduction in prices, greater availability of networks and a more user-friendly approach to technologies are strengthening the role of ICTs (United Nations ICT Task Force, 2003).

The role and impact of ICT and sustainable development goals

Why are ICTs essential for the achievement of the SDGs? What are the main opportunities of ICTs to accelerate progress and maximizing the transformational change needed, as well as the challenges linked to access and connectivity for all?

In September, 2015, leaders from all over the world gathered in New York to agree on the Sustainable Development Goals (SDGs). There are 17 goals aiming to end poverty, extreme hunger, ensure quality
education for everyone, improve healthcare, end gender inequality, protect, restore and promote sustainable use of ecosystems and to improve social and economic development, and end inequality (http://www.undp.org). According to Sachs (2014) these SDGs offer an ambitious path to end poverty, fight inequality, and tackle climate change and he state that they are wide-ranging, but have one thing in common: all rely on the enabling power of ICT.

Hoffman and Girvan (1990) note that evidence by developments from other countries that ICT as a sector can contribute immensely to the sustainable development goals. Adamali and Safdar note that ICTs can help build on synergies among the goals, realize possible multiple benefits as well as avoid barriers and conflicts on the challenging road toward SDGs (Adamali and Safdar, 2006).

ICT and SDGs report emphasize that “ICT has immense potential to speed up and scale—or increase the rate of diffusion of—a very wide range of cutting-edge technologies, applications and platforms across the economy, helping low-income countries to leapfrog to achieve key development milestones while contributing to a growth economy. Significantly, it can also dramatically reduce the costs of service delivery”. The report further point out that ICT will be key in accelerating achievement of sustainable development goals in Africa in the following five ways:

1. Accelerated upscaling of critical services in health, education, financial services, smart agriculture, and low-carbon energy systems.
2. Reduced deployment costs addressing urban and rural realities.
3. Enhanced public awareness and engagement.
4. Innovation, connectivity, productivity and efficiency across many sectors.
5. Faster upgrading in the quality of services and jobs.

According to Bello (2014) ICTs provide an opportunity for nations to address the digital divide and reduce poverty while registering economic growth. Bello further point out that developed and some developing nations have seen the emergence of a vibrant ICT sector that significantly contributes towards national gross domestic product (GDP) (Bello, 2014). According to Crede & Mansell (1998), ICTs are crucially important for sustainable development in developing countries and Africa in particular.

ICT4D Report (2012) point out that ICT is, and will continue to be, a catalyst in advancing sustainable development goal. The report argues that new information and communication technologies overcome the barriers of distance and time, and significantly improve the accessibility of information and knowledge (ICT4D Report, 2012). As a result, the sharing of information and knowledge quickly and effectively becomes feasible and acts as a key element in achieving sustainable development goal (Farid, 2015).

According to Harindranath (2007) the way ICT is conceptualized makes it meaningful for any developmental goal. Afta and Ismail (2015) argue that ICT can create new jobs and opportunities, improve access to finance, improve health outcomes and agriculture performance in developing countries.

**Africa’s utilization of ICTs is key to the success of the SDGs**

Many African countries are adopting information and technology communications to achieve SDGs. However, diffusion of ICT into Africa is at a snail's speed, such that the gap between the information-rich developed countries and Africa continues to increase every day (Baro, 2011). Consequently most African countries have not been able to reap the abundant benefits of the global information society and the information economy in areas such as education, health, commerce, agriculture and rural development (Mutula, 2004).

This figure indicates the most important indicators about ICT in Africa at the period 2005 – 2015.
Information and communication technology for youth employment in Africa

ICT offer Africa an opportunity to address the challenge of youth unemployment (Ebaidalla 2014). According to the Africa Economic Outlook (2012), Africa has the youngest population in the world, with almost 200 million people aged between 15 and 24. These young people will be in need of employment. The Africa Development Bank (2016) acknowledges that youth unemployment and underemployment constitute central challenges to Africa’s sustainable development goals.

The Africa Development Bank further state that if “youth unemployment rates remain unchanged in Africa, nearly 50% of youth – excluding students – will be unemployed, discouraged, or economically inactive by 2025” (AfDB, 2016). The Bank argues that the “likely consequences of these include increased poverty, social and economic exclusion, migration out of the continent, and increased risk of political tensions” (AfDB, 2016). Therefore youth employment will be critical to the achievement of SDGs goal 8 which relates to promote inclusive and sustainable economic growth, employment and decent work for all.

Ukomm and Okeagu (2015) point out that ICT will play a critical role in creating employment opportunities, empowerment and development. According to Ukomm and Okeagu (2015) the role of ICT in facilitating job creation for the youths, especially in Africa cannot be over emphasized. HAFIZ et al (2013) argue that the youths are often the leading innovators in the use and spread of ICT. HAFIZ et al (2013) further point out that the youth adapt quickly and are adventurous for new knowledge and therefore if provided with opportunities, they can translate it into livelihood ventures.

In his paper Muhammad (2015) indicates that the ICT sector was boosting the federal government effort in job creation on an average of about 12 million jobs from 2012 to date which is a significant improvement against the 2.5 million jobs the sector created” between” 2002 - 2012. According to Muhammad (2015) the World Bank in line with its investment policy has expressed its readiness in providing 2 million dollar investment on facilities to promote growth and employment projects on ICT in Nigeria in the year 2014.

ITU point that access to information means better access to capital, markets and job opportunities
and training, for example The World Bank state that ICTs connect youth to jobs. Online employment marketplaces are helping an estimated 12 million people worldwide find work by connecting them with employers globally (World Bank, 2007). The World Bank further indicates that Babajob in India, Duma and M-Kazi in Kenya, and Souktel in the Middle East and North Africa are examples of job search services using internet-based and mobile tools (ibid).

Michael and Samson (2014) studies indicate that “ICT era has created various types of jobs from chief information officer in big enterprises or government agencies to the computer shop operators since early 90’s. According to Michael and Samson (2014) vendors of hand held phones and their accessories are common sight in every community. They argue that there are various types of ICT based businesses such as document processing centres, cybercafé, computer training centres, computer services and repairs, hand set services and repairs, internet, programming, cable and satellite TV installations, etc. with very little take off funds” (ibid).

In his view Christine zhen- Wei Qiang (2009) stated that “The mobile platform is emerging as the single most powerful way to extend economic opportunities and key services to millions of people”. He further maintained that, investment in telecom services in African region between the years 2000-2007 reached $20 billion and number of mobile subscribers increased from 2 million in 2000 to over 150 million in 2007 (Christine zhen- Wei Qiang, 2009).

Mohammed and Sadiq (2016) argue that ‘interconnectedness and collaboration; allowing smaller, entrepreneurial companies to compete in global markets; reducing the cost of entry for new entrepreneurs; facilitating research diversification and interdisciplinary approaches; enhancing the ability of entrepreneurs to develop new business models, products, services, and processes; shortening product development cycles; providing new tools to create, organize, store, and transmit information; and facilitating faster access to regional and international markets”.

However, Mohammed and Sadiq (2016) note that “while access to technology and associated electronic content has significantly changed the lives of many young people in developed countries; this is not always the case for those in Africa”. According to Michael and Samson (2014) access to ICTs such as computers, mobile phones and the Internet, especially broadband, remains a challenge for youth in Africa.

Information and communication technology for financial inclusion in africa

Helmore et al (2009) argue that beginning 1970s, financial inclusion swept through Asia and Latin America, helping countless millions of poor people get the economic boost they needed to start small businesses and work their way out of poverty. Sreedevi (2011) notes that poverty can now, in part, be redefined as a lack of access to reliable, affordable financial services that enables people to build economic security and improve their lives. Helmore et al (2009) point out that while there are more than 300 million economically active individuals in sub-Saharan Africa, only about 20 million of them – less than 10 percent – have access to any kind of formal financial services.

Helmore et al (2009) assert that if “African countries are to achieve sustainable development goals more quickly, the poor in Africa – like people everywhere – must have access to an array of flexible, cost-effective financial products and services targeted to their needs, including savings, credit and insurance”. Jonathan (2008) argues that financial inclusion has the potential to improve the standards of life of the poor and the disadvantaged. According to Beck et al (2007) financial services permit individuals and households to manage the risk and uncertainties, to save on better terms, to invest in a business venture or property, or to cope with unforeseen expenses.

Boriana (2015) point out that the increasing use of mobile phones in Africa has contributed to the emergence of branchless banking services, thereby improving financial inclusion. Helmore et al (2009) notes that mobile telephone subscriptions allow expansion and access to financial services to previously underserved groups in African countries.

Boriana (2015) argue that this increased access to financial services for underserved people helps
narrow the financial infrastructure gap, where the costs of distance and time are very high for formal banking services. Therefore ICT and mobile phone in particular improve access to credit and deposit facilities, allow more efficient allocation of credit, facilitate financial transfers, and boost financial inclusion (Helmore et al. 2009).

**Information and communication technology for health in Africa**

The World Health Organization state that health is an important facet of sustainable development goals and has potentially to contribute to attainment of SDGs. The World Health Organization (WHO) has emphasized a need to improve health care services particularly in Africa (WHO 2014) .argue that “African countries will not develop economically and socially without substantial improvements in the health of their people”.

Istepanian and Lacal (2003) state that the health-care interventions — treatments, diagnostic and preventive methods — that are needed in Africa are known. The World Health Organization point that the challenge for Africa is to deliver these to the people who need them and the best way to do this is to establish well-functioning health systems” (WHO 2014, p. xiii). According to Lucas (2008) ICT can be used to transform the health paradigm by shifting the provider-patient configuration. This typically can involve extending health care services to underserved areas by use of electronic or telecommunication means (Telemedicine) such as video chat, or health telephone hotlines (Mimbi and Bankole, 2015).

Nkqubela et al (2010) argue that ICTs enable online communication about medical issues and diagnosis of complicated diseases by linking medical practitioners who are separated geographically. They have the potential to change the delivery of healthcare services and patient care, as well as the management of healthcare systems.

**Discussion and conclusions**

This paper therefore assumes that ICT presents wide ranging opportunities especially for Africa to attain sustainable development goals. The paper has argued that information technology facilitates fast, cheap, equitable, and resource-efficient access to information. ICTs are important in Africa for several key reasons. First, technology can be used through commerce to generate money and capital income. Secondly, updated ICTs improve the quality of life of through creating employment opportunities, improve access to financial inclusion for the poor and support health care services. Lastly, ICT allows for easier communication, for example, through computers and production of goods using new machinery. The paper concludes that the trend of development in ICT has immensely contributed to providing job opportunities for young people who are roaming the streets due to lack of employment in Africa.

The adoption of ICT requires a business environment encouraging open competition, trust and security, interoperability and standardization, and financial resources for ICT. This requires the implementation of sustainable measures to improve access to the internet and telecommunications infrastructure and increase ICT literacy, as well as development of local internet-based content. One of the causes that discourage access to digital information is culture and language differences. Efforts should be made to make ICTs available in local languages if they are to be demystified, adopted and utilized by locals.

In general, ICT goals in Africa are: to establish an environment that encourages networking of services and applications; promoting e-commerce and trade promotion programmes for goods and services; promoting internet access to exchange and access digital content; establishing e-government; promoting education and on-line services; strengthening network security; building and developing e-society and ICT human resources.
References


Automated Result Process System Processing System  
(A Case Study of University of Port Harcourt)

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Abstract

Due to enormous problems associated with manual computation of students’ result and transcript processing in university of Port Harcourt, there is need for efficient method with error free that will enable result to be processed automatically. This system will accept multiple inputs and aid course advisers carry out their responsibilities effectively. A result is an official report and record of student courses with grades. Students result is critical to their graduation.

Currently, there is no reliable way to track incoming results. This creates problems for students and staff. Lost or misplaced result has unwanted consequences and delay graduation.

In this work, a computer software application was developed to facilitate the automated processing of the results. The software was developed in Java programming language in the form of a database, employing PostgreSQL Relational Database Management System. The developed software performed well and produced expected results on completion. With it, it was possible to compute Grade Point Average and Cumulative Grade Point Average for each student based on examination scores entered being the core idea behind the design.

Keywords: Relational, Database, Management, GPA, Software, Hardware, Programming, Java, Computer, Design, Examination, Record, PostgreSQL.

Introduction

Over the years several efforts has been made to alleviate the burden of result processing and transcript generation on the desk officers who are in charge of the five faculties in University of Port Harcourt at the Examinations and Records office.

The effort expended in the process of registration of students and computation of their examination results is awesome. Quite worrisome is the fact that these processes are carried out every academic session, putting the operators in a continuous and ever demanding cycle. The computation of examination results and registration of students is obviously an object-centered activity, the student being the dominant object in this case. Hence, the need to evolve a computerized process that will effectively and efficiently capture all the important data associated with the registration and examination result processing within the University and the interactions among the objects.

Students’ Examination Result is the summary of each of the semester or four years performance in a degree program for Bachelor degree to be terminable. A students’ Result is also demanded by a student who has finished Bachelors and Masters degree and wishes to transfer to another school or student who wishes to get a job.

Transcript is not given directly to a student. It is sent to the school that the student wishes to be transferred, or to the organization or establishment that requires the result.

A students’ Result is prepared or formed by the scores entered on the designed score sheet by the individual subject lecturers on semester examinations. This genuine and noble desire necessitated the design and development of this project.

Background of the study

Founded in 1975, University of Port Harcourt (UNIPORT) is a second –generation Federal University Located in the Niger-Delta region of Nigeria with over 50,000 students and a strong focus in Petroleum Engineering. Formerly known as University College Port Harcourt, It has been ranked amongst the top ten universities in Africa and as the first in Nigeria by Times Higher Education.
The vision of University of Port Harcourt is to rescue some of our wandering and teeming youths from further slide into academic and moral decay, and development and transformation of our society through sound and adulterated education. Its mission is to discover, sanctify and apply the knowledge of science, environmental and engineering for human well-being and sound development of man for better society.

The University’s goal is to give efficacy to the University’s motto and to its philosophy of education. The school embraces not only sound education for professional skills and competency in various fields; but also maintain strict discipline. We train the mind, body, soul and spirit in the exercise of obedience and self-control. The students must not only be intellectually and professionally prepared for different tasks and roles in the world, they must also be morally equipped to face the world itself with all its tensions, conflicts, challenges and contradictions. We achieve this with the help of God Almighty who is with us always.

The philosophy is to promote sound education for professional skills and competencies in various fields with strict discipline. By discipline the University meant the training of the mind, body and soul and spirit to obedience and self-control. Also to prepare the students to be intellectually and professionally sound for different tasks and roles in the world with its tensions, conflicts, challenges and contradictions.

In the University, there has been need for automated method of keeping data using computer and the right Software. The only method available to the school presently is the use of different forms of spreadsheet applications to collate and process academic results which also are still evident in other Nigeria universities. This method could not meet their demand for result generation, automated course registration and result storage in school database to also facilitate students’ transcripts.

This problem used to delay the results of graduating or graduated students that have made some of them not to go for the National Youth Service Corp (NYSC) when they ought to or ought to have gone. It has even made some not to have gone at all. To solve this problem, there is a need to develop software that is accurate, error free as the problem has imposed so much stress on both exams and record and the management in Universities.

The University of Port Harcourt is made up of six (6) faculties namely:

1. Engineering with the following departments: Computer, Mechanical, Civil, Petroleum, Gas, Chemical and Electrical and Electronics Engineering.
2. Management Sciences with the following departments: Architecture, Urban & Regional Planning and Estate Management.
4. Natural Sciences with the following departments: Biochemistry, Computer Science & Information Technology, Industrial Chemistry, Mathematics & Statistics and Microbiology & Biotechnology.
5. Medicine and Health Science: Nursing, Laboratory Science, Medicine, Anatomy.
6. Agricultural Science: Crop Production, Botany, Fisheries and Animal Husbandry.

**Table 1.0. University of port harcourt faculties and associated number of departments**

<table>
<thead>
<tr>
<th>S/No</th>
<th>Faculty</th>
<th>Number of departments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Engineering</td>
<td>8</td>
</tr>
<tr>
<td>2</td>
<td>Management Sciences</td>
<td>10</td>
</tr>
<tr>
<td>3</td>
<td>Natural Sciences</td>
<td>7</td>
</tr>
<tr>
<td>4</td>
<td>Agricultural Science</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>Medicine and Health Science</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td>Environmental</td>
<td>4</td>
</tr>
<tr>
<td>*</td>
<td><strong>TOTAL</strong></td>
<td><strong>38</strong></td>
</tr>
</tbody>
</table>
University of Port Harcourt grading system

In University Port Harcourt, the grade is by letters, A, B, C, D, E, and F. where A stands for 5.0, B = 4.0, C = 3.0, D = 2.0, E = 1.0 and F = 0.0 i.e. anything below 1.0 which E (pass) is F (fail).

Below are the illustrations:

Table 1.1. University of Port Harcourt grading system.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Grade point</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>5.0</td>
</tr>
<tr>
<td>B</td>
<td>4.0</td>
</tr>
<tr>
<td>C</td>
<td>3.0</td>
</tr>
<tr>
<td>D</td>
<td>2.0</td>
</tr>
<tr>
<td>E</td>
<td>1.0</td>
</tr>
<tr>
<td>F</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Table 1.2. University of Port Harcourt degree classification

<table>
<thead>
<tr>
<th>CGPA</th>
<th>Class of degree</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.50-5.00</td>
<td>First Class</td>
</tr>
<tr>
<td>3.50-4.49</td>
<td>Second Class (Upper Division)</td>
</tr>
<tr>
<td>2.40-3.49</td>
<td>Second Class (Lower Division)</td>
</tr>
<tr>
<td>1.50-3.2.39</td>
<td>Third Class</td>
</tr>
<tr>
<td>Less than 1.5</td>
<td>Fail</td>
</tr>
</tbody>
</table>

Definition

Automated Result Processing System (ARPS) is a set of software programs that is designed to control the institution’s (practically using University of Port Harcourt) storage, management, and retrieval of data (Result) in a database. Automated Result Processing System is categorized according to their data structures or types. It accepts requests for data from an application program and instructs the operating system to transfer the appropriate data. The queries and responses must be submitted and received according to a format that conforms to one or more applicable protocols. When an ARPS is used, information systems can be changed much more easily as the organization's information requirements change. Use of manual imputation of result is discarded and new categories of data can be added to the database so easily without disruption to the existing system.

A database management system in it provides the ability for many different users to share data and process resources. But as there can be many different users, there are many different database needs. The question now is: How can a single, unified database meet the differing requirement of so many users?

As this study entails adding a different form of database management in connection with organizational result computation and assessment. This brings about the use of Automated Result Processing system (ARPS).

Prior to this approach, the institution relied on the manual method of data processing and storage and each file used are with a specific application. Needless to say, file processing was bulky, costly and nonflexible when it came to supplying needed data accurately and promptly.

This study therefore, examines clearly the effect of the Design and Development of Result Processing System towards the improvement of University of Port Harcourt.

Significance of the study

The significance of this study is to examine closely the advantage of automated result processing system to the benefit of the University and the entire community.

The project work will help in a good number of ways to ease the delay in manual examination result processing. The software developed will help schools management to achieve efficient
information management system. There are many other advantages, and some of them are listed below:

1. It saves time during examination processing
2. Database for course registration and examination result is maintained
3. References are very fast and delays can be avoided.
4. It allows easy access to stored information.
5. Help in reducing the costs such as labor, inventory and stationary.
6. To enhance speedy of the results.
7. To eliminate error due to manual processing.
8. To provide security measure to check student mischievous act of changing marks on the result sheet.
9. It will serve as a reference material to those who use this project material.
10. It is a contribution to knowledge.
11. It will provide information to other researchers/developers on how best and beneficial the use of a management information system can be in providing accurate information for an organization’s decision making.
12. It will ensure high level quality service development of the management which will ensure that students are not subjected to undue suffering in collection of their transcript or clearance prior to the deployment for youth service

![University of Port Harcourt](image)

**Figure 2.1.** The administrative panel

**Summary**

The Automated Result Processing Systems is very important machine in the university environment and it performs all the activities of a result management system by providing the basic
storage and retrieval technology. The result application software sends data to and receives data from the DBMS and you hardly noticed its activities. Yet great claims are made for different types of database and their particular offerings. You should at least be able to understand the basics to understand what you might be getting - or missing when you choose a Result Management System (RMS).

The result application stored in the database is so important because of its reliability, efficiency and flexibility which is capable to respond to the up-coming changes in the computer and information handling world and is commercially viable.

**Recommendation**

I recommend this work to the management of University of Port Harcourt to ease them the stress of manual system of result computation and storing of students information’s. This will lead to the growth of the university.

I also recommend this work to all institutions that process the results of students.

**Conclusion**

The benefits of using the Automated Result Processing system cannot be over emphasized. This is because the system will increase the speed of processing results, increase accuracy in result computation, eliminate cases of misplacing files of students and reduce the piling up of papers in the offices.

**References**


[2]. https://www.academia.edu/10427266/Student_Examination_Result_Processing_System


Child Participation in Development Programming: Lessons from Southern Nigeria

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Abstract

Generally, participation, as a concept in development programming, usually refers to the idea of involving target beneficiaries and/or actively seeking their opinions and inputs into decision-making process on issues that directly or indirectly affect them. Involvement of beneficiaries in this manner is one proven means of securing their buy-in into a project or programme intervention. It is a time-tested strategy that guarantees ownership, an indispensable pillar of programme sustainability. Child participation is not any different. Involvement of children and/or seeking and obtaining their opinions and inputs into decisions that affect them is an established strategy in development programming.

Methodology consisted of Focused Group Discussion (FGD) with children randomly selected from four States in Southern Nigeria. A total of four (4) participating States were selected, out of ten, using compulsive non-probabilistic sampling method, purposive sampling. Most suited for exploratory research, this approach enables a researcher to focus on a specific target group for some unique purpose.

In this work, we analyses information obtained from children and adolescents to establish the extent to which they are consulted in decision-making process on issues that concern them. Our data analysis suggest three factors that are significant in determining effectiveness of child participation in decision-making at home, school and community levels. These are age, gender and economic status of parents.

Based on our findings, we strongly recommend the mainstreaming of child participation strategy into development programming by governments and their international development partners.

Keywords: Child participation rights; focused-group discussion; childhood; adolescents; young people; UNCRC.

Introduction

Generally, participation, as a concept in development programming, usually refers to the idea of involving target beneficiaries and/or actively seeking their opinions and inputs into decision-making process on issues that directly or indirectly affect them. Thus, it is imperative to involve target beneficiaries in the decision making process for siting of programme inputs like Early Childhood Development Centres (ECDC), health posts, water points or sanitation facilities. Involvement of beneficiaries in this manner is one proven means of securing their buy-in into a project or programme intervention. It is a time-tested strategy that guarantees ownership, an indispensable pillar of programme sustainability!

Child participation is not any different. Involvement of children and/or seeking and obtaining their opinions and inputs into decisions that affect them is an established strategy in development programming. It is a strategy that is widely acknowledged amongst international development agencies and also reasonably well documented in development discourses as a solid pillar of sustainability in development programming. Besides, use of child participation principles in development programming also significantly contributes to the building of life skills in children and adolescents. It helps to inculcate decision-making skills early in life, enhances critical thinking and improves self-esteem and self-worth amongst children and adolescents, thus preparing them for meaningful contribution to nation-building in their adulthood. Child participation is consequently accorded its rightful place of prominence in the Convention on the Rights of the Child adopted by the United Nations in 1989 (UNCRC, 1989), the most widely ratified human rights instrument in human history.
The UNCRC constitutes of a total of fifty four (54) Articles, organized in three (3) parts.
- Part I (Articles 1-41) - Substantive articles which clearly stipulate all the rights of a child as well as the responsibility of State parties and other duty bearers in fulfilling them.
- Part II (Articles 42-44) - Procedure to monitor compliance of State parties
- Part III (Articles 45-54) - Process for signature, ratification, accession and reservations by State parties

The substantive articles in Part I address the four groups of child rights viz.:
- Survival (Articles 6, 24, 27)
- Development (Articles 28, 29, 17, 18, 23, 30)
- Protection (Articles 4, 19, 20, 21, 22, 32, 33, 34, 35, 36, 37, 39 and 40)
- Participation (Articles 12, 13, 14, 15, 16 & 17)

The fourth component, participation right, is the focus of this study.

Statement of problem

Participation is one of the guiding principles of the Convention on the Rights of the Child. Others include universality, the best interests of the child, and survival and development. Despite its key place as a guiding principle and also as one of the four baskets of rights, participation is often accorded the least attention in development programming. Possible explanations for this situation include the fact that participation of children and adolescents is the most controversial of the rights of a child (UNICEF, 2001). Oppositions and contentions against child participation are usually enshrined in social norms, tradition and religious beliefs regarding the relationship between children and adults, particularly in Africa, Asia and a few other parts of the world. In these parts of the world, children are generally socialized to conduct themselves only to be seen and not heard, when they are in the midst or presence of adults. Thus, expression of views by children in the presence of adults is considered inappropriate and strongly suppressed.

But research has shown that that effective participation of children and adolescents drives “social change and improves community conditions for healthy development” (UNICEF, 2017:1). Similarly, DFID opines that “Young people are the foundation for effective development, and if engaged they will improve many of the structural development challenges that we face today, including enhancing the cohesiveness of families and communities, reducing health risks and advancing livelihood opportunities” (DFID, 2010:89). In the same vein, Child Fund acknowledges that “literature on child development theory provides strong evidence supporting the importance of including child and youth participation in development practice” (Child Fund, 2012:4).

Participation, however, has been shown to contribute meaningfully towards protection and development of children and adolescents. Ignoring participation of children in development programming could result in negative personality traits like low self-esteem, shyness, diminished sense of personal worth and unassertiveness in childhood. In the medium and long term, these traits often transit into adulthood, manifesting as lack of drive for excellence, timidity, unimaginative, uncreative tendencies with its attendant impulsive avoidance of leadership roles. These are obviously counterproductive in any progressive society.

Background

The Convention on the Rights of the Child (CRC) was adopted by the United Nations General Assembly on 20th November 1989 and enforced on 2nd September 1990. In 1991, Nigeria became one of the earliest countries to ratify the CRC. The CRC was successfully domesticated in Nigeria, through a legislative process in the national assembly, into the Child Rights Act (CRA, 2003). By virtue of this legislative process, the stipulations of the CRC, adopted into CRA 2003, became enshrined in Nigeria’s national laws, providing a strong legal framework for the promotion of the rights of the child. The CRC is the key instrument that guides the work of United Nations Children’s Fund (UNICEF), in collaboration with national governments in more than 193 countries, including Nigeria, where it promotes the rights of all children, working to help them realize their fullest potentials.
Aims and objectives of the study

This study aims at providing evidence to encourage:

- Broadening the space for involvement of children and adolescents’ participation in development programming, as part of a broader strategy for enhancing direct benefits of child-friendly programme interventions.
- Mainstreaming child participation principles into development programming.

Specific objectives include:

A. Assess the extent to which children and adolescents are consulted at family, school and/or community levels while issues concerning them are being discussed or decided.
B. Identify the factors that either promote or impede effective exercise of child participation rights at the family, school and/or community levels
C. Obtain and interpret perspectives and views of children and adolescents on child participation for the purpose of providing concrete evidence for promoting the mainstreaming of child participation strategy into development programming.

Theoretical framework

Ordinarily, participation refers to numerous things, ranging from seeking information to forming and expressing views, to taking part in social activities within one’s social circles. As a concept, child participation refers to an enabling environment where children are “partaking in and influencing processes, decisions and activities” (UNICEF, 2001:11).

One of the earliest theoretical foundations for the concept of child participation was laid in 1969 by Sherry R. Arnstein in her ground-breaking work entitled A Ladder of Citizen Participation. Arnstein proposed a typology of citizen participation depicted in a ladder of eight (8) rungs, each rung representing a higher level of citizens’ power in democratic processes. This 8-rung ladder metaphor was later adapted by Roger A. Hart into a framework that attempts to assess the quality of participation in terms of the extent to which children and adolescents initiate their involvement in decision-making processes on issues that concern them. This ladder is shown in figure 1 below.

![Figure 1. Levels of participation (Hart, 1997:41)](image-url)
Hart’s work, *Children’s Participation: From Tokenism to Citizenship*, was published by UNICEF in 1992 as Innocenti Essays Number 4. According to Hart, *participation* refers to “the process of sharing decisions which affect one’s life and the life of the community in which one lives…the means by which a democracy is built and it is a standard against which democracies should be measured” (UNICEF, 1992). The first three lowest rungs of the ladder are labelled, *Manipulation, Decoration*, and *Tokenism*. These three, by their definitions, constitute *Non-Participation*. Meaningful participation begins from the fourth rung of the ladder and continues to increase in effectiveness until the eighth rung where activities become fully *Child-Initiated*. At this point, children and adolescents initiate the activities and then share with adults in decision-making processes, marking the apogee of child participation.

**The place of child participation in development programming**

Interestingly, the word *participation* occurs only two times in the UNCRC. Even these two occurrences appear in articles 23 and 40, not within the core set of articles (12-17) that typically outline action required of state parties for promoting child participation in decision-making. The principles of child participation are, nonetheless, variously rendered in articles 12-17 viz.:

- **States Parties shall assure to the child who is capable of forming his or her own views the right to express those views freely in all matters affecting the child, the views of the child being given due weight in accordance with the age and maturity of the child.** (Article 12 (1)).
- **The child shall have the right to freedom of expression; this right shall include freedom to seek, receive and impart information and ideas of all kinds, regardless of frontiers, either orally, in writing or in print, in the form of art, or through any other media of the child’s choice** (Article 13 (1)).
- **States Parties shall respect the right of the child to freedom of thought, conscience and religion** (Article 14 (1)).
- **States Parties recognize the rights of the child to freedom of association and to freedom of peaceful assembly** (Article 15 (1)).
- **No child shall be subjected to arbitrary or unlawful interference with his or her privacy, family, home or correspondence, nor to unlawful attacks on his or her honour and reputation** Article 16 (1)).
- **States Parties recognize the important function performed by the mass media and shall ensure that the child has access to information and material from a diversity of national and international sources, especially those aimed at the promotion of his or her social, spiritual and moral well-being and physical and mental health** (Article 17 (1)).

Beyond academic rhetoric, evidence abound in demonstration of the positive contributions to human development accruable from involvement of children and adolescents in decision-making processes. Participation can help children and adolescents know and understand their rights and also enhance acquisition of vital life-skills and knowledge amongst them. Such skills can be useful as they are enabled to take action to prevent and address abuse and exploitation. Beyond this, ensuring the adequacy and appropriateness of child survival, development and protection measures relies significantly on the extent to which promotion of participation rights of the child is operationalized in development programming. This position is corroborated by the statement credited to a former United Nations Secretary-General, Kofi Annan:

*We know more clearly now than ever before that if development is to be sustained and poverty to be reduced, it will require the strong and active participation of children, women and men in the decisions that affect them* (Annan, 2001).

**Methodology of the study**

Key methodology involved Focused Group Discussions (FGDs) with children and adolescents, where the concepts of child participation are elucidated. Afterwards, the children were divided into smaller manageable groups where we had closer interaction with them and administered the questionnaire.
Sampling methods for selection of participating states

Non-probabilistic sampling method, purposive sampling, was used to select the participating States. Most suited for exploratory research, this approach enables a researcher to focus on a specific target group for some unique purpose, although representativeness of the population by the selected sample may not necessarily be guaranteed. Thus, Anambra and Enugu States were selected, out of five States within Southeast region. Similarly, Awka Ibom and Rivers States were also selected out of another group of six States within the Southsouth region. From these four selected States, one local government council was selected from each of their three senatorial districts, respectively, resulting in a total of twelve (12) local government councils that made up the sample size of the study.

Table 1.1. Distribution of participants by state and age

<table>
<thead>
<tr>
<th>State</th>
<th>Age Category</th>
<th>12-13</th>
<th>14-15</th>
<th>16-17</th>
<th>18-19</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enugu</td>
<td>12-13</td>
<td>17</td>
<td>35</td>
<td>41</td>
<td>16</td>
<td>109</td>
</tr>
<tr>
<td>Anambra</td>
<td>14-15</td>
<td>41</td>
<td>50</td>
<td>41</td>
<td>17</td>
<td>149</td>
</tr>
<tr>
<td>Rivers</td>
<td>16-17</td>
<td>39</td>
<td>34</td>
<td>13</td>
<td>1</td>
<td>87</td>
</tr>
<tr>
<td>Akwa Ibom</td>
<td>18-19</td>
<td>43</td>
<td>51</td>
<td>48</td>
<td>16</td>
<td>158</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>Age Category</strong></td>
<td>140</td>
<td>170</td>
<td>143</td>
<td>50</td>
<td>503</td>
</tr>
</tbody>
</table>

As shown in Table 1.1 above, a total of one hundred and nine (109) children and adolescents were selected from Enugu States, one hundred and forty nine (149) from Anambra State, eighty seven (87) from Rivers State and one hundred and fifty eight (158) from Akwa Ibom State. In sum, we worked with five hundred and three (503) children and adolescents within the 12-19 years age cohort.

Figure 1.01. Participants’ distribution by sex by state

As shown in Figure 1.01 above, gender balance of participation is in favour of females – cumulatively, nine percent (9%) more girls than boys participated in the study. A total of sixty nine (69) girls (63%) and forty (40) boys (37%) participated from Enugu State; at Anambra State, we had sixty (60) girls (41%) and 88 boys (59%) in attendance, the only one of the four States where boys outnumbered girls; Rivers State presented forty nine (49) girls (56%) and thirty eight (38) boys (34%); and Akwa Ibom State had ninety three (93) girls (59%) and sixty five (65) boys (41%) who took part in the FGD. Overall, we had five hundred
and two (502) children and adolescents who were interviewed from all four participating States. Out of these, fifty four percent (54%) were females while forty six percent (46%) were males, as shown in Table 1.2 below.

<table>
<thead>
<tr>
<th>Sex of Child</th>
<th>Total Number</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>232</td>
<td>46</td>
</tr>
<tr>
<td>Female</td>
<td>271</td>
<td>54</td>
</tr>
<tr>
<td>Total</td>
<td>503</td>
<td>100</td>
</tr>
</tbody>
</table>

Participants were also disaggregated by geographical location of their residences, rural or urban. In Nigeria, adult literacy rates are generally higher amongst urban residents relative to rural dwellers. Levels of enlightenment, social capital development, as well exposure to modernisation, also tend to chart similar course. Thus, urban-rural disaggregation as a variable, is an attempt to establish whether or not there exists any association between location of residence and effective participation of children in decision-making processes that affect them. The result is presented in figure 1.02 below.

![Figure 1.02. Urban and rural mix of participants by state](image)

Figure 1.02 above shows the urban-rural mix of participants. In Anambra State, rural participants nearly quadruples their urban counterparts; in Akwa Ibom State rural-urban ratio is almost double; in Enugu State, rural participants are more than twice their urban colleagues, while in Rivers State it is almost twice in the same trend. This is part of a deliberate attempt to factor in equity principles by creating more participating space for rural children and adolescents vis-à-vis their urban counterparts. The wide variance in absolute numbers across State is due to the fact that Anambra and Enugu States had four locations, three rural and one urban, while the other two States had three location, two rural and one urban.
Figure 1.03. Participants by socioeconomic class

Proxy means were used to classify the participants into three socioeconomic classes – low, medium and high. These proxies, which were clearly explained to the participants before they were required to provide responses to the questions, reflected their situation at home with respect to housing, nutrition, health, access to portable water and sanitation facilities, among others. Similar, to figure 1.1 above, the greatest majority of the children fall within the low socioeconomic class, understandably.

Guided by the plan to obtain perspectives from both urban and rural communities, the capital city of each of the States was selected, in addition to two rural communities from each of the other two senatorial districts. Basically, therefore, this process would produce one urban community (State capital city) and two rural communities.

A total of forty (40) children and adolescents, aged 12-19 years, were selected from each of the communities of study, with equitable representation of children across gender, geography, socioeconomic and other social divides. Thus, we had nearly equal numbers of male and female children and adolescents, in-school and out-of-school, from both rural and urban public schools, including the physically challenged.

Data collection instrument

Due to its relative abstractness, child participation is a concept that is not readily amenable to direct scientific measurement, using standard statistical softwares, particularly, when assessing the quality of child participation. This often happens when child participation “programmes are created without clear objectives, and with no real indicators or benchmarks against which to measure progress” (SC, 2014). Qualitative methods are sometimes employed in dealing with this challenge; but quantitative methods are not out of place, either. Often, mixed methods are most ideal, providing the advantage of a combination of quantitative and qualitative measures, particularly when high precision in measurement is required. Save the Children (2014) has provided a set of very useful tools for this purpose in their publication, A Toolkit for Monitoring and Evaluating Children’s Participation: How to measure the scope, quality and outcomes of children’s participation, Booklet 5. We have used quantitative methods in this study, though, since it very well serves our modest purpose.

A data collection instrument was, thus, developed ahead of the field visit. The survey questions were patterned after a previous survey conducted by the Council of Europe in Finland on child and youth participation in 2011. The aim of the questions was to ascertain the extent to which adults (and other adult-
controlled bodies) create conducive environment for children living in South-East and South-South Nigeria to voice their views and influence decisions affecting them, in line with Article 12 through 17 of the United Nations Convention on the Right of the Child. Thus, the questionnaire constituted of simple and direct questions designed to elicit responses that would be suitable for the assessment of the objectives as defined above.

Despite the simplicity of the questionnaire, we arranged and had the consultants administer them on the respondents because many of them, particularly from rural public schools, were hindered by language barrier and still needed additional explanation of the questions. The questions were clustered around issues like how often adults listen to and/or seriously consider the views of children and adolescents; how seriously such views are taken during decision-making by parents/guardians at home, by teachers and administrators at school, by doctors and health workers at health facilities or opinion leaders and other gatekeepers at community level, including media, social clubs, government, among others.

**Focused group discussions (FGDs)**

We adopted Focused Group Discussion (FGD) as a means to obtain the voices and views of the selected children and adolescents. First, there was a plenary session, where we introduced UNICEF to the children. The history of the United Nations – when UN General Assembly created UNICEF, the original purpose for which UNICEF was created, and how the Agency has evolved over the years until today – was traced and clearly explained. We also took time to explain how UNICEF collaborates with national governments, the system of Country Programme cycles and how it operates, the roles of the government of Nigeria and those of UNICEF in the collaboration and how these result in development of the country. Furthermore, we explained to the children why we were consulting with them at the time and manner we were doing it and how their views and responses will be factored into the drafting of the new FGN/UNICEF Country Programme of Cooperation (2018-2022). At the end of this introduction and learning sessions, ample time was provided for questions, clarifications and other inputs. This initial interaction at the plenary session worked very well in all locations as ice-breakers and helped to stimulate inquisitiveness in the participants. Afterwards, the class was randomly divided into four classes.

**Results from data analysis**

In analyzing the responses obtained from the field, we will use a simple distributional presentation of the data set as shown in the figures and tables above. This will be followed by an econometric analysis of the factors accounting for participation or non-participation. Since our outcome variable is binary, we will use logistic regression as it is most suited for modeling binary outcome variables. The logistic regression follows the method of maximum likelihood and is used to estimate the likelihood of an event turning out to be true or false, yes or no and so on. This method is superior to the linear probability model as its results often fall within the positive binary bounds. The general form of the logistic model is given as:

\[
\ln \left( \frac{p}{1-p} \right) = X\beta
\]  

(1)

Where \( P = \frac{e^{X\beta}}{1+e^{X\beta}} \)  

(2)

Where \( P \) is the probability that the outcome variable is 1 conditional upon the predictors. And \( X \) is the set of predictor variables and \( \beta \) represents the set of parameters or regression coefficients to be estimated. In practice, the regression coefficients are unknown and are estimated by maximizing the likelihood function.

**The model**

The model we are estimating here is intended to respond to our specific objective number ‘B’ above: identify the factors that either promote or impede effective exercise of child participation rights at the family, school and/or community levels.
For the purpose of analysis, model (3) above could be expressed in its logistic form as

\[
\text{Logit}(P(\text{pindex} = 1)) = \ln \left( \frac{P(\text{pindex} = 1)}{1 - P(\text{pindex} = 1)} \right) = \beta_0 + \beta_1 \text{ageyrs} + \beta_2 \text{inschl} + \beta_3 \text{female} + \beta_5 \text{ses} + \beta_6 \text{urban}.
\]

or

\[
P(\text{pindex} = 1) = \frac{e^{(\beta_0 + \beta_1 \text{ageyrs} + \beta_2 \text{inschl} + \beta_3 \text{female} + \beta_5 \text{ses} + \beta_6 \text{urban})}}{1 + e^{(\beta_0 + \beta_1 \text{ageyrs} + \beta_2 \text{inschl} + \beta_3 \text{female} + \beta_5 \text{ses} + \beta_6 \text{urban})}}
\]

Model (5a) and model (5b) are essentially the same.

Where:

- \(P\text{index}\) = A dummy representing participation or non-participation.
- \text{Index of participation}=1, index of non-participation=0
- \text{ageyrs} = The age of the child/adolescent (Continuous)
- \text{female} = A dummy for the sex of the child/adolescent (Female=1 and male=0)
- \text{ses} = The socioeconomic grouping of the child/adolescent (Low income=1, middle income=2 and high income=3)
- \text{urban} = A dummy representing the sectoral location of the adolescent (Urban=1 and rural=0)

### Measurement of key variables

Since all other variables are either dummy or continuous variables supplied directly by respondents, we are only estimating two variables – Participation Index (pindex) and the socioeconomic status of the child (ses). The questions on participation were structured in such a way that responses were scaled from numbers 1 to 4 and 1 to 5 as the case maybe. The average of the sum of responses was calculated. Scores beyond the average are considered as the “participation” rating and marks below the average are regarded as the “non-participation” rating. Binary or dummies were then assigned so that “participation”=1 and “non-participation” =0. The socioeconomic status of the adolescents’ household was measured to be a reflection of the possession of certain household items such as a cell phone, a car, more than one car, video set; the occupation of the household member with the highest income, the type of accommodation, toilet system, main source of energy, main source of water and other household characteristics. Each of these items is given a predetermined score such that they summed up to a hundred. The scores cards collated from the children/adolescents were then grouped to determine the socioeconomic status the child/adolescent fits into.

### Analysis of results from the logistic regression

The outcome measure in this analysis is \(p\text{index}\) (a categorical variable for participation or non-participation) from which we will determine the relationship between all other characteristics such as the child’s residence (Urban), age, sex, socioeconomic status and our measure of participation.
Table 1.3. Logistic regression result on the determinants of participation

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficients</th>
<th>Odd Ratios</th>
<th>Z-stat</th>
<th>Prob</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Urban</strong></td>
<td>0.9521453</td>
<td>2.591263</td>
<td>4.37</td>
<td>0.00</td>
</tr>
<tr>
<td><strong>Ageyrs</strong></td>
<td>-0.1334418</td>
<td>0.8750784</td>
<td>-2.59</td>
<td>0.010</td>
</tr>
<tr>
<td><strong>Female</strong></td>
<td>-0.3732289</td>
<td>0.6885076</td>
<td>-1.96</td>
<td>0.051</td>
</tr>
<tr>
<td>Inschl</td>
<td>0.2931024</td>
<td>1.34058</td>
<td>0.55</td>
<td>0.585</td>
</tr>
<tr>
<td>SES</td>
<td>0.1581872</td>
<td>1.171385</td>
<td>0.84</td>
<td>0.399</td>
</tr>
<tr>
<td>Siblings</td>
<td>0.0657759</td>
<td>1.067987</td>
<td>1.60</td>
<td>0.109</td>
</tr>
<tr>
<td>_cons</td>
<td>1.19783</td>
<td>3.312921</td>
<td>1.11</td>
<td>0.268</td>
</tr>
</tbody>
</table>

** indicates significance.

Iteration 3: Log likelihood = -320.19035
Number of obs = 488
LR chi2 (6) = 33.17
Prob > chi2 = 0.0000

Odd ratios measure relative risk of an event occurring. So the odd ratio for Urban which returned 2.591263 implies that adolescents who reside in urban areas are about 2.6 times more likely to enjoy child participation rights compared to those in rural areas. Again, odd ratio for the adolescent’s sex, represented with the variable, Female, returned 0.69. This figure tends more towards the Female sex assigned number 1 in the model and away from the male sex assigned number 0, meaning that females are about 0.69 times less likely to enjoy participation rights in comparison to their male counterparts. This result also sufficiently shows that education, family SES and the number of siblings born to a family comparatively increases levels of effective participation.

Discussion

Results from our analysis show that there are three (3) variables that are statistically significant in determining the quality of child participation. These are economic status (location of residence), age and sex. We find that:

- Unsurprisingly, very low awareness level amongst adolescents, and even adults, at school, family and community levels, of the concept of child participation, remains pervasive. The respondents knew practically nothing about the concept of child participation nor its relevance in development programming towards the realization of children’s rights. There was evidence, however, of a token of general knowledge on the rights of children.
- Children and adolescents who live in urban areas have a higher likelihood of being consulted by adults on issues that concern them at home, school and community levels.
- Children from families with higher socioeconomic statuses were found to be more likely to be allowed at family, school and community levels to make contributions to issues that affect their lives. This might suggest some association between economic status and level of adult literacy. In other words, more educated parents/guardians are more likely to understand the value of child’s rights and to actively promote its realization.
- Age plays a significant role in the participation of children and adolescents. We observed that as children grow older, their voices and views become more likely to be taken seriously by adults at home, school and community levels. Besides, as their capacities evolve with age, children and adolescents tend to make more demands for more effective participation.
- Relative to their male counterparts, female children and adolescents are less likely to be consulted or have their views taken seriously by adults at family, school and/or community levels in both rural and urban settings.
Conclusion

Paucity of funds had, inexorably, restricted the scope and depth of this study. Consequently, the sample size may not be representative enough for any reasonable generalization across the country or even across the Southsouth and Southeast regions of Nigeria. The study has, nonetheless, unearthed some very useful information that could support constructive dialogue and partnership for prioritization of social welfare for the most disadvantaged children. Investment of more resources (human, financial, other) into this worthy cause would certainly be the required stride that will significantly contribute to faster advancement towards the realization of children’s rights as enshrined in both national and global development goals.

The above view is corroborated by UNICEF thus: Peer educators are very effective in reaching individuals and groups at especially high risk, including males having sex with males, young people who are sexually exploited, gang members, homeless youth and those who use drugs. Many of these young people distrust adults too strongly for adult social workers to reach them. But peer educators are members of the communities they aim to reach; they meet these young people on their own territory, speak the same language and, most importantly, treat them with respect. (UNICEF, 2002 in Child Fund, 2012:6).

In view of the above findings and discussions, we hereby conclude as follows:

- Effective mainstreaming of child participation principles in development programming in development programming has become imperative, obviously. Violence, exploitation and abuse of children and adolescents across all geopolitical zones of Nigeria continue unabated, despite existence of Child Rights Act (2003) at national level, as well as Child Rights Law (CRL) in most States. Strengthening of child participation principles will help to equip children and adolescents with necessary life skills, information and knowledge necessary to become effective advocates for promotion of child rights across the country. It will also help ensure a productive adult workforce far into the future.
- Renewed advocacy efforts should be directed at making child participation rights visible in school curricula and policy frameworks, both at national and subnational levels. This involves building and/or strengthening partnerships with the relevant government agencies, as well as with civil society entities with interest in promotion of child rights.
- Quality of child participation at family, school and community levels, is clearly engendered, as shown in our results. In designing social development programmes, there is an urgent need to identify the right strategy mix that will aid effective programme implementation towards addressing the identified development challenges. It is important that deliberate efforts are made, at this point, to vigorously weave gender equality into the core fabric of protective environment for children and adolescents, which is the core business of UNICEF across the globe.
- Participation is one of the core principles, both in the Universal Declaration of Human Rights (UDHR, 1948) and in the United Nations Convention on the Rights of the Child (UNCRC, 1989). But child participation, one of the four baskets of rights in UNCRC, is the least fulfilled of rights, the least promoted in development discourses and literature. Efforts should, therefore, be made to create more space for the promotion of child participation rights with clear accountabilities established at high levels in UNICEF and also in government institutions. This might require restoring child participation as a programme component, domiciled in the most appropriate UNICEF programme section, as the management deems fit.
- Equitable investment in children, adolescents and young people is recommended since participation can be “uneven because of disparities in ability, preparation and experience among different participants…An adolescent with low literacy skills, inadequate clothing, violent living environment, and little time to reflect and prepare will have a difficult time participating as powerfully as a young person in an opposite situation’. (UNICEF, 2001).
Acknowledgements

First, I wish to appreciate my Technical Supervisor, Enrique Delamonica (PhD). Currently, the Chief of Social Policy and Gender Equality in UNICEF Abuja, Nigeria, Enrique initiated this work and provided technical oversight and professional guidance that enabled the successful completion of the task. The contribution of government officers in the selected States and local government councils, who anchored the FGDs with the children and adolescents, is also acknowledged. Technical skills for STATA analysis of our completed questionnaire was willingly provided by Mr. Ben Ozougwu, a PhD student of the University of Nigeria, Nsukka. Finally, I sincerely thank all the children and adolescents, our participants, for their active engagement in the FGDs and frankness in providing responses.

References

Evaluating the Current Usage and Integration of ICTs in Education: A Review of Teachers’ Usage and Barriers to Integration

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Abstract

This study examined current usage of information and communication technologies (ICTs) in a group of private secondary schools in Qatar and explored the barriers to effective integration of technology in Maths and Science lessons. The data was obtained from a total of 40 (18 female and 22 male) high school teachers. Results indicate that most teachers do not use ICTs as part of their pedagogical repertoire, instead, teachers reported using ICTs mostly for administrative work: - tracking attendance, preparing power point presentations, handouts and assessments. The article also reviews personal, institutional and technological factors that hinder teachers’ use of computer technology in teaching and learning processes: - teacher-level, school-level and system-level. These barriers include lack of teacher ICT skills; lack of teacher confidence; lack of pedagogical professional development and a streamlined and effective school policy on ICT; lack of suitable and adequate educational software; limited access to ICT infrastructure and a restrictive curricula, amongst other factors. Teachers also made insightful suggestions on how to ameliorate the current situation. Implications of this study will help the group management and administration in planning, implementation and evaluation of effective integration of ICTs in teaching and learning within the group of schools, efficient use of limited technology infrastructure and resources, and improvement of access to learning for the students.

Keywords: ICT adoption; integration; barriers; teaching and learning.

Introduction

Information and communication technologies, (ICTs) are becoming increasingly important in our daily lives and in our educational systems. Therefore, there is a growing demand on educational institutions to use ICTs to teach the skills and knowledge students need for the 21st century. ICTs are regarded as a factor in economic and social growth (World Bank, 2004). In many countries education has been selected by politicians as a means of bridging the gap between technology and society and for introducing new technology into society.

Realising the demands and effects of ICTs on the knowledge economy, educational institutions have attempted to restructure their educational curricula and facilities, in order to bridge the existing technology gap in the teaching and learning environments. The restructuring process requires effective adoption of technologies into existing ways of teaching and learning in order to provide learners with knowledge of specific subject areas, promote productive and meaningful learning and to enhance professional productivity (Tomei, 2005).

Research findings over the past 20 years provide some evidence supporting the positive effects of the use of ICTs on pupils’ learning. In spite of such projects, the effects of numerous training programmes and investments by schools in ICT resources, there has been an agonisingly slow adoption and integration in schools (Cox et al, 1999; Passey & Samways, 1997). Global investment in ICTs to improve teaching and learning in schools have been on the wish lists and initiated by many governments. For example in the United Kingdom, the government spending on educational ICT in 2008–09 in the UK was £2.5bn (NUT, 2010), in the United States, the expenditure on K-12 schools and higher education institutions was close to $6 billion and $4.7 billion respectively in 2009 (NUT, 2010) and in New Zealand, the government spends over $ 410 million every year on schools ICT infrastructure (Johnson, Calvert & Raggert 2009).

Despite all these investments on ICT infrastructure, equipment and professional development to improve education in many countries, Gulbahar (2007) claimed that huge educational investment have
produced little evidence of ICT adoption and use in teaching and learning especially in countries like Turkey and those in the middle East. Evidence suggests that the education sector is investing heavily on ICT but ICT adoption in education sector has lagged behind the business sector (Leidner & Jarvenpaa, 1995). Several surveys have been carried out to investigate the factors that are related to the use of computer technology in teaching and learning processes by teachers (Baek, Jung & Kim, 2008; Norton, McRobbie, & Cooper, 2000).

Many reasons for this lethargy have been reported, ranging from technical factors such as a lack of technology and software in schools and the limited expertise of teachers regarding ICT usage to other factors such as teachers’ beliefs and knowledge about how to integrate ICT into teaching (Hsu & Sharma, 2008; Jedeskog, 2005, Nivala, 2009; Pelgrum, 2001; Peralda & Costa, 2007; Teo, Chai, Hung and Lee, 2008). Some writers have described these results in terms of waves where different technologies with intervals of three to four years have promised to deliver a revolution in teaching, learning and education but that, after a period of time, have sadly resulted in disappointment and little substantial educational change (Cuban, 1986, 2002; Gouseti, 2010; Rushby, 2005).

More so, it could be argued that the history of digital technologies in formal education has tended to promise a great deal but delivered far less. The gap between the optimistic talk surrounding ICT usage in education and the current level of ICT integration into educational settings has inspired researchers to focus on teachers and the difficulties they encounter integrating ICT tools into their classroom practices (Drent & Melissen, 2008; Hsu et al., 2008; Pelgrum, 2001; Teknikdelegationen, 2010).

Identifying factors explaining ICT use is seen as a way of answering the question why some teachers embrace the use of technology with students in classrooms and others do not. These factors are often technology-related teacher characteristics where, for example, teachers’ attitudes and self-efficacy are in focus (Herman, Tondeur, van Braak, and Valveke; 2008; Peralda et al., 2007; Teo et al., 2008).

Qatar has of late, been in the headlines for various reasons and has seen unparalled economic development at an astronomical pace which has also been accompanied by a proliferation of English medium schools within the education system. These schools may be individual and stand alone in terms of management hierarchy, or fall under a single governing body, i.e. a group of schools under the same name and more often than not, follow external curricula which compounds the problem of the use of English as a second language.

The more the number of campuses of the same governing body, the higher the need to streamline policies governing the choice and implementation of the curriculum, standardisation and uniformity of practice in all spheres. It is the focus of this study to examine the current status of ICTs in the different campuses under the same management structure: - Office of Standardisation, (OFSTAD), in as far as the adoption and integration is concerned in Maths and Science lessons.

The present study also tries to distance itself from viewing teachers as the main barriers in the implementation of ICTs in schools. The approach is multi-pronged as the factors needed to be categorised under different themes. Even if the rhetoric, deployment and use of ICT in educational settings remains challenging, there are teachers who do use ICT as a teaching and learning tool in their daily work with students in lessons, however this investigation was interested in identifying the particular factors affecting ICTs uptake and integration in the group of schools and proffer some solutions as suggested by teachers.

The analysis is based on the following research questions:

i. Which factors influence teachers’ use of ICT in education?

ii. What is the current status of ICT usage in Maths and Science teaching and learning environments?

iii. What are the barriers to adoption and integration as perceived by the teachers?

Research methodology

In order to obtain a broader understanding of the nature and scope of teachers’ use of ICT a survey study was undertaken. The main strength of survey research is the possibility to gather information from a larger sample of people, which is generally seen as a good method to employ if the aim of the study is also to acquire information about people’s attitudes, beliefs and behaviour (Mitchell & Jolley, 1996). The research instrument was a questionnaire that was distributed to selected high school teachers at the
different campuses. The questionnaire was piloted to ascertain its construct validity and the necessary adjustments were made thereafter. This was followed by an observation checklist which corroborated the data from the questionnaire as well as a semi-structured interview to seek clarifications of some of the points raised in the questionnaires. These interviews were audio recorded and transcribed verbatim.

**Sampling method**

The target population in the present research were teachers in all the 10 secondary schools in Doha. In educational terms, Doha could be considered to be a cosmopolitan city, as there are many international schools within groups of schools which follow the National curriculum of England and Wales. The group of schools under study is one of the largest groups of schools in number and was chosen mainly for practical reasons, but also because the group contains demographic variations typical of the educational landscape as a whole in the country.

The selection of teachers was conducted using quota sampling. It is admissible that the main disadvantage of this type of sampling is that of the representativeness of the comparatively smaller sample. However the teachers needed to fulfil the requirements of being either Mathematics and/ or Science teachers. Generally speaking, it is hereby acknowledged that the larger the sample better, as this not only gives greater reliability also enables more sophisticated statistics, however a more rigorous statistical analysis was not a major thrust in the study. The results from the study may also not be generalizable to the greater population. Quota sampling emerges as an attractive choice when one is pressed for time, since primary data collection can be done in shorter time with this method compared to many alternatives. It can save costs and time.

Quota sampling is also independent of the presence of the sampling frames. Nonetheless, it is not possible to calculate the sampling error accurately and the projection of the research findings to the total population is risky. There is a great potential for researcher bias which was kept to a minimum.

**Methods**

The main data gathering methods were a survey questionnaire, semi structured interview schedule and a physical checklist to the respondents from the schools.

The questionnaire gathered demographic data, professional experience as well as that pertaining to ICT infrastructure as well as issues of adoption and integration. The questionnaire focused on teachers’ perception of technology integration. It consisted of a number of subthemes that investigated teachers’ perceptions of their technology competencies and usage, students’ usage of technology, obstacles hindering technology integration, and the motives for teachers to integrate technology.

The questionnaire used a five-point Likert scale extending from 5 (very high or strongly agree) to 1 (very low or strongly disagree).

The semi structured interview collected detailed data on ICT competence, technology integration methods, problems hindering such integration, and incentives that increase integration in the classroom and also used to seek clarification on the issues raised in some responses from the questionnaire and the checklist was used to confirm the physical infrastructure in terms of hardware and software as well as the physical environments for the teaching and learning of Science and Maths. Simple descriptive statistics were used.

**Results**

**Type and Extent of Teacher’s Computer Use.**

Table 1 presents the type and extent of computer use by teachers. The results indicated that teachers used computers often for preparing tests and lesson handouts for students (n=28, 70%). The second highest computer use frequency was reported for homework assignments. Of the respondents (n=35), 7 teachers (17, 5%) indicated that they used computers for homework assignments to some extent. Another interesting point was that although the schools have purchased a number of instructional software packages installed on computers, more than half of the respondents (56%) never used these software packages during teaching and learning. Only a very small number of teachers reported using instructional software regularly to enhance their classroom teaching (approximately 8%). Finally,
teachers reported using computers less frequently for grading (5%) and for administrative tasks (45.6%).

Table 1. Type and extent of computer use by basic education school teachers

Frequency
Total never sometimes often daily

<table>
<thead>
<tr>
<th>USE TYPE</th>
<th>N</th>
<th>%</th>
<th>N</th>
<th>%</th>
<th>N</th>
<th>%</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creating Tests &amp; Handouts</td>
<td>40</td>
<td>100</td>
<td>14</td>
<td>22</td>
<td>8</td>
<td>12.5</td>
<td>5</td>
<td>12.5</td>
</tr>
<tr>
<td>Homework Assignments</td>
<td>40</td>
<td>100</td>
<td>7.5</td>
<td>23</td>
<td>5</td>
<td>12.5</td>
<td>7</td>
<td>20</td>
</tr>
<tr>
<td>Administrative Tasks</td>
<td>40</td>
<td>100</td>
<td>11</td>
<td>1</td>
<td>3</td>
<td>8</td>
<td>32</td>
<td>91</td>
</tr>
<tr>
<td>Testing &amp; Evaluation</td>
<td>40</td>
<td>100</td>
<td>32</td>
<td>80</td>
<td>5</td>
<td>12.5</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Grading</td>
<td>40</td>
<td>100</td>
<td>70</td>
<td>7</td>
<td>17.5</td>
<td>5</td>
<td>12.5</td>
<td>0</td>
</tr>
<tr>
<td>Demonstration &amp;</td>
<td>40</td>
<td>100</td>
<td>75</td>
<td>5</td>
<td>12.5</td>
<td>2</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Drill &amp; Practice</td>
<td>40</td>
<td>100</td>
<td>62.5</td>
<td>8</td>
<td>20</td>
<td>5</td>
<td>2.5</td>
<td>5</td>
</tr>
<tr>
<td>Tutorials</td>
<td>40</td>
<td>100</td>
<td>33</td>
<td>82.5</td>
<td>5</td>
<td>12.5</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Telecommunications</td>
<td>40</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>5</td>
<td>4</td>
<td>34</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

Teacher's perceived computer competence

Teachers were also asked to rate their perceived computer competence levels on common computer applications used in classroom situations. Means and standard deviations of teachers’ self-perceived computer competence are shown in Table 2.

Table 2. Teacher’s perceived computer competency

<table>
<thead>
<tr>
<th>Application Type</th>
<th>N</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Word processing</td>
<td>35</td>
<td>3.12</td>
<td>0.88</td>
</tr>
<tr>
<td>Database</td>
<td>35</td>
<td>2.1</td>
<td>1.24</td>
</tr>
<tr>
<td>Spreadsheet</td>
<td>35</td>
<td>2.59</td>
<td>1.01</td>
</tr>
<tr>
<td>Presentation Software</td>
<td>35</td>
<td>2.62</td>
<td>1.06</td>
</tr>
<tr>
<td>Web Browsing</td>
<td>373</td>
<td>35</td>
<td>2.07</td>
</tr>
<tr>
<td>Telecommunications</td>
<td>35</td>
<td>2.52</td>
<td>0.98</td>
</tr>
<tr>
<td>Educational Software</td>
<td>35</td>
<td>1.86</td>
<td>1.08</td>
</tr>
<tr>
<td>Desktop Publishing</td>
<td>35</td>
<td>1.92</td>
<td>0.92</td>
</tr>
<tr>
<td>OVERALL</td>
<td></td>
<td>2.35</td>
<td>1.0</td>
</tr>
</tbody>
</table>

Follow-up interviews

In order to identify the factors which contribute to teacher's ICT use in classrooms and to reveal their experiences with ICT and suggestions to overcome the obstacles that prevented them from effectively utilising ICT in classrooms, a questionnaire with 4 open-ended questions was distributed to the 40 teachers. Of the total respondents, 32 (57.1%) agreed to give their perspectives on hindrances of ICT integration. The interviews were audio taped and transcribed for further analysis.

Current conditions of ICT and classrooms in the schools

The first question sought to indicate the current physical and technical conditions in the classrooms as well as teacher’s current levels of access. Teachers’ responses (n=35) to this question indicated that the most significant impediment associated with access to ICT integration was the lack of adequate
desktop or laptop stations. In most situations there was only one desk top for the use by the teacher and children had no hands-on experience as they had to contend with focusing on the whiteboard during teaching.

It was also indicated that a very small number of classrooms had access to interactive whiteboards (IWBs). Teachers reported that the average size of classes they taught ranged from 20 to 28 students which was considered to be ideal, but could not be supported by the current infrastructure.

From the responses it was evident that most teachers worked at schools with manageable class sizes, however some felt that there was no proper resource utilisation within the schools. For example, one teacher reported that "I have 30 learners in my class and one computer in the room, I could book to use the IT room with my class, but the time table does not always allow and also it requires extra time which I do not usually have." Similarly, another teacher pointed out that "... I have to upload work on every computer before I take my class to the IT room and that takes too much time sometimes."

A number of teachers (n=24) wrote that scheduling of IT rooms was another challenge since most schools did not have any concrete and acceptable systems of access and usage of ICTs within the school. It was left to the teacher to make an appointment with the teacher in the IT room. Teachers speculated on a wide range of causes for this challenge, varying from "lack of administrators’ vision and knowledge on the use of ICTs in general and IT rooms in particular” to "lack of management’s guidance and regulations on how IT rooms should be operated for access to all". The following statement from one teacher illustrates the extent of scheduling mix-up taking place in one school: "... we don’t have any schedules ... I cannot even take the learners there before making prior arrangements and sometimes there might even be a double booking."

Another important aspect is that of technical support services provided to teachers. There was a consensus among teachers (n=37) that the quality of technical service was sometimes below expectations. Teachers indicated that either there wasn’t any clear procedures of enlisting assistance of IT technicians or when they did know of the problem they normally took a long time to respond and that meant the teacher had to change lesson plans for a long period of time or abandon that approach. Another interesting comment written by one teacher was" ... why don’t we leave management and maintenance of ICT rooms to students. Most are more knowledgeable than us. I am sure they would do a better job."

When asked about the Internet access, teachers reported that most schools had a dial-up connection that was relatively slow and could sometimes be off without much explanation from the technicians.

A number of teachers indicated that language is another barrier to ICT integration as another important obstacle to the use of Internet in schools (n = 20). Most useful sites for teachers on the Internet are predominantly in English, ‘this limits the extent of usability to learners especially in the early grades in high school’, and one respondent observed.

It is apparent from the responses provided for the first question that most teachers indicated on the rather poor technical service at their schools. Another issue raised by teachers was about the quality of Internet service in both IT rooms and classrooms. They alluded to the slow connection to the Internet as a demotivating factor to students and sometimes contributed to poor behaviour and finally, teachers highlighted the need for the subscription to more interactive websites and computer assisted learning programmes to assist learners outside classes.

Prevalence and quality of in-service ICT training and support

The second question sought to delve into the prevalence and quality of organised ICT in-service programmes within the schools. Notably most respondents indicated that they did not have prior experience with ICTs in a pedagogical setting (n=33), but had participated in in-service training programs in the past. These were said to have been too few and far in between. They reported having participated in at least one in-service training program or seminar on the use of ICT in teaching.

However, the teachers indicated a number of issues regarding the effectiveness of in-service training and why it did not address their immediate ICT skills needs. One of the issues reported by the teachers was that training programs were not tailored in accordance with their specific needs. There had been no prior needs analysis. The teachers expressed dismay at the fact that they taught different grades or subjects; and they attended the same once off professional development sessions irrespective of their
individual needs. One teacher was even more emotional in her criticism “... I don't think ICT means the same thing to a Maths teacher than it does to a form tutor or a Physics teacher.”

Teachers also extensively criticised the PD sessions as failing to provide hands-on activities and practice in reduced sessions (n=34). Teachers reported that the PD sessions were also very short and (n=25) did not provide any opportunities for them to apply what they had learned. A number of teachers criticised the schools management for the haphazard manner in which these sessions were conducted, without a developmental approach which is cyclic and looks at skills development and generally, management’s approach to the design and delivery of in-service training.

In summary, teachers’ responses to the second question revealed that teachers did not think that the in-service training they received prepared them for teaching with technology. They thought that management should realign their adhoc approach to professional development and focus on fewer training objectives at a time, based on the actual needs of a teacher.

Obstacles to the effective integration of ICT

The third question delved into obstacles that hindered integration of ICT into their pedagogy. In their words, teachers indicated a variety of obstacles to the integration of ICT in the schools.

The most emergent obstacles reported by teachers are presented within the following categories:

School curriculum

More than half of the respondents (n=26) expressed difficulty in finding time in which to fit ICT into their planning and teaching. Teachers felt that the curriculum is examinations based, it was therefore, primordial for them to cover the specifications for examinations whether internal or external. Hence they felt that ICTs use up a lot of preparation and teaching time. One teacher commented "I think the biggest obstacle ahead of ICT in the curriculum is that it has a lot of superfluous concepts and skills.” Another teacher added "I know ICTs allow student engagement in more productive learning activities, but this is not examinable.” The following statement from one teacher is quite interesting in terms of how management underestimate the value of ICTs in schools; " ... when the deputy head is here, s/he will be interested in the teacher’s performance and on how much of the content has been covered in the class, and test scores of students, not the extent to which ICTs are used.” From the teachers' responses it can be concluded that the examination system puts a lot of pressure on teachers to cover as much content as possible in a short space of time.

Lack of Incentives

In the current system, there is not much motivation for teachers to engage in innovative classroom practices since they are only paid for 40 hours per week, therefore, any extra load is considered as charity work. The time table is usually so congested that the only free time to attend any CPD would be during weekends, hence there is little motivation to put in that extra time and effort. Additionally students are not so keen to be in school for extra hours unless they are preparing for examinations. This issue was reported by a good number of teachers (n=30).

Lack of clear policy guidelines on ICT in the schools

Teachers concurred in that schools had not yet provided clear policy guidelines on the usage of ICTs other than those governing their interaction with students and the wider community on social media. Some teachers even blamed their school administrators for lack of knowledge about the purpose ICTs in schools and for their lack of instructional leadership and technical pedagogical content knowledge.

Lack of collaboration and collegiality among teachers

Teachers indicated that they were not able to share best practice with other teachers’ (n=24). Some even reported that they were not aware of what other teachers teaching the same subject were doing in their schools since they were only given schemes of work which were not specific on ICT incorporation. A handful of teachers reported that such collaboration could contribute significantly to their ICT integration.
Dealing with the barriers, teacher suggestions

As the last question in the follow up interview, the teachers were asked to give their perspectives on dealing with the hindrances to effective integration of technology in schools.

1. Timeous and tailored in-service training (in accordance with teacher's needs) should be provided at the local level (n=36) and if possible, even at subject level.

2. Timely and effective technical support should be provided for ICT rooms (n=34).

3. The number of computers in classrooms should be increased to at least 20 per room or provision of a mobile laptop station could be done. (n=38).

4. Effective incentive mechanisms should be available to motivate teachers towards the use of ICTs (n=32) such as recognition and appropriate rewards.

5. School time-tabling should be such that it allows for the use of the ICT rooms for at least one double period a week (n=37) per class or subject.

6. Every attempt to introduce ICTs in schools should be carried out with well-defined goals, policies and good praxis (n=37).

7. In-service training to all teachers, should be a matter of priority (n=26).

8. Schools should procure ICTs according to their needs (n=17) and purchase up-to-date software for teaching and learning.

9. Students could be encouraged to do their work on ICT applications at home and be rewarded for their work.

10. Schools could support teachers who engage in professional development programmes by financing their studies fully or in part.

Discussion

This study was conducted to examine the current utilization of ICTs in a group of schools of Qatar. Furthermore, this study attempted to reveal the barriers and obstacles that teachers believe prevented them from the effective integration of ICTs in classrooms. Finally, teachers' suggestions to overcome the obstacles were explored.

The findings of this study indicated that teachers largely used ICTs for creating handouts and tests, rather than using it to promote student's critical thinking skills and to foster their higher order cognitive abilities. Due to the lack of pedagogical technical support, teachers reported the lowest frequency for the use of instructional software. Additionally, teachers felt most competent on word processing whereas they felt least competent on the use of instructional software.

The follow-up interview revealed that in-service training was still a prevailing difficulty for many teachers to integrate technology in their classroom teaching. Some of the teachers belong to a different generation which did not have adequate training in the usage of ICTs in learning environments.

There is a large of body of research in the literature that supports the same position that teachers should could receive effective, timely and continuous training to promote technology in their teaching. (Wilson, Notar, & Yunker, 2003; Yildirim, 2000; Yildirim & Kiraz, 1999; Lemke, 1999; Northrup & Little, 1997). There is a need to adequately plan for a developmental programme of ICT integration and related skills and knowledge.

Additionally, appropriate access to technology is another factor in the effective technology integration process (Norris et al, 2003). Teachers agreed that the use of ICT was only effective if every pupil in the class was assigned to authentic and meaningful instructional activities with sufficient number of computer workstations. Otherwise, computer lab sessions would only waste a teacher’s and students instructional time; and further contribute to developing negative attitudes toward the use of ICTs among teachers.

It can also be deduced from the teachers' responses that the current curriculum could be arranged to incorporate the successful integration of ICTs. Teachers reported that they could have enough time or contextual support to seamlessly embed ICTs into the curriculum. This quarrel is also strengthened in the literature that curricula should be designed and mapped based on the principle that ICTs should be used by teachers and students as an inevitable tool to expressively explore and construct their own meanings among the concepts of various subjects (Vrasidas & Mcisaac, 2001; Knapp & Glenn, 1996; Ortega & Ortega, 1995).
Teachers expected strong educational leadership from the administrators and leaders for ICTs to cascade smoothly through the schools. Concurrently, in related literature, school principals and leaders are largely criticized for their reluctance to any kind of innovation penetrating into the system. Usually, their reluctance is attributed to their insufficient training and their tendency to preserve the status quo. Dawson and Rakes (2003) stressed that "... without well trained, technology capable principles, the integration of technology into school curricula will remain incomplete." (p.46)

Finally, teachers underlined the paucity of incentives that they thought dampened their attempts to integrate the use of ICTs in their classrooms. Needless to say, recognition and promotion of those who could make productive use of technology in teaching will not only ensure the continuity of such practices, but also encourage others to invent their own practices of using technology.

Based on the findings from the present study, it is clear that the success of the group of schools’ current endeavour to introduce ICTs largely depends on teacher’s collaboration and their active involvement to the process. In order to ensure such collaboration and involvement, the governing body should develop and employ new policies to have teachers involved in the decision making and planning processes based on analysis of needs.

Unless the teachers are:
1. Empowered through appropriate preservice and in-service training,
2. Led by a powerful leadership,
3. Provided with necessary incentives, and
4. Continually provided with pedagogical technical content knowledge, the digital divide will be a perennial challenge in the group of schools.

Conclusion

There are, apparently various factors that influence and direct the process of adoption and integration of information and communication technologies in teaching and learning environments. These can be categorised into school factors, personal and external factors. It is concluded that teachers are willing to incorporate ICTs in their pedagogies, however there is need for clear guidelines in as far as ICT usage in the schools is concerned. Policy statements should not only be about communication with students and the community at large, but also refer to a workable systems that can be implemented and followed by all concerned so that ICTs can be accessible and used productively in teaching and learning. Instructional leadership must develop, implement and evaluate working ICT policies within the whole group of schools.

There is also a need for a developmental programme vis-a-vis continuing professional development within the schools. Teachers need to upgrade their skills in terms of the use of software for teaching purposes as well as the use of other computer related equipment such as interactive white boards. There is a strong consensus among teachers that the number of computer workstations in classrooms needs to be increased so as to be able to differentiate effectively during lessons. They also believe that behaviour could be controlled better with more computer workstations in classrooms.

Professional development needs to be looked at in a holistic manner including incentives and recognition for those teachers who make the extra effort to upgrade their skills.

The study recommends similar studies, however on a larger scale, so as to be able to ascertain the levels of adoption and integration of ICTs in teaching and learning environments in Maths’ and Science. Professional development in terms of ICTs in learning would be more beneficial if planned through needs analyses so as to address the peculiar needs of the teachers. Further exploration is necessary to be able to come up with more useful CPD programmes within the group of schools. It could also be beneficial to explore the effect of language on the use of teaching and learning software programmes to students foreign to the English language.
References


A Critical Review of Cryptocurrency Systems

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Abstract

Adoption of Cryptocurrency has grown significantly over the time and becoming more popular among young generation. People are calling it currency of new digital era. In this research work we are reviewing the dominant Cryptocurrency systems and its underlying disruptive Innovations and Technologies.

Keywords: Cryptocurrency, Blockchain, Digital Currency, Hashing, Proof of Work, Proof of Stake, Tangle, RippleNet, Bitcoin, Altcoins.

Introduction

We are in the middle of next revolution where Innovations and Technologies are challenging our existing systems and disrupting the way we do several operations. From industrial revolution to the invent of Internet we have already seen lots of changes which have significantly affected our daily life. In today's era we cannot imagine our life without Internet. Our various industries are getting benefits from Smart Phones, Cloud Computing, Artificial Intelligence, Machine Learning, Big Data, Internet of Things (IoT), etc. These technologies are just not replacing the old technologies but also transforming our economy to more digitized and innovation driven economy. New set of services have been build on these technologies like eBanking, eLearning, eCommerce, eGovernance, etc.

Cryptocurrency is an example of such disruptive Innovation and Technology which is transforming the way we do banking in this globalized world which is powered by Internet.

A Cryptocurrency is cryptographically signed digital currency which is virtual in nature and hard to counterfeit due to strong encryption. Cryptocurrency is different from fiat currency. Fiat currencies are printed by various governments and they control the value of it while governments are not having any control over Cryptocurrency and mostly decentralized. Crypto-currencies are controlled by Cryptocurrency community members, miners, general public participating in the transaction. Transactions are processed, validated, verified by Cryptocurrency miners and successful transaction get recorded in public and distributed ledger called Blockchain. Cryptocurrency transactions are anonymous, irreversible and secure in nature.

A. Objectives of the study

The main objectives of this Study is to:

- Critically review the underline technologies being used in dominant Cryptocurrency Systems.
- Analyze strengths and weaknesses of underline technologies of dominant Cryptocurrency Systems.

B. Significance of the study

Cryptocurrency has been adopted significantly by various financial insinuations. Various merchants have started accepting Crypto-currencies along with fiat currencies. Cryptocurrency has given new opportunity to governments, businesses, individuals, start-ups to build future ready, open, reliable and secure services which could be helpful to rebuild dying global economy. This study could be a significant contribution in literature on Technologies of Cryptocurrency Systems as authors are going to review technologies being used in dominant Cryptocurrency Systems and also going to discuss advantages and disadvantages of Cryptocurrency.
In this research work authors are going to review underline technologies of dominant Cryptocurrency Systems as per as Innovation and Technology is concern which is not linked with market capitalization, valuation or legal status of Cryptocurrency.

D. Research methodology

In this study authors have used Qualitative research methodology. Mainly Exploratory and Descriptive approach adopted in this critical review and based on observation.

Literature review

Wei Dai published a description of "b-money", a distributed and an anonymous electronic cash system in 1998 (Dai, 2017). As per Wei Dai “b-money, a scheme for a group of untraceable digital pseudonyms to pay each other with money and to enforce contracts amongst themselves without outside help”. Later on Nick Szabo created "bit gold" (Peck, 2012). Bit Gold was a Cryptocurrency and was based on Proof of Work (POW) function (Szabo, 2008). Reusable Proof of Work ("RPOW") was proposed by Hal Finney in which was an extension to Dai’s and Nick’s work. The RPOW system reuses POW tokens and uses Hash-Cash (Finney, 2005). Hash Cash was based on SHA-1 hashes (Eastlake 3rd & Jones, 2001). At this time none of the Cryptocurrency become famous.

And then the global financial crisis begins in 2007 when subprime lending market in US breakdown due high debt risk Lehman Brothers collapsed on 15th September 2008 (Williams, 2010). 2007 and 2008 was the year of global recession, economy slowdown and debt crisis. Double spending was the fundamental issue which leads to this financial crisis along with mismanagement of funds by various financial institution and governments.

In 2009 a purely peer-to-peer, decentralized, electronic cash called Bitcoin was introduced by pseudonym Satoshi Nakamoto which could be an individual or group (Nakamoto, 2008). Bitcoin was the first Cryptocurrency which become famous among general public. Since then lots of similar Cryptocurrency was introduced with similar or new technology and known as Altcoins.

Later in 2011 the Financial Crisis Inquiry Commission (FCIC) (FCIC, 2017) given reason behind this financial tragedy. As per the FCIC the financial disaster was preventable and was mainly caused by "widespread failures in financial regulation and supervision", "dramatic failures of corporate governance and risk management at many systemically important financial institutions", "a combination of excessive borrowing, risky investments, and lack of transparency" by financial institutions and what "added to the uncertainty and panic" was, hostile groundwork and fickle act by government (FCIC, 2011).

This fueled the adoption and technical enhancement of Cryptocurrency. Followings are the underline technologies being used in dominant Cryptocurrency Systems: -

A. Blockchain

Blockchain is one of widely used non-controversial technology in Cryptocurrency space which works flawlessly, securely and is a most valued technology after Internet. Blockchain maintains a public ledger which is a central but distributed record of all successful event/transaction in Blockchain networks. Once transaction is recorded in Blockchain it is impossible to remove or reverse. Verification of each transaction in this public ledger is done by agreements of a mainstream of the contributors in the Blockchain (Michael, Pattanayak, Verma, & Kalyanaraman, 2016). Block ownership in Blockchain can be verified thus forged entry can be avoided.
1. Transaction in blockchain

As depicted in Figure 1 (Nakamoto, 2008) in Blockchain each transaction has chain of cryptographically signed digital signatures which is irreversible. Each party transmit the digital information to the next party by digitally signing a hash of the prior transaction and the public key of the subsequent owner and adding these to the end of the digital information. Any changes in the block leads to different hash thus the changed block is dropped to avoid forging. Timestamps are hashed to track that data was existing already before it is processed by next node in the Blockchain network. High level and simplified version of Blockchain transaction is given in Figure 2 (Michael, Pattanayak, Verma, & Kalyanaraman, 2016)

2. Proof of work

Proof of work (POW) concepts was introduced in “Bit Gold” later on it has been used in Hashcash as Reusable Proof of Work (RPOW) was introduced in 1998. In 2002 Adam Back introduced the concepts of CPU cost function which can be used as proof-of-work. Costs functions can be interactive
and non-interactive which can be used in connection oriented and connectionless environment respectively (Back, 2002).

As per Satoshi Nakamoto “The proof-of-work involves scanning for a value that when hashed, such as with SHA-256, the hash begins with a number of zero bits. The average work required is exponential in the number of zero bits required and can be verified by executing a single hash.” (Nakamoto, 2008).

Cryptocurrency protocol uses Proof of Work to prevent double spending and to establish scarcity (Becker, et al., 2013).

3. Incentive or mining rewards

To keep Blockchain network running someone has to verify the transaction which involve execution of hashing algorithms and require significant CPU time and electricity resources. To reward supporting node in Blockchain network new coin is generated and given as a rewards to the supporting note which is also called miner. The incentive or mining rewards can also be given as transaction fees. Some of the Cryptocurrency which uses Blockchain as their fundamental underlying technology is listed in Table 1. However, they are having few difference in term of validation times, way of processing and services provided. Like Bitcoin and Bitcoin Cash is identical but uses difference block size. Bitcoin Cash uses higher block size and faster than Bitcoin. Ethereum and Dash is based on Virtual Machine but Dash uses two category of nodes one is master node and another one is validation node. While Ethereum is a decentralized Blockchain Application platform that runs smart contracts. Ethereum allows developers to design and issue their own Cryptocurrency. Ether is the fuel in Ethereum platform. Litecoin is similar to Bitcoin but is faster than Bitcoin as it takes 2.5-minute lesser block generation time. It uses scrypt hashing algorithm (Percival & Josefsson, 2016) while Bitcoin uses SHA-256 hashing algorithm (Dadda, Macchetti, & Owen, 2004). Litecoin uses Segregated Witness, and the Lightning Network technology to boost transaction in the Litecoin Blockchain network.

Some of the Strength of Blockchain is listed below:-

1. Blockchain is based on Peer-To-Peer concepts thus there isn't any third party or central bank sitting between sender and receiver.
2. Same currency cannot be spend at the same time.
3. Transactions are recorded in single public ledger and cannot be manipulated one recorded.
4. In traditional banking International transaction takes days to settle while in Blockchain it is a matter of few minutes.
5. Blockchain eliminates need of third-parties thus transaction fees are very low.
6. Users are empowered and having control of all their information and transactions.
7. Government cannot control or regulate Blockchain because users are allowed to do transaction anonymously.
8. Blockchain work on the concepts of decentralization thus Blockchain network cannot be closed down and users can do secure transaction 24/7.
9. Blockchain completely elements associated risks of frauds and identity thefts which is biggest issue in traditional banking system.
10. Blockchain tolerate unauthorized transaction and prevent malicious attacks. Some of the weaknesses of Blockchain is listed below:-
    • Blockchain is power hungry. To keep Blockchain network running huge amount of power is needed. As per John McAfee, to generate 1 Bitcoin around 1000$ get burnt.
    • Various government regulation status is not clear on Blockchain. Legal adoption is an issue as per as Blockchain for Cryptocurrency is concern.
    • Blockchain related technologies are still in its evaluation phase thus cyber security is an major issue.
    • Due to anonymously nature of transaction this can be used by various criminals.
    • To Integrate Blockchain to existing financial and banking system lots of extra capital and cost is required.
Customer protection is another issue in Blockchain, once transaction is committed, it cannot be reversed, unless the will of the new owner of the token.

Increasing block size is the biggest challenge in Blockchain.

Online Initial Coin Offering (ICO) frauds are common in Blockchain space so one should be very careful. Due to unclear regularity framework future of Blockchain related projects are in high risk.
<table>
<thead>
<tr>
<th>Ranking</th>
<th>Cryptocurrency Name</th>
<th>Cryptocurrency Code</th>
<th>Market Cap</th>
<th>Price as on 22/09/2017</th>
<th>Coins in Circulation</th>
<th>Remaining Coins to be mined</th>
<th>Total Coins</th>
<th>Official Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bitcoin</td>
<td>BTC</td>
<td>$59.00B</td>
<td>$3,558</td>
<td>21M</td>
<td>16.58M</td>
<td>$24.44B</td>
<td><a href="https://bitcoin.org">https://bitcoin.org</a></td>
</tr>
<tr>
<td>2</td>
<td>Ethereum</td>
<td>ETH</td>
<td>$24.44B</td>
<td>$257</td>
<td>100M</td>
<td>94.77M</td>
<td>$18.92M</td>
<td><a href="https://www.ethereum.org">https://www.ethereum.org</a></td>
</tr>
<tr>
<td>3</td>
<td>BitcoinCash</td>
<td>BCC</td>
<td>$6.67B</td>
<td>$404</td>
<td>21M</td>
<td>5.23M</td>
<td>$53.05M</td>
<td><a href="https://www.bitcoincash.org">https://www.bitcoincash.org</a></td>
</tr>
<tr>
<td>4</td>
<td>Dash</td>
<td>DASH</td>
<td>$2.53B</td>
<td>$335</td>
<td>16.49M</td>
<td>11.35M</td>
<td>$50.95M</td>
<td><a href="https://www.dash.org">https://www.dash.org</a></td>
</tr>
<tr>
<td>5</td>
<td>Litecoin</td>
<td>LTC</td>
<td>$2.42B</td>
<td>$45</td>
<td>84M</td>
<td>30.95M</td>
<td>$30.95M</td>
<td><a href="https://litecoin.com">https://litecoin.com</a></td>
</tr>
</tbody>
</table>
B. RippleNet

RippleNet is one connected global payment decentralized network which is based on Ripple and Network participants. As Ripple.com “RippleNet is the world’s only enterprise Blockchain solution for global payments.” but it is different than other decentralized Cryptocurrency which uses Blockchain listed above. It's complete architecture is similar to current traditional Banking System where funds are being transferred between banks and MasterCard, Visa, Western Union, etc. verify transaction. So what is the different in RippleNet? In simple manner if we replace MasterCard, Visa, Western Union, etc. to Ripple with its xCurrent enterprise software that form RippleNet. So the next question is why banks are switching to RippleNet? Because it is fast, secure, less transaction fees and most important thing is that it can be regulated. Transaction in RippleNet not totally anonymous it maintains the record in Interledger along with other user information such as account and bank information. Each transaction in Interledger is verifiable along with other details. The whole RippleNet ecosystem members have been categories into two category. First is Network Members who are the enablers of RippleNet which includes Banks and Payment Providers and another one is Network Users which includes Platform Business, Corporate treasury, Banks, Payment Providers and Consumers. xCurrent is Ripple’s enterprise software solution (Ripple.com, N.D.) which is used to do cross-border payment processing, end-to-end tracking and support two way information passing in RippleNet. In Figure 4 FX Ticker in xCurrent facilitate exchange between ledger and provide exchange rates. RippleNet is powered by the Interledger Protocol (ILP) (Thomas & Schwartz, 2015) which enable to send payments between diverse ledger. xCurrent maintain ILP ledger. It is a sub-ledger of transacting bank’s universal ledger. Validator in xCurrent is used to verify success and failure of payment transfer cryptographically. Ripple is the digital token which is used in RippleNet. Ripple related information has been given in Table 2. Ripple uses HTTPS protocol for communication link between bank and xCurrent. It uses OAuth 2.0 for authentication. Communication link within xCurrent component is also protected using HTTPS protocol (Ripple.com, N.D.).

Figure 3. Ripplenet ecosystem
Some of the Strength of RippleNet Solution is listed below:

2. Speed: Instant, on-demand and payment settlement 4 seconds
3. Scalable: RippleNet handles 1500 Transaction Per Second (TPS) and can be scaled to handled more transaction same as Visa which is currently handling around 50,000 TPS.
4. Cost: Low operational, liquidity costs, negligible energy consumption as compare to other Cryptocurrency.
5. Access: One stop solution and single point of access to an international network.
6. Compliance: Ripple provides licensed Solution to Banks and respects banks compliance responsibility. Thus regulation is not an issue with Ripple. More than 90 Banks/ Financial Institutions have already adopted or going to adopted RippleNet solution. Some of them are Banks like Bank of America, Standard Chartered Bank, Yes Bank, UBS, UniCredit, Axis Bank, AKBANK, SBI, etc.
Table 2: Cryptocurrency ripple (XRP)

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Cryptocurrency Name</th>
<th>Cryptocurrency Code</th>
<th>Symbol (Icon)</th>
<th>Price as on 22/09/2017</th>
<th>Total Premined Coins</th>
<th>Premined Coins in Circulation</th>
<th>Remaining Coins Premined</th>
<th>Market Cap</th>
<th>Official Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ripple</td>
<td>XRP</td>
<td>🌊</td>
<td>$0.17</td>
<td>100B</td>
<td>38.34B</td>
<td>61.66B</td>
<td>$ 6.75B</td>
<td><a href="https://ripple.com/xrp/">https://ripple.com/xrp/</a></td>
</tr>
</tbody>
</table>
Some of the weakness of RippleNet is listed below:

1. Ripple is not completely decentralized. It is similar to traditional banking payment system which uses ILP ledger as core.
2. All coins in Ripple is premined and considered as fake Cryptocurrency in Cryptocurrency world.
3. It does not maintain users’ anonymity and Governments can audit all transactions along with user details.
4. While in Blockchain miners produced new coins by processing transactions, in Ripple all coins are Premined and transaction fees are burned and paid to none.

C. IOTA

IOTA is a revolutionary solution for Internet of Things (IoT) and backbone of IoT technology (iota.readme.io, 2015). It is a transactional settlement and data integrity layer for the IoT and based on distributed Tangle ledger (Popov, 2014). IOTA born in 2014 and lots of new technologies which as a solution to limitation of current first and second generation Blockchain space. IOTA is third generation of Blockchain technology which provide function as the lightweight distributed ledger with scalability, quantum resistance and decentralization for all IoT devices and do not have any mining, blocks, difficulty or transaction fees (Tangleblog.com, 2015).
<table>
<thead>
<tr>
<th>S.No.</th>
<th>Cryptocurrency Name</th>
<th>Cryptocurrency Code</th>
<th>Symbol (Icon)</th>
<th>Price as on 22/09/2017</th>
<th>Total Premined Coins</th>
<th>Premined Coins in Circulation</th>
<th>Remaining Coins Premined</th>
<th>Market Cap</th>
<th>Official Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Iota</td>
<td>IOT</td>
<td>$0.52</td>
<td>2,779,530,283,277,760</td>
<td>2,779,530,283</td>
<td>2,779,527,50 3,747,480</td>
<td>$ 1.44B</td>
<td><a href="https://iota.org/">https://iota.org/</a></td>
<td></td>
</tr>
</tbody>
</table>
IOTA is just not a Cryptocurrency but it is complete platform for IoT devices and can be used to support Micro/Nano transaction without any fees, Data transfer, Voting, Masked Messaging, anything that need distributed ledger as the Ledger of Things (LoT), financial activities as the Economy of Things (EoT).

The Tangle, a Directed Acyclic Graph (DAG) is the core of this modern Cryptocurrency which is records all transaction in IOTA. Markov Chain Monte Carlo (MCMC) algorithms select attachment sites in the tangle for just arrived transaction (Popov, The Tangle, 2017).

Some of the Strength of IOTA is listed below:-
1. The biggest strength of IOTA is zero transaction fees but you have to only confirm other 2 previous transaction then after your transaction get confirmed.
2. It is blockless Blockchain technology.
3. In IOTA no need to mine coins thus no need to pay any fee to miners.
4. Internet of Things (IoT) is 4th industrial resolution and IOTA is just not support IoT but also Internet of Everything (IoE).
5. First Quantum proof Blockchain technology.
6. It supports micro-transaction and is based on Machine 2 machine economy.
7. Scaling is Infinitely.

Some of the weaknesses are listed below :-
1. It is in development phase and still evolving.
2. There could be lots of hidden bugs in IOTA implementation as it is in early phase.
3. EoT, LoT and Machine-to-Machine transactions, scale till infinity, etc. are on paper only. There are huge difficulties that need to address while implementation.
4. All coins are premined.
5. There is not concept of mining.

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1 See Directed Acyclic Graph (DAG) in Figure 5.
D. PeerCoin

PeerCoin or PPCoin is first Cryptocurrency which uses Proof-of-Stake concept along with Proof-of-Work. PPCoin is a hybrid model where Proof-of-stake takes care of network security. Proof-of-stake is based on coin age and every node which is same as Bitcoin. Centrally broadcasted checkpoint mechanism is used to protect Blockchain history and transaction settlement in PPCoin (King & Nadal, 2012). Proof-of-stake as name suggest is a proof of Cryptocurrency ownership. Coin age is used to determine proof-of-stake. Coin holding period is known as Coin Age. In order to transaction timestamp is used to facilitate the computation of coin age. Block timestamp and transaction timestamp is used to protect the computation of coin age.
Table 4. PeerCoin/PPCoin cryptocurrency market cap

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Cryptocurrency Name</th>
<th>Cryptocurrency Code</th>
<th>Symbol (Icon)</th>
<th>Price as on 22/09/2017</th>
<th>Total Coins</th>
<th>Coins in Circulation</th>
<th>Remaining Coins to be mined</th>
<th>Market Cap</th>
<th>Official Website</th>
</tr>
</thead>
</table>
Some of the Strengths of PPCoin\(^2\) is listed below:-
1. PPCoin is based on fair distribution and are having no pre-sale of Cryptocurrency or instant mining.
2. PPCoin is the first Cryptocurrency which uses Proof-of-Stake concept to secure network along with centrally broadcasted checkpoint mechanism.
3. PPCoin is stable and secure. It is in function since 2012.
4. PPCoin is energy efficient and consume less power than other Blockchain based Cryptocurrency.
5. PPCoin is based on Bitcoin with Proof-of-stake implementation.

Some of the weaknesses of PPCoin is listed below:-
1. Being an open source community the design and protocol specification is hidden from public.
2. PPCoin algorithm uses SHA256 which can be broken in future with the help of quantum computers.
3. Lack of transparency and security is major issue in PPCoin.
4. Transaction one started cannot be reversed.

**Discussion and Conclusion**

There is no doubt that Cryptocurrency is addressing some of the functional issues in the current fiat currency and trying to give more control to the users as trust on governments have shaken due to mishandling of core economic issues. Cryptocurrency cannot be counterfeit and can be transacted instantly with either low or no transaction fees. Blockchain is the wonderful technology that has been invented after Internet. Proof-of-stake is another solution which shows that first generation Blockchain can improve further. Technology like RippleNet with xCurrent is a successful solution for current banking and financial institution and more than 90 organization worldwide already using Ripple based technology. IOTA is future ready technology for IoT and solid solution to power hungry Blockchain technology with zero transaction cost. However this is just a beginning Blockchain is just 2 decade old but growing rapidly. Blockchain is the future and answer to digitally driven global economy.

Various governments are having compliance and legal concern over uses of Cryptocurrency. Authorities are arguing that Cryptocurrency are being misused to illegal activities and trying to stop Cryptocurrency uses which is very unfortunate. In fact Fiat currency is being misused for this kind of activity so long and authorities are failed to stop it. This is really contradictory argument and need more and open minded discussion on this subject area so that t can be resolved via dialog and issuing legal guidelines for compliance. Governments also must have to understand that they cannot control or stop Cryptocurrency. This is beyond their control. Cryptocurrency communities and Governments have to find out solutions for a win-win situation for all of stockholders.

**References**


\(^2\) Market capitalization information is given in Table 4.
Contractor Information Management System (CIMS) – Import Module

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Abstract

X-organization is looking for a solution to enables the X-client to identify which contractors are being used in Afghanistan and for what purpose (contracts). The contractor should be defined as business / enterprise / organization / or individual that will commission or employ to perform a specific job for a specific period through a contract with the X-Organization. Furthermore, the application should provide details on where the contracts are as well as the value, and to indicate the performance of the contract / contractor per different clients.

Based on strong research, the Application has been developed in Drupal. After some time, the organization decided to add more features in the application to satisfy their clients for example bulk import, grouping specific fields and a map showing geographical information.

Previously X-organization clients were adding each contractor separately which was quite time consuming, but recently they installed a new module called “Feeds Import” to facilitate their client’s data import process. This new module allows clients to import, a list of their contractor/contracts information just by importing from a CSV file.

By implementing the above features the X-organization faced another challenge. Each CSV file had to be imported several times to accomplish the bulk import process and we later explain in more details in the next sections of this paper why the clients had to import the same file several times?

Now, the organization is looking for a solution to eliminate the need for importing one content type multiple times. So, the purpose of this document is to design and develop a module through which the import process is made dynamic, flexible and user friendly.

Keywords: Drupal, import module, Contractor Information Management System, Feeds Import, Field collection, bulk import.

Introduction

Before we explain the needs of this module, we need to explain the Contractor Information Management System. The purpose of this purpose-built and designed system is to define a business / enterprise / organization / or individual that will commission or employ to perform a specific job for a specific period through a contract with the X-Organization. Furthermore, the application is providing details on where the contracts are, as well as the contracts monetary values, and to indicate and assess the performance of the contract / contractor per different clients.

The Contractor Information Management System is designed as an electronic, inexpensive, fast, transparent, dynamic, secure, reliable and multipurpose.

The current multipurpose CIMS main features are listed below:

- Satisfies all agencies requirements.
- Enables a client to query the details of contractors and contracts (client’s agency contracts) from anywhere using an Internet connection.
- Designed to be very user friendly. Any registered user with a valid login code can access the CIMS from anywhere with an Internet connection. Nominated agency focal points will receive a login code and training on how to add Contractor and Contracts information.
- Can be only accessed through the agencies specific users.
- Allows the user to identify what contracts have been undertaken, where, for what services/works and for how much value.
- Designed in a manner which allows the agencies to add multiple fields and some fields having multiple values.
- Registered users are able to check how many contracts a specific contractor has ongoing with the X-Organization (search results dependent upon user access level). The capacity of the contractor is therefore able to be assessed to determine whether the contract is likely to be fulfilled at a satisfactory standard (technically or administratively) and prevent over-extension of the contactors resources.
- Serves as the common platform for submitting requests for monitoring and reporting missions at risk.
- Enables organizations to be informed about total expenditures on contracts throughout Afghanistan and can drill down to identify each region and district, as well as by type of contract (works, services, goods, lease, etc.).
- Defines financial thresholds for each Contractor. The system is able to aggregate the total contracts awarded and when the threshold is surpassed, it is flagged. This will then lead to a collective review (and possibly audit) of the contractor/partner to increase collective due diligence on contractor/partner’s engagement.
- Enables comments to be registered about contracts and contractors to ensure greater information sharing (read functionality dependent upon user access level).
- Enables users to see the performance indicator of a contractor (Satisfactory, Not Satisfactory, and Suspended) and, if necessary, can request more information from the relevant agency.
- The system has various levels of access to restrict stored data usage and processing:
  - Level 1: Data Entry (X-Organization Staff Only - Access to specific agency data).
  - Level 2: Supervisory (Approved Focal Points) – Access to data from all agencies, including performance and total contractor value.
  - Level 3: Manager (Head of Agency or Designate – as approved by the Head of X-Organization) - Access to all of the above including specific contract values.
  - Level 4: Administrator (X-Organization development unit) – Access to all data and administration of the system.

Research problem

Currently some content types need to be imported multiple times. For instance, if we want to import contractor then we must import it 5 times in different “feeds importer” (Contractor_import_1, Contractor_import_2, Contractor_import_3, Contractor_import_4, and finally contractor_import_5). And the reason behind this process is that location and field collection modules will create separate tables for each field collection in the database and it creates a link with content type through foreign key. So, feed importers module neither allows us to map both content types and field collection, nor to map multiple field collection in a single feed importer process. Due to this fact, we need to have multiple feed importers.

The purpose of this document is to design and develop a customized module for Contractor Information Management System which is developed based on Drupal. So, this module eliminates the need for importing one content type multiple times. The new customized module interface is designed to be dynamic, flexible and easy to scale. The new module will address most of the CIMS users concerns in regard to feeds import feature forcing the users to do repetitive imports of same data, static features usage and time consuming processes.

The current “Feeds import” module needs to be transformed to a modern, electronic, inexpensive, fast, transparent, dynamic, secure, reliable, multipurpose module for contractor information management system (CIMS). The current multipurpose module challenges are listed below:

The module should be designed to be very user friendly.

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1 It is very important to know that first the content type should be imported and then we will be able to import its field collections (because field collection need the primary key of the content type in order to be imported successfully.)
• Allow administrator to select their bulk importers.
• Allow users to import the contractors in series.
• The module should work for all types of fields collection.
• The administrator should be able to apply security policies.
• The module should be able to show the report messages once at the end of bulk import.
• The module should be accessed only through the agencies specific users.
• The module should be designed to allow the administrator only to add unlimited bulk importers.

**Proposed solution**

The following are two proposed solutions for this problem:

1. Customizing the existing feeds import module.
2. Developing a custom module in top of feeds import module.

First solution will work, but it is not recommended by Drupal community since it is called hacking of module. By hacking the module, the X-organization will face problems in future so we cannot go with this solution.

Second solution will be recommended if no solution on the marketplace is available today that can meet at least 80% of our requirements. As we explored the marketplace, we couldn’t find any existing solution for solving this problem, hence we will have to go with this second solution. The solution which is proposed for this bulk importing process, is to develop a custom module in top of feeds import module to eliminate the need for importing one content type multiple times.

The custom module will trigger whenever any content type has been imported through feeds import module. If the content type has dependencies, then it will immediately start to import its dependencies after the completion of the first import (content type). For instance, Contractor has five dependencies which are Contractor_import_1, Contractor_import_2, Contractor_import_3, Contractor_import_4, and finally contractor_import_5, so this module will automatically start to import all its dependences in series. Let me put this another way, normally when user import contractor_import_1 after completion of import process the system will show message (failure/success with report download link) to user, but now with the help of this module system will work as following.

When the user tries to import “contractor_import_1”, if all the information related to contractor_import_1 is saved into database without error, then before it displays the success message to user, it will check whether this contractor has dependencies or not if it has, then it will start to import its dependencies and once all the dependencies import is finished then it will complete the importing process and display the message (failure/success with report download link) to user. Otherwise, if some error is displayed and the data couldn’t be save to database then system will not start to import its dependencies and it will immediately display the failure message.

**Success factors**

Looking at the scope of this problem, knowledge of several computer science subjects are required to propose a workable solution. We will mainly need knowledge and concepts of object-oriented programming, algorithms and data structures, database design, HTML/CSS and software engineering courses.

Object-oriented programming knowledge is required because our capabilities can be massively augmented by machines. While being able to simply ask the machine for “what you need” gives you some results, knowing how to clearly tell it “what to do” can give you more personalized results and make any automatable tasks easier to automate. Object-oriented programming has great advantages over other programming styles such as code reuse and recycling, encapsulation, design benefits and etc. The most important thing is that Drupal is completely developed based on object-oriented programming principles [8] and [9].

 Algorithm and Data structure knowledge and concepts are required in order to write proper programming statements that can be easily coded in reduced number of code lines. Algorithm tells exactly how to do
something to reach our goal or to achieve the required output or to accomplish our task. Programming is all about applying logic and reason to solving technical/programming problems. When you solve the problem, you arrive at an algorithm. Your algorithm is the solution to your problem. Let me put this another way: Your algorithm is the solution to your problem. If you don’t have an algorithm, you haven’t solved your programming problem. An algorithm is the series of logical instructions for the computer that you translate into the programming language of your choice, whether that be Java, Python, C++, Go, Ruby or PHP [1] and [7].

When we code our solution, we may indeed lean on the work of other people. We may use libraries and frameworks. This is why code reusability is so important. Nobody writes software from scratch. We build on top of an existing foundation. However, the set of unsolved programming problems in the universe is infinite. When we write an application, it is just one of many programming problems. The importance of algorithms is that they constitute all of programming techniques. Data structures are the best way of storing and organizing information in a computer so that it could be retrieved and used most productively and efficiently. Data structures are key to designing efficient algorithms.

Database design and development concepts are required to store and retrieve data in a convenient and efficient manner. Management of data involves both defining structures for storage of information and providing mechanisms for the manipulation of information. In addition, the database system must ensure the safety of the information stored, despite system crashes or attempts by unauthorized users. If data is to be shared among several users, the system must avoid possible anomalous results [1].

HTML/CSS skills and knowledge is required in order to design the interfaces or layout of the web pages. The CSS will define styles for our documents, including the design, layout and variations in display for different devices and screen sizes [13].

Software engineering which is a set of methodologies, techniques and tools which helps us to build high quality software that works and fits our budget based with the consideration of organizational requirements. It is an important and critical discipline, concerned with cost effective software development. It is based on a systematic approach that uses appropriate tools and techniques, operates under specific development constraints, and most importantly, follows a process with the consideration of the user and business requirements. As a result, a good programmer should follow and use the software engineering principles along with algorithm and data structure knowledge to develop a robust and high performance application [11].

Limitations

Our proposed solution is developed to improve the CIMS features of and existing system for “Data Import” process. The developed module is dependent on the CIMS existing modules to work properly and efficiently. However, the developed module could be customized to any organization’s requirement with little efforts using its dynamic features. The solution is limited to the CIMS developed using Drupal, PHP programming language and feeds import module. The data flow in the system is customized and automated to meet the x-organization and its agencies requirements to improve their day to day activities and tasks.

Goals and achievements

Our goal is to design and develop a module to support and make it easier for those Drupal users who have multiple feeds importer (for any reasons) for its one content type, which forces the user to import one file (CSV) several times in order to accomplish the bulk upload. We aim to eliminate the needs for importing one content type multiple times. The module is designed to be dynamic, flexible and easy to use. The newly developed and customized module will possess the following main features:

- Can be used for other databases which are having the same senior for instance, the Contractor Information Management System has been configured as multisite in different countries (having same source code, but different databases schemas).
- Designed to be very user friendly.
- Allows the administrator to select their bulk importers.
• Allows users to import the contractors in series.
• The module will work for all content types which have dependencies (field collection, map and etc.).
• Enables the administrator to apply security policies.
• Displays the report messages ONCE at the end of bulk import.
• Can be only accessed through the agencies specific users.
• Designed in a manner which allows the administrator to add unlimited bulk importers.
• Works for all Drupal users who are using field collection and feeds import together.

Method

In order to solve the stated problem and answer the research questions we will have to develop a module with the capability to provide the required features based on the organizational needs. We consider the following best software engineering practices and use some tools to improve software development phases, introduced the required features, and to support software development tasks in general.

Tools usage and automation processes are fundamental components in software engineering. And they are essential for improving productivity, efficiency, and effectiveness of our activities in the software development process. Hence, we have used several tools in this research such as Integrated Development Environment (IDE) eclipse, Version Control System Git and UML Diagraming tools such as Signavio.

Software process model

Process modelling is the best way to visualize a business process and to make the process much more understandable for technical and non-technical audience. The software development process has to go through a cycle in order to be delivered reliability, effectively and efficiently. Therefore, choosing the right lifecycle model is of fundamental importance. First, we describe the software lifecycle or software processes.

We have a several software process models for instance: waterfall process, spiral process, evolutionary prototyping process, rational unified process and agile process. Since, this application has been already developed based on Scrum Agile development method, so we will continue with is software development model. Agile process is one of the best models which is very useful for small and medium-size software development projects.

Agile is a group of software development methods that are based on highly iterative and incremental development. In particular, I’m going to discuss Test Driven Development or TDD.

This involves the iteration of three main phases. In the first phase, we mark as red, we write test cases that represents our requirements, and for which we have not written code yet. Therefore, they will fail, obviously. So, we're in this sort of red or fail phase.

From this phases, we move to another phase, in which after we write enough code to make the test cases pass. We have a set of test cases that are all passing. Therefore, we can consider this as the green phase. We had enough code to make the test cases pass because the test cases represented our requirements. We have just written enough code to satisfy our requirements.

When we do this over time the structure of the code deteriorates, because we keep adding pieces. So, that's why we have the first step, which is refactoring. In this step, we modify the code, and we will talk about refactoring extensively later in this paper. We modify the code to make it more readable and maintainable. In general, we modify to improve the design of the code. After this phase, we will go back to write more test cases for new requirements and to write code that makes these test cases pass, and this process continues. So, we'll continue to iterate among these phases.

Also, in this case, we will talk about agile software processes. In particular, about extreme programming, or XP, and Scrum in more details.

I would like to go with Scrum, Agile process or TDD (Test-driven development) because, agile process is one of the best model which is very useful for small and medium software development projects.

Agile has the following two processes, which will be discussed one by one.
XP (extreme programming)

Kent Beck describes the XP as “XP is a lightweight methodology for small to medium sized teams developing software in the face of vague or rapidly changing requirement”. So as a result, XP is a lightweight, humanistic, discipline and all about software development.

Scrum

Scrum is a lightweight process framework for agile development and the most popular one. Process framework means that it follows a particular set of practices to deliver high-quality software and to meet the requirement of stakeholders based on iteration. And lightweight means that keeps the task as small as possible.

There are three main kinds of actors in scrum development model.

- **Product owner (customer):** is mainly responsible for the product backlog, where the Product backlog is basically the list of things that have to be done, the backlog is in fact for the project. And that is analogous to the user stories to be realized in XP. So, what the product owner does is to clearly express these backlogs items and to also order them by value or weight, so they can be prioritized.
- **Team:** The team is responsible for delivering shippable increments to estimate the amount of development effort required for the backlog items. It is normally self-organized and consists of four to nine people, and it is what you would consider normally as the main development team in a project. In other words, in Scrum development model there is no need for overall team leader, who decides which person will do which task or how a problem will be solved. These are issues that are decided by the team as a whole.
- **Scrum Master:** is the person who’s is responsible for overall Scrum process, so he or she has to remove obstacles, facilitate events, helps communications, and so on. So, you can see the Scrum master as sort of a manager or the person who's got oversight, or the supervisor of the Scrum process.

Software phases

Software processes are normally characterized by several phases, which is called the software phases, and only one of these phases are mainly focused on coding. The other phases are meant to support other parts of software development process. [10]

1. Requirements engineering
2. Design (high level structure)
3. Implementation (write code)
4. Verification and validation
5. Maintenance

Requirement engineering

Based on the above scenario (problem scope) or business requirements, the below system requirement should be achieved:

- The module should be designed to be very user friendly;
- The module should allow administrator to select their bulk importers;
- The module should allow users to import the contractors in series;
- The module should work for all types of fields collection as well as other modules;
- The administrator should be able to apply security policies (in this custom module);
- The module should be able to show the report messages once at the end of bulk import;
- The module should be accessed only through the agencies’ specific users;
- The module should be designed in a manner which allow the administrator to add unlimited bulk importers;
The module should eliminate the need for importing the same CSV file several times;

**Design**

This view shows all the main components of a CIMS upload module for X-Organization. It makes it easier for developer to understand the processes, the components, dependencies and critically of the system. Based on the design the developer can easily test the module.

The below process activity diagram is designed in Signavio. This tool makes the job of developers much easier. As shown in Figure 1. 

![Custom CIMS Upload Module](image)

**Figure 1.** This view shows all the main process of CIMS upload module

**Implementation**

**PHP Language**

We need to select a programming language for our server side. And according to our requirements PHP is the best choice since Drupal is based on PHP.

**Backend process**

This module has one main function and seven auxiliary functions2.

The auxiliary functions are: `hook_help()`, `hook_permission()`, `hook_menu()`, `hook_form()`, `add_remove_ajax_callback()`, `find_feeds_by_id()` and `list_feeds()`. The description of each functions is described in a module code as inline comments.

The one main function (`hook_feeds_after_import()`) has been used in order to accomplish the task[6].

Function `hook_form()`

As per the organizational requirement we need to develop a dynamic field. Dynamic fields must allow the administrator to add unlimited bulk importer and bulk importer events furthermore, the dynamic fields should be adding at the tail of the list, but should be deleted from anywhere in the list or vice versa. The

2 To develop a custom module, I have used the following source [3].
Dynamic form has implemented by using the following sources [4], [5], [12] and [14]. Figure is the complete code of dynamic field.

To implement the dynamic field, I have considered array data structure.

An array data structure is an ordered map in PHP. A map is a type that associates values to keys and this type is optimized for several different uses, it means that it can be treated as an array, list, hash table dictionary collection, stack, queue and more [2].
**Figure 2.** The view shows the compete code of dynamic field in drupal

Function `hook_feeds_after_import()`

This function is used when module requires to perform an operation after a feed source has been parsed. Figure 3 is the complete code which runs after feed source has been parsed.
White-box testing

White-box testing is the kind of testing that we perform when we open up the box. It means that we look inside the program, and we actually test it based on its code.

Based on automatic testing (branch and condition coverage) in Signavio our code coverage is 100%.

Maintenance

Maintenance is a fundamental activity in software life cycle.
Below are the reasons why software maintenance is a necessary phase in software development.
- Bug report
- Feature request
- Environment change

Figure 3. The compete code which runs after feed source has been parsed
Development organizations perform three kinds of maintenance activities.

- Corrective maintenance: to eliminate problem with code
- Perfective maintenance: to accommodate feature request (improve the software)
- Adaptive maintenance: to take care of the environment changes

This module is part of perfective maintenance since X-organization wants us to add feature in the existence application.

In each one of the above maintenance activities, the iteration will be done. It means that again we will need to identify the requirement for any of the above maintenance activities which includes design, implementation, verification and validation and finally we will be able to release the product/module.

**Results**

While developing this module, I have considered the knowledge and concepts of different computer science subjects for example: object oriented programming, algorithms, data structure, database design, HTML/CSS and Software Engineering best practices. As a result, a user friendly and extendable module which eliminates the need for importing one content type multiple times has been developed.

**Bulk import of contractor/contracts**

Prepare two CSV Files – one for Contractors and one for Contracts using the template provided (Below details ‘Contractor’ Tab). Table 1. Shows the contractors template for parsing into CIMS database, Table 2. Shows the contracts template for parsing into CIMS database.

**Contractors**

**Table 1.** Shows the contractors template for parsing into CIMS database

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contractor’s Name</td>
<td>Business Email</td>
<td>Contact Person</td>
<td>Contact Number</td>
<td>Company Website</td>
<td>Street Address</td>
<td>City</td>
<td>State</td>
</tr>
</tbody>
</table>

**Contracts**

**Table 2.** Shows the contracts template for parsing into CIMS database

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contract Title</td>
<td>Contractor’s Name</td>
<td>Contract No.</td>
<td>Contract Value (in USD)</td>
<td>Start Date</td>
<td>End Date</td>
<td>Location</td>
<td>Contract Type</td>
</tr>
</tbody>
</table>

The Column under the CONTRACTS sheet for ‘Contractor’s Name’ is to ensure that when the data is uploaded, the database links the relevant Contracts to the Contractor.

Therefore, it is important to ensure that the spelling you use for the Contractor’s name is identical on both excel sheets.

It is only necessary to list the Contractors once in the CONTRACTOR sheet (i.e. you do not need to duplicate the details on the Contractor sheet if you have more than one contract.).

**Administrator view**

Configuration setting of bulk import. Figure shows the configurations and settings of the CIMS-import module.
Importing process

Previously, each feed import need had to be imported separately. For instance, user needs to import contractor import 1, contractor import 2, contractor import 3 and finally contractor import 5 furthermore, this process had to be done in order. But now by developing this new module, there is no need to import each feed import separately, the user only needs to import contractor import 1 and rest will be managed by the module as shown in below screenshots.

<table>
<thead>
<tr>
<th>Import</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contractor Import 1</td>
<td>This is a CIMS feeds import for adding new contractors to the database.</td>
</tr>
<tr>
<td>Contractor Import 2</td>
<td>This is a CIMS feeds import for adding new contractors to the database.</td>
</tr>
<tr>
<td>Contractor Import 3</td>
<td>This is a CIMS feeds import for adding new contractors to the database.</td>
</tr>
<tr>
<td>Contractor Import 5</td>
<td>This is a CIMS feeds import for adding new contractors to the database.</td>
</tr>
<tr>
<td>contracts Import</td>
<td>This feed imports the Multi-rating functionality.</td>
</tr>
</tbody>
</table>

**Figure 4.** This views shows the configurations and settings of the CIMS-import module

**Figure 5.** This view shows the list of feeds importers
**Figure 6.** Shows the page where user can select a CSV file to import the contractor import 1

**Figure 7.** Shows the process of importing contractor import 1 with its dependencies

**Figure 8.** Shows the result of imported contractors’ import 1 with its dependencies.
Discussion

The module is designed and developed from scratch. To the best of my knowledge, no one has worked on solving this problem previously. The purpose of this module is to support either X-organization or Drupal community who are using similar products or dealing with similar business processes.

Previously, X-organization had many problems with feeds import, location and field collection. For example, it was very time consuming and unprofessional to import one file several times and the clients had to import the files in order otherwise and error would have been produced. Furthermore, it created limitation in importing process. In other words, the more information we wanted to import, the more feeds import was required and that was making it a difficult job for the users to import one file 10 to 15 times. But by developing this module we do not need to worry about these complicated and time consuming processes since is managed by the custom module that I have developed to solve this problem.

Conclusion

In this paper, we analyzed X-Organization problem and collected the business requirements. We used software development method and other tools to design, implement, test, validate and deliver a customized module for an existing application. Luckily, when the proposed solution to problem was presented to X-Organization, they agreed to implement it after several rounds of testing in their UAT environment and finally it became part of their production system. As a result, the developed module is actively being used and complimented by X-Organization clients.

This module has been developed as an assignment and because of limited time and space I could not concentrate and present other parts of the overall application. Furthermore, enterprise application cannot be developed by a single person. Enterprise application development process needs multiple development teams and each team works separately on different part of the application and contribute to the entire software development lifecycle process.

References

Intercultural Institutional Competence Proposed Standards Evaluation Framework

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Abstract

Educational institutional intercultural competence can only be fully achieved once accreditation bodies commit and embrace a systematic, coherent and explicit standardized framework and process of criteria, dispositions, institutional culture, attributes and policies that are aimed at fostering a real intercultural landscape that is beyond the rhetorical jargon often articulated in institutional mission and vision around the globe. Fostering the development of intercultural skills remains at the forefront of promoting understanding, respect and more equitable communities around the globe.

A clear set of institutional intercultural competence will further buttress accreditation processes and provide institutions with the opportunity to engage on a self-reflective process and to implement tangible and verifiable evidence that once analyzed and verified will validate best practices and the effectiveness of approaches. Hence, this study establishes why institutional intercultural competence is an important element in promoting the development of schools that are interculturally competent and explores the current limitations of international standards.

Moreover, this study reviews the three major accreditation bodies’ (AdvancED, International Baccalaureate and Cambridge) standards of school accreditation and points that currently none have standards that directly endorse the principles of interculturalism based on the universal values of fairness that ought to be reflected and articulated in school’s policies; respect which must be evident in the institution’s commitment to promote a climate of acceptance and understanding; and fairness by establishing an institutional culture of inclusion and equality. Finally, this study presents a comprehensive set of institutional interculturalism standards and criteria that serves a practical and tangible evaluative tool.

Keywords: Accreditation, Intercultural; Competence; 21st-century; International Baccalaureate; Equality.

Introduction

This study identifies an important lack of standards and, therefore, detrimental deficiency on the accreditation process of international K-12 educational institutions by three main accrediting bodies – AdvancEd, Cambridge, the International Baccalaureate. Furthermore, it calls for the review of accreditation processes and, finally, it proposes an evaluative framework of school accreditation that clearly addresses and sets a clear evaluative framework for institutional intercultural competence.

While many institutions of higher education have policies on interculturalism, the same remains to be seen in K-12 schools – many of which are independent and privately owned schools currently authorized or accredited by the three major abovementioned accrediting bodies which themselves have limited scope in promoting accountability. Therefore, while the proposed framework serves as an additional tool for institutional self-study and reflection, its scope remains limited as it may not be translated into practical and tangible actions at the institutional level. Finally, interculturalism is a complex, layered and multifaceted, concept seen a global and cultural asset and welcomed by many, but it may be also considered a threat by some.

The human experience is characterized by a rich diversity of cultures, ethnicities, languages, races, and religions throughout our planet. We speak about 6909 languages (Anderson, 2017); and we embrace thousands of religious denominations divided amongst an important number of ethnic groups. One may
argue that the richness in diversity of the human experience is our greatest asset. However, as history has shown many times over, it can also serve as our greatest divider with catastrophic consequences when those differences are used to instill fear, prejudice and hate.

Regrettably, it is unlikely that we will ever be able to completely erase fear, prejudice and hate. However, as educators, we ought to do and deploy every tool we can to curb, diminish and eliminate fear of the “other” and to promote intercultural competence in our educational institutions. By promoting diversity, fairness and respect for all, we are systematically and institutionally contributing towards the betterment of our community and, undeniably, of humankind.

By the time young adult enter higher education, their perceptions and views of the “other” are often well-established and galvanized by their experience and exposure during their early years. Hence, the earlier we can foster intercultural competence, the greater impact we will have in promoting individuals’ ability to behave and promote equality, fairness and respect. Therefore, this paper aims at providing a brief overview on the relevance of intercultural competence; the absence of standards for intercultural institutional competence in accreditation processes; and it proposes it presents a new rubric-framework for institutional intercultural competence.

Is institutional intercultural competence important?

On September 9, 2002, Israeli Prime Minister, Benjamin Netanyahu was scheduled to deliver a speech at Concordia University in Montreal, Quebec, Canada. The events that unfolded included riots, a swat squad intervention, tear gas, students and dignitaries stranded inside Concordia’s F. Hall Building and a school community traumatized and divided. The event left Concordia’s leadership, an institution characterized by diversity and tolerance, in utter shock and the community galvanized into two very diametrically opposed sides. The following is Thomas Hecht who is a Holocaust offer a vivid account of the day:

“This was anti-Semitism. I was the object of their hatred ... which expressed itself with placards; with a kind of venom which I have not seen on the streets of a city since the horrible days of occupied, Nazi-occupied Europe. What happened on the 9th of September was really a dark day for Concordia. And I think that the university will have to suffer the consequences of this. It will not come, the change will not come from one day to the other. The perception of Concordia will not be that of an institution where freedom of speech can be freely expressed. Because the way these thugs behaved was not any better than the people who were condemned for such behaviour in 1939 in Europe.” (Canadian Broadcast Standards Council National Conventional Television Panel, 2004).

Every school, college or university community is unique and a reflection of its own cultural, social, and more often than what we would like to admit, the political landscape and it is naïve to think otherwise. Could the events that took place at Concordia on September 9, 2002 been prevented? Could the university leadership been more sensitive towards the large number of Palestinian students on campus? Possibly. Nevertheless, it seems that any conjecture about how the situation could have handled past the event bears no impact on the past.

However one may feel about what became known nationally as the “Concordia University Netanyahu riot”, Concordia’s institutional experience reveals an important gap between what institutions aspire to be in terms of diversity, intercultural understanding and respect and the reality of the group dynamics, personal and social interests and the student population’s diversity and institutional culture. Unless educational organizations also commit to support intercultural competence at the institutional level and translate that commitment into well-articulated policies, practices, learning opportunities and personal social development of every staff and student, intercultural competence cannot be truly achieved.

The need for developing intercultural competence have been highlighted as central to address and prevent social problematic issues such as racism, discrimination and hate speech and as an important tool to promote understanding. Huber (2012) recognizes the importance of education’s role in fostering intercultural positive attributes, he argues: “Intercultural competence is a central precondition for every individual and since it is not automatically acquired, it needs to be developed, learned and maintained throughout life.”

Review of accreditation process and limitations of current international accreditation standards. International accreditation bodies such as the AdvancED, Cambridge and the International Baccalaureate offer a framework and curriculum for international education, however, it should be noted that none of the

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organizations consider intercultural competence both at the organization and cohort levels as criteria for accreditation purposes. The review of literature revealed that many of the learning approaches suggested by the three organizations would indeed promote intercultural awareness. Nevertheless, they fall short of making organizational intercultural competence a standard or criteria for international accreditation. The table below offers a general overview of the current five accreditation standards used by AdvancED, Cambridge and the International Baccalaureate and the number of institutions authorized by each organization:

<table>
<thead>
<tr>
<th>STANDARDS</th>
<th>AdvancED</th>
<th>Cambridge</th>
<th>International Baccalaureate Diploma Program</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Offered in 35,000 schools in 71 countries (AdvancED, 2017)</td>
<td>Offered in 10,000 schools in over 160 countries (Cambridge, 2016)</td>
<td>Offered in 4,655 schools over 170 countries (IBO, 2017).</td>
</tr>
<tr>
<td>1. Purpose and Direction</td>
<td>1. The school’s mission and educational values</td>
<td>1. Philosophy</td>
<td></td>
</tr>
<tr>
<td>2. Governance and Leadership</td>
<td>2. School management and leadership</td>
<td>2. Organization (Leadership/Resources)</td>
<td></td>
</tr>
<tr>
<td>5. Using Results for Continuous Improvement</td>
<td>5. Legal requirements</td>
<td>5. Assessment</td>
<td></td>
</tr>
</tbody>
</table>

Framing institutional intercultural competence

Policies that support intercultural competence – fairness

In order to support intercultural competency, educational institution ought to develop and articulate comprehensive policies that are inductive of promoting equal treatment and intercultural awareness in very practical terms. For instance, Bennet (cited in Safie 2014) suggests that cultural competency entails cognitive, affective and behaviours applied to different contexts.

Environment that promotes intercultural competence - respect

United Nations Education and Scientific Cultural Organization (UNESCO) have been at the forefront of establishing international conventions and recommendations that puts intercultural competence at the forefront. For instance, as early as 1974, UNESCO established a pointed recommendation: “Education for International Understanding, Cooperation and Peace and Education relating to Human Rights and Fundamental Freedoms” which calls for the “need for understanding and respect for all peoples, their cultures, civilizations, values and ways of life.” (UNESDCo, 2009). This can be best achieved in an environment and institutional atmosphere where trust and respect are achieved through dialogue, mutual understanding and the equal treatment of all.

Educational programme that fosters intercultural competence - inclusive

The, hallmark of intercultural education is diversity and, arguably, any institution aiming at adopting and embracing diversity ought to be inclusive and to take the necessary steps both in terms of resources and policies that promotes diversity beyond the veneer of bolstering its number of international students. An optimum inclusive academic community implies that its cohort regardless of background have an overall equal academic and social experience that takes into consideration individual and community identities (Council of Europe 2007). Additionally, its faculty and administration should be composed of
professional from diverse backgrounds and be equipped with the intercultural attributes that the institution wishes to impart.

The case for intercultural competence accreditation standards

The role of intercultural awareness has been recognized as an important personal attribute and in promoting positive climate. Additionally, there is a wide range of assessment tools to evaluate intercultural competence, for instance, the Intercultural Communication Institute (2017) offers an important repository of resources and assessment tools that can be effectively deployed by organizations and school communities to foster intercultural awareness amongst its cohort, faculty and professional members. However, the literature review unearthed scant evidence that systematic resources and frameworks of intercultural competence that addresses educational institutions, leading to the question: How can school leadership evaluate its effectiveness in promoting intercultural effectiveness? Ironically, it is practically impossible to visit educational institutions that do not call for intercultural awareness or global citizenship and whilst the mantra is often repeated, there is little evidence of any measuring tools which allow for an objective and pragmatic evaluation and validation of existing policies, approaches and activities that foster intercultural competence.

Therefore, this study proposes that various international accreditation agencies, such as aforementioned, enshrine intercultural competence as a core standard leading to accreditation. The rubric/framework here proposed ought to provide international school communities around the globe the opportunity to engage in a self-assessment process that ought to be a collaborative exercise which brings together all communities aiming at promoting organizational intercultural accountability.
## Institutional Intercultural Competence Assessment Rubric Framework

<table>
<thead>
<tr>
<th>Key Domain</th>
<th>Capstone 7-8</th>
<th>Milestones 5-6</th>
<th>3-4</th>
<th>Benchmark 0-1-2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Institutional Culture</td>
<td>There is strong evidence that the institution’s mission, vision, standards, policies and practices clearly demonstrate a commitment to promoting self-cultural awareness. Additionally, the community is proactive in promoting knowledge and appreciation and respect of others’ cultures, perspectives and diverse backgrounds.</td>
<td>The institution’s mission, vision, standards, policies and practices clearly demonstrate a commitment to promoting self-cultural awareness. Additionally, the community is proactive in promoting knowledge and appreciation and respect of others’ cultures, perspectives and diverse backgrounds.</td>
<td>Most of the institutions’ core documents demonstrate a commitment to promoting cultural awareness and appreciation of others’ cultures, perspectives and diverse backgrounds.</td>
<td>The institution ought to develop core documents that promote cultural self-awareness and appreciation and respect of other cultures and backgrounds.</td>
</tr>
<tr>
<td>Leadership</td>
<td>Demonstrates sophisticated understanding of the complexity of elements important to members of another culture in relation to its history, values, politics, communication styles, economy, or beliefs and practices.</td>
<td>Demonstrates adequate understanding of the complexity of elements important to members of another culture in relation to its history, values, politics, communication styles, economy, or beliefs and practices.</td>
<td>Demonstrates partial understanding of the complexity of elements important to members of another culture in relation to its history, values, politics, communication styles, economy, or beliefs and practices.</td>
<td>Demonstrates superficial understanding of the complexity of elements important to members of another culture in relation to its history, values, politics, communication styles, economy, or beliefs and practices.</td>
</tr>
<tr>
<td>Culturally Responsive Learning and Assessment</td>
<td>There is strong evidence that learning and assessments are reflective of an institutional commitment to providing a broader interpretation of cultural experiences both local and global. Curriculum and learning are culturally responsive and assessments systematically allow for the interpretation and respectful consideration intercultural experiences from various perspectives.</td>
<td>There is adequate evidence that assessments are reflective of an institutional commitment to providing a broader interpretation of cultural experiences both local and global. Curriculum and learning are culturally responsive and assessments allow for the interpretation and respectful consideration intercultural experiences from various perspectives.</td>
<td>There is little evidence that assessments are reflective of an institutional commitment to providing a broader interpretation of cultural experiences both local and global. Curriculum and learning, planning ought to further integrate culturally responsive and assessments that allow for the interpretation and respectful consideration intercultural experiences from various perspectives.</td>
<td>There is no evidence that assessments are reflective of an institutional commitment to providing a broader interpretation of cultural experiences both local and global. Curriculum and learning, planning ought to be thoroughly revised to integrate culturally responsive assessments that will allow for the interpretation and respectful consideration intercultural experiences from various perspectives.</td>
</tr>
<tr>
<td>Cultural and Social Environments</td>
<td>The organization articulates a profound and complex understanding of cultural differences in verbal and nonverbal communication (e.g., demonstrates understanding of the degree to which people use physical contact while communicating with different cultures or use direct/indirect and explicit/implicit meanings) and is able to skillfully promote and negotiate a shared understanding based on those differences within the institution and in the wider community.</td>
<td>The organization recognizes and the complex nature of cultural differences in verbal and nonverbal communication and is able to support all in developing a negotiating skills and understanding based on those differences.</td>
<td>The organization identifies some cultural differences in verbal and nonverbal communication and is aware that misunderstandings can occur based on those differences, but is still unable to negotiate and promote a shared understanding.</td>
<td>The organization demonstrates a minimal level of understanding of cultural differences in verbal and nonverbal communication and is unable to negotiate a shared understanding.</td>
</tr>
<tr>
<td><strong>Fairness &amp; Inclusion</strong></td>
<td>There is strong evidence that the institutional policies and guidelines are inclusive in nature and recognizes the equal status of students, faculty, and administration from a various backgrounds who are welcome members of the school community. The organization is proactive in identifying barriers to inclusion and in developing remedial approaches when needed.</td>
<td>The institutional policies are inclusive in nature and students, faculty, and administration from a various backgrounds are welcome members of the school community. The organization responds to barriers to inclusion develops developing remedial approaches.</td>
<td>Most of the institutional policies are inclusive in nature and students, faculty, and administration welcome members of the school community. The organization responds to barriers to inclusion develops developing remedial approaches.</td>
<td>There is little or no evidence that institutional policies supports inclusion neither is the community open to a diverse body members.</td>
</tr>
<tr>
<td><strong>Intercultural Engagement</strong></td>
<td>The organization’s provides outstanding and rich opportunities for its community members to be engaged in intercultural activities, initiatives and interactions.</td>
<td>The organization’s provides rich opportunities for its community members to be engaged in intercultural activities, initiatives and interactions.</td>
<td>The organization’s provides haphazard opportunities for its community members' engagement in intercultural activities, initiatives and interactions.</td>
<td>There are no opportunities for the organization’s community members to be engaged in intercultural activities, initiatives and interactions.</td>
</tr>
</tbody>
</table>
Application and limitations

While the proposed rubric/framework for intercultural competence assessment may serve as a self-evaluative tool or as a standard for international accreditation, by its own nature it is limited in scope since international accreditation organizations have no reinforcement or legal power and while many organizations such as UNESCO and the Council of Europe have traditionally emphasized the importance of interculturalism and the importance and urgency of promoting intercultural competence, they are limited in legal and political scope – issues that are beyond the scope of this study, nevertheless, important to be acknowledged.

Nevertheless, it is important that accreditation agencies articulate clear expectations and evaluative criteria for the promotion of intercultural competence as a pre-condition for school’s international authorization. In that endeavor, the implementation of the rubric/framework here included aims at providing a practical self-assessment/measuring tool which will enable both the accreditation agency and the school community to assess its policies, organizational culture, teaching and learning, approaches and attitudes in a continuum of effectiveness.

Furthermore, whilst many institutions have effectively implemented intercultural policies, important obstacles remain related to the nature of interculturalism in itself. Deardorff (2010) posits that many postsecondary institutions aim at internationalization to foster intercultural competence. However, she notes, “Yet few universities address the development of interculturally competent students as an anticipated outcome of internationalization in which the concept of “intercultural competence” is specifically defined” Deardoff’s survey of international scholars on the nature of intercultural competence revealed a variety of opinions and definitions and she posits this attests to the complex and multilayered nature intercultural competence.

Conclusion

There is an underlying assumption that the more diverse a school population is, the more likely the community and its members are to emulating the attributes associated with intercultural competence. However, as the University of Concordia 2009’s events illustrates, that, is an unnecessarily risky assumption with serious organizational and societal implications.

As noted at the outset of this study, the promotion of intercultural competence ought to be at the forefront of fostering fairness, respect and equality. In the age of globalization, we ought to promote the cultural skills our students and faculty need to be truly functional in whatever capacity they decide best fits their aspirations to contribute to their communities both locally and globally. In doing so, we will promote individuals who are able to assert positively and constructively with their own identities while able to engage with the “other” with equality, fairness and respect.

Finally, it is a well-accept reality that schools and teachers have a great impact on the development and students’ outlook in life. As educators, we are privileged and have a unique opportunity to embrace and impart intercultural competence and every school community and every classroom teacher have a moral and social obligation to do so.

References


Challenges and Issues of Medical and Nursing Education: An Outcome qualitative Research at various Medical/Nursing Institutes of Pakistan

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Abstract

Objectives: To evaluate the consequences of individualized education and systematic social contract education through exploring education systems of various training institutes. Materials & Methods: Qualitative design was applied and data were collected through using interview guide/topic guide. Data was collected on emails, telephone, and face to face interviews, till saturation. Data was collected in the months of January and February 2017 with different types of participants. Participants were selected using purposive and networking sampling from various medical/nursing colleges. Finally, 4 patients, 4 students 4 faculty members 6 academic key informants, were selected for interview. Results: After analyzing and data interpretation, the challenges and issues are categorized in four main themes, including 1. Deficient Multidisciplinary /multi-setting teaching methodology, 2. Curriculum paradigm shift, 3. Curriculum misalignment and 4. Need for Professionalism. Each of these main themes comprises several subthemes and accordingly each subtheme encompasses several issues. Each issue is presented in form of verbatim. Recommendations: Curriculum revisions and retreat can help in facing the challenges and fixing up the issues. Research and program evaluation is mandatory for the curriculum paradigm shift.

Keywords: Multidisciplinary teaching, Multi-setting teaching methodology, Curriculum paradigm shift, Curriculum alignment, Curriculum misalignment.

Introduction

Doctors and nurses as healthcare providers are critically observed by the society as highly respectable members of the society. They not only deal with the lives of the patients rather with their emotions, feeling and thoughts with an extreme of accountability and responsibility. Medical/nursing profession is very sensitive and one error, no matter how minor or insignificant for the professional, can stamp badly to the minds of patient, family and community. To avoid serious repercussion, it is imperative that medical/nursing graduates should have the requisite sound professional knowledge, skills, and most importantly attitude to deal head on with the challenges that real life brings to them. In recent past the paradigm shift of professional educational system have brought certainly a rise in professional education but unfortunately a fall in professionalism and decline of ethical human care.

Fundamentally education is one of the most important issues that could affect nurses and doctors to work in an ethical and professional manner. Regarding to importance of the issue, the present research aimed at exploring challenges in medical/nursing education that makes them away from social contract. This issue is very important and the results of this research could help policy makers and educational planners for addressing the said issue (Earle, Scribani, Scott, May, & Jenkins, 2015).

Materials and methods

Qualitative design was applied for the purpose of the study and data were collected through using interview guide/topic guide (Refer Appendix “A”). This interview guide was used to collect data on emails, on telephone, and face to face interviews. Prior to starting qualitative study, reviewing the literature and a pilot study was done and accordingly interview guide for interviews was extracted for
interviews. Topic guide mainly focused on challenges of medical and nursing education in various teaching hospitals and institutes of Pakistan. Questions of topic guide were about challenges/issues and planning to meet those challenges in future. Some modifications in interview guide were made after pilot interviews. The outcomes from pilot study were Professional communication gap, Theory practice gap, and less interaction with patient, family, community and society at large.

Based on pilot topic guide and its modifications, semi-structured interviews were conducted in the months of January and February 2017 with different types of participants.

Participants were divided in main categories including, patients (P), medical/nursing students (MS, NS), faculty members (F), academic key informants (AKI), executive key informant (EQI) from medical and nursing colleges and institutes. Participants were selected using purposive and networking sampling. Army and civil areas are tried to cover and sample was selected from all over the country at micro and macro level of the Pakistan’s health education system. Data was taken from Combined Military Hospital Multan Institute of Medical Sciences, Shifa Tameer-e- Millat University Islamabad. National University of Medical Sciences Rawalpindi, Shalimar College of Nursing Lahore, and Syeda Waheed College of Nursing Lahore.

Interviews were performed until reaching to data saturation. Finally, 4 patients, 4 students 4 faculty members 6 academic key informants, were selected for interview. No executive key informants responded either on email or text. Although, most of participants had studied medicine and nursing and were well informed about their education system and thus the results would be reliable.

Face to face and telephonic interview time varied from 20 minutes to 35 minutes. Most of the participant did not allow recording of conversation, only 2 were recorded and transcribed verbatim and in one case interviewer noted during interview. Data were analyzed using thematic analysis approach. In this way, texts were coded and issues and subthemes were extracted. Several ethical issues were considered in interviews with participants. All participants were consented to participate in the study and free to express their opinions about the subject. Interviewees were ensured the confidentiality of emails, recorded and noted interviews and their names and positions. As well, the study protocol complies with the ethical guidelines of the 1975 Declaration of Helsinki and approved by the higher authorities of GHQ (Refer Authority letter number in consent form and interview guide).

Results

After analyzing and data interpretation, four main themes were found, including professionalism, multidisciplinary /multi-setting teaching methodology, curriculum paradigm shift, and curriculum alignment. Each of these main themes encompasses several subthemes and accordingly each subtheme encompasses several issues. The thematic framework of the findings is presented in Table 1. According to table 1 challenges and issues in medical/nursing education are as follows:

Table 1. Thematic framework of challenges and issues in medical/nursing education (verbatim are written after the thematic framework)

<table>
<thead>
<tr>
<th>Main Themes (MT)</th>
<th>Sub Themes (ST)</th>
<th>Issues (I)</th>
</tr>
</thead>
</table>
| MT.1.Professionalism | ST. 1.Communication | 1. Lacks in therapeutic communication  
2. Non-touch techniques of patient assessment |
|                  | ST. 2.Ethics : Violating ethical principles | 1. Unjustified care to officers vs soldiers, paid vs unpaid  
2. Breach of confidentiality and privacy  
3. Not finding a human in |

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### Professionalism

#### 1. Lacks in therapeutic communication

A participant’s (NS) verbatim *I don’t feel confident in discussing with doctors about care plan of my ward patients, I want to match nursing diagnoses with medical diagnoses, I want to do health assessment with doctor or want to share my findings of assessment documentation, but I don’t have document to write nurses notes, and as subordinate or separate entity from doctors I kept silent while conducting daily ward round.*

#### 2. Non-touch techniques of patient assessment

A participant’s (P) verbatim: *Sister mareezon se ziada files main masroof rehti hain, Doctor Sahib door hi say keh daitay hain mareez ki saans (breathing) theek nahi lag rahe machine (Nebulizer) lagado.*

#### 3. Unjustified care to officers vs soldiers, paid vs unpaid

A participant’s (P) verbatim: *……ajkal kay doctors and sisters bhi politician ho gay hain. Jahan se faida ho what pe care bhi di jati hy……*
4. Breach of confidentiality and privacy

A participant’s (MS) verbatim: *I don’t feel good to discuss about personals of a patient during ward round and in a team of doctors. Ward sisters also discuss everything on the counter and all patients listen about every patient......*

5. Not finding a human in a patient

A participant’s (P) verbatim: *Hospital main aa k lagta hy k hum insaan nahi hain. Hamain aik qitaar main laga diya jata hy medicines and treatment k liyay*

6. Robotic styled care providers

A participant’s (P) verbatim: *Sister main aur robot min koi faraq nhi lagta, muskurana tou door ki baat hay;......tassali (counselling) ka aik lafz nhi boltin.......*

7. Self-importance

A participant’s (P) verbatim: *Doctor sahib tou bahot parhy likhay aur masroof insaan hain, kehtay hain kay hmari baat kay liyay unky pass time nahi hay.......unko aur bhi bahot kaam hotay hain.*

Multi-disciplinary, Multi-setting teaching methodology

1. Separate teaching and learning entities of doctors and nurses

A participant’s (MS) verbatim: *I don’t know the types of taught subjects and depth of knowledge nurses have, ......am not aware of nurses jobs and responsibilities, I think they are care takes of ward and equipment.*

2. No harmony and therapeutic inter and intra personal relationships

A participant’s (NS) verbatim: *Hum logon ne koi subject ikathay (together) nahi parha. Koi case study ya case management ikathay plan ya present nahi ki.......*

3. All teaching tenures remains stagnant

A participant’s (NS) verbatim: *Har subject ki class room teaching similar hay....... I think har subject ki teaching methodology and setting change honi chahiyan*

4. Less exposure in community settings, except OPDs

A participant’s (P) verbatim:

A participant’s (MS) Verbatim:

*We are educated in an ideal environment ....we weren’t prepared for an overcrowded OPD and general ward settings.*

Another participant’s (NS) Verbatim:

*Ward kay patients ka kaam tou kafi kia hay lekin mera community work ka koi experience nahi hy*

Curriculum paradigm shift

1. Modular system of education is newly adopted and started without training of faculty

A participant’s (AKI) Verbatim: *Modular system is started now a dys, but no prior training is given to the trainers.......*

2. Few institutes are still on eclectic approach

A participant’s (AKI) Verbatim: *No model based curriculum is being followed in our universities, even though we are planning to do so.......*

3. Few adopted one model for entire program, rather using variety of subject wise models

A participant’s (AKI) Verbatim: *.....we are using SPICES model for the curriculum of medicine......*
Curriculum alignment

1. Educational philosophies are not reflecting in curriculum
   A participant’s (AKI-1) Verbatim: We are using social constructivism as philosophy …..
   A participant’s (AKI-2) Verbatim: We are using philosophy of constructivism ….
   A participant’s (AKI-3&4) Verbatim: philosophy is undefined ….
2. Lack of social contract due individualized mode of education
   There are some challenges regarding to curriculum of medical/nursing education; i.e., some courses are
   needed for preparing students for working in social contract. In this study we found that focusing on skills
   needed for general public practice, health related courses, management and leadership, communication,
   and medical ethics could make a student ready to an accept practicing in all types of settings.
   A participant’s (MS) Verbatim:
   After graduation at the first day of practice in general ward. I had a patient and I wanted to fill and
   sign the referral sheet for the patient. I was not knowing how to handle the sheet and crowd of attentants
   around the patient…the patient found this and this resulted in bad reputation of me as newly
   graduate….They think that I don’t have enough skill of treating……
   Another point is that newly graduates in general OPD and wards settings where work is more on health
   issues instead of treatment and cure. They are the head of health system and they need to have perception
   about health subjects such as epidemiology, social determinants of health, health houses and their
   functions, etc. Nevertheless, as newly graduate stated, their education is different from what is needed in
   actual settings. They learn mainly about treatment of complicated cases in specialized hospitals.
   A participant’s (MS) Verbatim:
   …we need to learn humble health and social issues that we need them more in actual practical
   settings…instead of many complicated health issues…….
3. Missing of social sciences subject
   A participant’s (MS) Verbatim: The supporting subjects should start in year one of medicine…….
   A participant’s (NS) Verbatim: I have knowledge of sociology and psychology, where I know human
   relationships and interaction with diverse type of patients…..

Discussion

Nurses and doctors are the key healthcare provider in health care settings. Education is a factor that
could affect the performance and conduct of these health care providers. Accordingly this qualitative
outcome research was done to find educational challenges that limit health care providers to work in
professional, ethical and subtle human care. According to the results four main challenges were, including
professionalism, multidisciplinary /multi-setting teaching methodology, curriculum paradigm shift, and
curriculum alignment (Ganle, Parker, Fitzpatrick, & Otupiri, 2014).

Professionalism

A challenge was related to students’ perception about their future working condition. Most of students
look for specialized courses in medicine and they would not stay general physicians. They do not consider
general practice after graduation in many cases. In fact Students’ perception about their personal career
development is a factor that affects their behavior, conduct and communication with the patients. Personal
and professional expectations also proved as a factor affecting on practice. On the other hand students are
not exposed to actual crowded and busy clinical settings. Accordingly it seems necessary that some
modification in education is needed to guide students’ perception toward general practice in a
professional way (McLean, Guthrie, Mercer, & Watt, 2015), (Unwin, & Peters, 2016)

Multidisciplinary /multi-setting teaching methodology

Another challenges that was found in this research were challenges related to education setting and
approach. Instructors and education location as well as education approach could have a significant

In Pakistan, medical/Nursing education is hospital oriented. Most of practical courses are presented in hospitals and students are not getting familiar with community settings and health issues. This approach could have a significant effect on medical/nursing students’ perception about their future working condition.

Instructors are one of the important factors in education that could guide student’s ideas and thoughts. Instructors who experienced working in all types of clinical settings and try to motivate their students for all types of practice are key factors. Students patterned form their instructors and if they stress on self-sacrifices, the spirit of working for deprived people, and medical ethics, students will be affected.

Education setting and approach could be as important as curriculum. It refers to factors that education is delivered via them including education approach, place of education, and instructors.

**Curriculum paradigm shift**

Medical curriculum has been recently transformed from traditional to modular approach and on SPICES, but still in infancy period as faculty is not yet prior or along with prepared for such a big change. Nursing curriculum is as semester system and curriculum is being in revision phase.

**Curriculum alignment**

Curriculum of medical education in Pakistan is a factor that does not properly make graduates ready for handling social issues. Authors consider curriculum as a factor that build an image for future working. The medical curriculum in Pakistan is individual-oriented; whereas, community or social-oriented education increases intention of working. Though, the students are not getting familiar with skills needed for social practice (Qing, Hu, Chen, Peng, Li & Wei 2015).

A robust curriculum, becoming a diseased curriculum which is called “Curriculumegaly” although less important than the quality of the teachers, is a factor that effects medical education imparted to young undergraduates. Curriculum needs constant revision in the light of changing social circumstances. The unparalled pace of progress in medical sciences has translated into “information overload”, causing an ever increasing amount of material taught to the students, stifling their education by the accretion of facts and technological information. Uncontrolled transfer of information has led to repetition and disjointed teaching and lessening the attention to be paid on real, actual societal issues (Kawamoto, Uemoto, Ninomiya, Hasegawa, Ohtsuka, & Kusunoki 2015).

**Recommendations**

There is strong need felt to revisit the methods by which our students are converted from raw recruits into medical/nursing graduates. In simple terms, professional education needs to be constantly updated in response to our social needs and requirements of the professional practice. A first year student of medicine or nursing should start interacting with patient as to evolve into a medical practitioner. This is to best utilize their intellectual acumen, interests, and foster social activities. Two factors that are in the control of the institutes and colleges that is the quality of teaching faculty and the curriculum. Staff development programs should be on cont focusing on improving teaching skills.

**References**


Uganda DHIS2 Case Based Surveillance System: Would Have Detected the 2016 Yellow Fever Outbreak in Uganda

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Abstract

Majority of developing countries have relayed on aggregate weekly epidemiological data to detect, investigate and respond to outbreak, however as revealed by the West Africa Ebola Outbreak in 2015, these systems were not able to detect the outbreak in time. This has driven countries to building effective case based surveillance systems aimed to link cases to laboratories. Uganda’s journey to a web-based electronic case-based surveillance started in 2013 with the United States Government (USG) Uganda Global Health Security (GHS) demo project.

On 24th March 2016, an alert of a suspected Viral Haemorrhagic Fever (VHF) outbreak was received by the Ministry of Health through the Public Health Emergency Operations Centre (PHEOC) and the case was confirmed on 8 April 2016 for Yellow Fever. A total of 60 suspected YF cases were reported between April and June, with 7 cases testing positive.

Building on the successful GHS Specimen Tracking System, we embarked on rebuilding the DHIS2 tracker expanding the scope and coverage to the now eIDS. Different disease specific Case notification forms were reviewed and common key notification elements harmonized into a general minimum data case DHIS2 tracker registry for immediate reporting.

The system underwent vigorous testing and fine tuning using the yellow fever outbreak cases. The systems demonstrated that it’s possible to build an effective case notification and lab confirmation system using DHIS2 tracker with automated SMS and email notification. With the success above it recommended to countrywide rollout and adoption.

Keywords: Disease Surveillance, Outbreak, Notifications, Yellow fever, DHIS2, Tracker.

Background

Majority of developing countries have relayed on aggregate weekly epidemiological data to detect, investigate and respond to outbreak, however as revealed by the West Africa Ebola Outbreak in 2015, these systems were not able to detect the outbreak in time. This has driven countries to building effective case based surveillance systems aimed to link cases to laboratories (Jose and Holman 2017). Uganda’s journey to a web-based electronic case-based surveillance started in 2013 with the United States Government (USG) supported through Centers for Diseases Control and Prevent (CDC) Uganda Global Health Security (GHS) demo project. A three-pronged supported was to improve among others information systems to ensure laboratory confirmation is within 24 hours after identification.

Uganda has had a number of outbreaks over the past whose identification and management has not been electronically managed leaving a great impact as result of late confirmation because of the paper data transition and notification from majority of the sources. Implementation of an web-based communicable disease surveillance system (SmiNET-2) in Sweden with immediate case notification and laboratory results revealed the ability for timely case identification, confirmation and outbreak management (Rolfhamre P, Jansson A, Arneborn M, Ekdahl K, 2006).

The purpose of this study was mainly to determine if the newly developed Uganda National Electronic Case Base Surveillance could have timely detected, confirmed and managed the 2016 yellow fever outbreak that was first reported as Viral Haemorrhagic Fever (VHFs) from 3 household members in rural Uganda.
The study is both a methodological description of the developed and an evaluation of its capabilities of prevent, detect and respond to infectious diseases.

In 2013, President Obama announced the United States’ initiative to support developing countries strengthen their surveillance systems to keep the world safe and secure from infectious diseases. The agenda was endorsed and launched by the G7 countries in February 2014 and now growing with over 50 nations, organizations participating. Prior to its launch the United States Centres for Disease Control and Prevention selected Uganda and Vietnam to demo the initiative by building strengthening surveillance systems around laboratory and information systems. Uganda used the District Health Information Software (DHIS2) to build a case notification, specimen tracking and online lab resulting systems that was piloted in 3 districts during the demo exercises. However, its use and scope expansion did not continue until early 2045 when scale and expansion was realized after the Liberia Ebola outbreak.

Building on the successful Global Health Security DHIS2 Specimen Tracking System, HISP Uganda together with CDC Uganda, MoH Uganda, MoH PHEOC embarked on rebuilding the DHIS2 tracker expanding the scope and coverage to the now eIDS. This system needed to be stress tested before country rollout and desk testing using the yellow fever data collected both before, within and after the outbreak in 2016.

On 24th March 2016, a phone alert of a suspected Viral Haemorrhagic Fever (VHF) outbreak in Masaka district (Kaloddo village) was received by the Ministry of Health through the Public Health Emergency Operations Centre (PHEOC). Three cases from a single family had presented to Masaka Regional Referral Hospital with high-grade fever that was non-responsive to anti-malarial treatment with haemorrhagic signs and acute neurological signs (convulsions and unconsciousness).

On 8 April 2016, the National IHR Focal Point of Uganda notified WHO of an outbreak of Yellow Fever (YF) in Masaka district, south of Kampala which was confirmed on 8 April 2016 when three blood samples from suspected Viral Hemorrhagic Fever (VHF) cases tested positive for Yellow Fever. A total of 60 suspected YF cases were reported between April and June, with 7 cases testing positive in three districts (5 in Masaka, 1 in Kalangala and 1 in Rukungiri). There was no electronic system in place to support early notification, specimen tracking, online laboratory results entry and outbreak monitoring thus the wide spread and magnitude.

It’s evident that lab confirmation of yellow fever took over 24 hours and spread over 3 districts, which given an electronic disease surveillance like the one developed would have helped early detection and management reducing spread.

Methodology

Building on the Global Health Security Demo specimen tracking systems, the national eIDS was further customized to address all the immediate notifiable disease in Uganda. A number of different disease specific Case notification forms were reviewed and common key notification elements harmonized into a general minimum data case DHIS2 tracker registry for immediate reporting.

Important laboratory confirmation pieces like test request, specimen tracking and receipt, lab resulting and contact tracing we to be addressed using different DHIS2 tracker repeated stages accessed and update by different players during detect and confirmation.

The system was presented to different stakeholdes including World Health Organization (WHO) who provided valuable feedback to the systems in line with standard disease surveillance. All suggestions and improvements were implemented prior to the evaluation exercise.

The different recent Ugandan outbreaks were evaluated to identify one that could provide sufficient stress testing to the system. Magnitude and spread was key in the selection criteria including availability of data on the cases together with laboratory test results.

Following the order in which cases were identified and reported, data entry of all the cases was carried out from all available Ms Excel and Ms Word line lists and lab focusing on case registration and lab results.
Data was analysed using the DHIS2 inbuilt analytic tools displaying on dashboards line lists and epi-curves. The results were presented to stakeholders involved.

**Results and discussions**

**System fine-tuning**

Following the yellow fever case definitions and sharing with disease surveillance stakeholder’s forum receiving constructive feedback, the electronic system was fine-tuned adding all missing data collections variables and required notifications especially as regards yellow fever identification, confirmation and outbreak management. The email server and SMS getaway were configured to allow for mail and SMS broadcast. Providing an electronic interface for a suspected case registration as seen in Fig 1 below enabled timely notification of the Public Health Emergency Operations (PHEOC) in form of emails and phone short structured messages (SMS).
Case Identification, registry and notification

On registering the first case, the system was automatically able to send both email and SMS to all National Task Force team members who confirmed by call us back confirming receipt. This created a lot of trust in the system as immediate notification was achieved. Timely notification allows disease surveillance team to quickly swing into action even if it’s a rumor. This was a great assurance to the team that as long as the District Disease Surveillance officer has access to the online systems all the members are notified at the same time.

Lab confirmation

The system allows for laboratory test request while specifying the laboratory to test the specimen, this in turn send a notification to the core laboratory team of the specimen referred to them for testing. With the ability to track, the specimen right from the field (source), the testing laboratory received and alert prompting them to start preparing to test the specimen and provide test results within 24 hours. Few hours later assuming the laboratory had received the specimen and tested, online results posted to the system. As illustrated in Figure 2, the entry of lab results trigger an alert the Public Health Emergency Operation Center (PHEOC) and National Task Force, to check the results and proceed with investigations.
Both laboratory teams and Task Force teams were able to receive appropriate notification in time to proceed with investigations. The study demonstrated that it is possible to build an effective case notification and lab confirmation system using DHIS2 tracker with automated SMS and email notification functionality.

**Epidemiology threshold and notification**

WHO recommends countries to setup threshold for each notifiable disease in their setting that would be used to compare with the positive cases for identification of possible outbreaks. For Uganda, any one positive laboratory confirmed case is enough to trigger an outbreak. The system was configured to alert by email and SMS the PHEOC and Task Force members, if one or more cases of Yellow Fever are confirmed from the laboratory tests.

Once the systems validations rules run, and the yellow fever cases were one and greater, notifications were sent to the PHEOC and National Task Force members who confirmed receipt.
Laboratory testing results

Samples were collected from all suspected cases and shipped to Uganda Virus UVRI, where testing was done for all possible pathogens including VHF, Chikungunya, Zika and many others. Only 7 cases tested positive for yellow fever. All these laboratory results including the negative pathogen test results were entered into the online system.

With all the data entered, the system customized dashboards were able to display the outbreak Epi-Curve, tool highly used by epidemiologists during an outbreak management to monitor cases daily and weekly. The Epi-Curve as shown in figure 4 below.

Another important outbreak analysis is a line list of all the identified cases for easy contact tracing while conducting further investigation which this system was able to produce this list

Figure 4. Epi-curve example of yellow fever outbreak 2016

Conclusions

The ability to replicate the outbreak identification, confirmation and management using retrospective data entry and notifications as described above, clearly demonstrated the capabilities of any disease outbreak containment. The system was also presented to the Uganda eHealth Technical Working Group and approved for rollout. Based on the results and achievements as demonstrated by the study, it’s recommended for country rollout to monitor all the Uganda’s immediate notifiable diseases.

References

[5].http://www.who.int/csr/disease/OP_YellowFeverFINAL.pdf: Downloaded September, 20th 2017 at 10:00AM
[6]. https://www.dhis2.org/ visited on September 19 at 12:00.
Investigation of Bioactive Properties in a Selected Species from the Leguminosae Plant Family Found in Guyana

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Abstract

Plants have always been a vital source of medicine since the dawn of time for man. The pharmacological evaluation of substances from plants is an established method for the identification of lead compounds which can lead to the development of novel and safe medicinal agents. Based on literature the Fabaceae or Leguminosae plant family has medicinal properties which have been proved safe for usage on humans. Species such as Cassia fistula, Saraca asoca, Cassia auriculata and Cassia tora have laxative, treating gynecologic disorders, anti-dysentery and treating skin disease respectively are from the Caesalpinioideae; a sub-family of the Fabaceae or Leguminosae plant family. Most of these botanicals contain heterogenous products in them. These products are bioactive in nature i.e. they are secondary metabolites which aids in the protection and survivability of the plant. These secondary metabolites are compounds such as alkaloids, terpenoids, steroids and polyketides etc. To extract these bioactive compounds from the plant, polar, semi-polar and non-polar solvents are used sequentially for extraction. To help identify if a plant has bioactive properties special bioassays are used which are an inexpensive to carry out on the botanicals. Bioassays offer a special advantage in the standardization and quality control of heterogeneous botanicals products. One such bioassay is the brine shrimp lethality test (BST) a general bioassay. The brine shrimp lethality test (BST) is used to predict the presence, in the plant extracts, cytotoxic activity. This bioassay uses the micro-organisms Artemia salina which is placed in different concentration levels of the plant extracts. The percentage death tells how toxic the plant extract is. The BST is especially suggested as an inexpensive, simple and rapid means of standardization of bioactivity in heterogeneous botanical products.

Keywords: Artemia salina, brine shrimp lethality test, secondary metabolites, cytotoxic activity, medicinal plants, heterogeneous botanical.

Introduction

Plants are the first source of medicine that was used for both humans and animals. Even now at present many plant species are being studied for the presence of medicinal properties using various bio-assays to check for these properties. Without plants life as we know it would not exist on earth, since plants produce oxygen and food for all living things to survive. Plants are a major group of life forms and include familiar organisms such as trees, herbs, bushes, grasses, vines, ferns, mosses, and green algae. About 350,000 species of plants, defined as seed plants, bryophytes, ferns and fern allies, are estimated to exist currently. As of 2004, some 287,655 species had been identified, of which 258,650 are flowering and 15,000 bryophytes. The plantae kingdom is divided in to many families some of which has herbal or medicinal properties. Since the dawn of time man have been using plants for many medicinal purposes for sickness. This is because plants contain in them many secondary metabolites that are developed during growth. These secondary metabolites are small molecules like alkaloids, terpenoids, phenols and steroid etc. However then man did not know exactly what was in the plants that made them had healing properties. But in today’s technological world and the many bio-assays experimental methods can help in identifying these bioactive compounds in plants. Bioassays offer a special advantage in the standardization and quality control of heterogeneous botanical products. Such products can be “heterogeneous” due to the presence
of mixtures of bioactive components either from the same or from purposefully mixed botanical sources. One plant family that many studies are being done on or that has been done on is the *Fabaceae* or *Leguminosae*.

Investigations of the plants family mentioned above may prove to be helpful to Guyana’s development as country, since the countries biodiversity is untouched. Bioactive properties if any to be found in these plant families are of herbal, medicinal and pesticide components can open new ways for the agricultural industry. Since these chemical components are of natural origin i.e. synthesized by plants, they will have almost no harmful effect on the environment. Another advantage of extracting chemical components from the plant species is that they are of abundance in the country; hence production of any useful bioactive properties will be of great benefit to the country’s economy. Thus it will be cheap to cultivate any one of these plant family on a large scale.

**Objectives**

The experimental research to be carried out on the plant family will enable the Guyanese biodiversity to expand since most of Guyana’s plant life is under researched.

- To investigate the bioactive properties in a selected *Leguminosae* plant family using cytotoxicity bio-assays.
- To prepare crude extracts for the selected bioassay.
- To determine which solvent is most effective in extracting the bioactive properties from the plant species.

**Literature review**

Extensive work has been done on the plant family worldwide, but none has apparently been done in Guyana. Also they are used as perfumes. Studies show that these species possesses many useful chemical components with bioactive properties that could be beneficial to the herbal and cosmetics industries (Nor Azah et al. 2001, Zaridah et al. 2003). Many plants synthesize substances that are useful to the maintenance of health in humans and other animals. These include aromatic substances, most of which are phenols or their oxygen-substituted derivatives such as tannins. Many are secondary metabolites, of which at least 12,000 have been isolated — a number estimated to be less than 10% of the total. In many cases, these substances (particularly the alkaloids) serve as plant defense mechanisms against predation by microorganisms, insects, and herbivores. One such plant family is the *Fabaceae* or *Leguminosae* are a large and economically important family of flowering plants, which is commonly known as the legume family, pea family, bean family or pulse family. It is the third largest family of flowering plants (after Orchidaceae and Asteraceae) with 730 genera and over 19,400 species, according to the Royal Botanical Gardens. The *Fabaceae* comprise three subfamilies (with distribution and some representative species):

- Mimosoideae: 80 genera and 3,200 species. Mostly tropical and warm temperate Asia and America. Mimos, Acacia.
- Caesalpinioideae: 170 genera and 2,000 species, cosmopolitan. Senna, Cassia.
- Faboideae: 470 genera and 14,000 species, cosmopolitan. Astragalus, Lupinus.

The *Fabaceae* plant family contains species such as the *Dolichos biflorus*, *Pongamia pinnata*, *Mucuna pruriens*, *Glycyrrhiza glabra* and *Teramnus labialis* are used in diuretic, anti-viral, anti-parkinsonism, anti-inflammatory and paralysis respectively (International Journal of Applied Science and Engineering 2005. 3,2: 125-134).

Below are a few bioactive compounds found in plants:
Ephedrine

\[
\text{HO} \quad \text{N} \quad \text{CH}_3
\]

Morphine

\[
\text{HO} \quad \text{O} \quad \text{N} \quad \text{H}
\]

Methodology

Collection and extraction: the plant species was collected at the Annandale Primary School from one tree and identified at the University of Guyana Biodiversity center. The bark, stems, leaves and pods were collected and put to air dry for 2-4 weeks. After drying the plant parts that were collected was cut and crushed into small pieces. Then 200 grams of each plant parts were weighed and placed in jars. Each jar was then filled with Dichloromethane to extract the non-polar constituents first. The plant parts were soaked for 2-3 days and then the solvent was decanted and a second soaking was done for another 2-3 days. This same procedure was carried out for the methanol solvent. The extracts were then placed in a rotation evaporation to take off the solvents. The crude extracts were then weighed and kept for the bio-assay.

Preparation of brine shrimp larvae

The plant extracts were then tested for cytotoxicity using brine shrimp. The sea water was prepared according to directions on box (38g sea salt per litre of water). The sea water was placed in small tank, and the brine shrimp larva was added to one side of the divided tank and was covered. A yeast solution was then added for food for the larvae. A lamp was placed on the other side to attract the hatched larvae. A period of 48 hr was allowed for the shrimp to hatched and mature as nauplii.

Brine shrimp microwell cytotoxicity assay

Each plant extract solutions were tested at concentrations of 1000, 100, and 10 mcg/ml (ppm). Three vials were prepared at each concentration for a total of nine vials. 20 mg of extract was weighed out and dissolved in 2ml of the solvent and then 0.5 ml was removed
using a 1 ml syringe 3 times for the 1000 ppm concentration. 0.2 ml was removed and 1.8 ml solvent was added to make up the 100 ppm concentration. The same procedure was done for the remaining concentration. The vials were left in open for the solvent to evaporate. Then 5 ml of the brine water was added to the vials, along with 10 brine shrimp and 1-2 drops of yeast solution. The vials were then placed in light for 24 hours. After 24 hours later the number of survivors were counted and recorded. The SPSS program was used for data analysis.

Results

Table 1. Showing number of survivors in control

<table>
<thead>
<tr>
<th>VIALS</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOLVENTS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DCM</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>MeOH</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 2. Showing number of survivors in plant extracts for DCM

<table>
<thead>
<tr>
<th>Plant extracts/ppm</th>
<th>VIALS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>DCM Bark/1000</td>
<td>0</td>
</tr>
<tr>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>DCM Leaves/1000</td>
<td>2</td>
</tr>
<tr>
<td>100</td>
<td>4</td>
</tr>
<tr>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>DCM Stem/1000</td>
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</tr>
<tr>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>DCM Pod/1000</td>
<td>0</td>
</tr>
<tr>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>10</td>
<td>5</td>
</tr>
</tbody>
</table>

Table 3. Showing number of survivors in plant extracts for methanol

<table>
<thead>
<tr>
<th>MeOH Bark/1000</th>
<th>0</th>
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</thead>
<tbody>
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<td>0</td>
<td>0</td>
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<tr>
<td>10</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>MeOH Leaves/1000</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
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<td>10</td>
<td>0</td>
<td>1</td>
<td>0</td>
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<tr>
<td>MeOH Stem/1000</td>
<td>0</td>
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<td>10</td>
<td>1</td>
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<td>0</td>
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<tr>
<td>MeOH Pod/1000</td>
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<tr>
<td>10</td>
<td>1</td>
<td>0</td>
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</table>

Percentage death = number died in test - number died in control
Number exposed

Percentage death = \( \frac{10-10}{10} \times 100 \)

= 100 %
Discussion

The SPSS program was used to analyze the data but since the percentage death was high it could not be computed using the program. There was 100% death of the brine shrimp in the controls using the solvents; hence the solvents are toxic to the organisms. From the table it can be seen that at concentrations level above 1000 and 100 ppm there was 100% death of the brine shrimp for both solvents, this can be linked to the fact that this plant family contain bioactive properties (secondary metabolites) such as alkaloids, aromatic compounds and phenolic compounds which is according to literature. For the methanol extracts only 1 brine shrimp survived at concentration 10 ppm for the pod, stem and leaves. This may due to the methanol was used to extract the polar constituents which are more toxic to the larvae, compared to the DCM extracts at concentration 10 ppm for all the plant parts there were more survivors thus the non-polar constituents are less toxic at concentrations below 10 ppm. However for both solvents less than half of the larvae survived.

Conclusions

From the bio-assay carried out using the brine shrimp lethality, it is conclusive that the concentrations levels above 100 ppm are very toxic to the larvae for both the solvents used. Thus concentrations of 10 ppm and below are less toxic to the larvae for the DCM extracts and for the methanol extracts it is still toxic to the larvae. The methanol proved to be better solvent for extraction used on the plant. It is also conclusive that this plant family contains bioactive properties.

Recommendations

Future work can be carried out on the same plant species using higher mass for extractions and also using different solvents such as ethanol and hexane. Also lower concentrations level of less than 10 ppm can be used in the brine shrimp lethality.

References

[10]. Q.A. Nguyen et al; A new Phenylnpropionoid Ester; August 2nd, 2002.
[13]. The use of spices and medicinal as Bioactive for Protectants; [http://www.fao.org/docrep/x2230e/x2230e09.htm](http://www.fao.org/docrep/x2230e/x2230e09.htm).
Financial Inclusion in the Digital Age, its Role and Impact on Economic Growth

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Abstract

Globally, Financial Inclusion (FI) and Digital Financial Services (DFS) have become a life-blood and key driver of socio-economic growth and development on the backdrop that economies are dependent on financial services to attain advancement. The paper explored the role of Mobile Money Services (MMS), also known as DFS in enhancing access to financial services.

The research was driven by the increasing mobile network spread, the under-served, ubiquity/penetration of mobile devices amongst both the poor and low-income earners, factors affecting FI, fees which are disincentive to users, introduction of cashless Nigeria by the Central Bank of Nigeria as well as the emergence of Mobile Money Services in 2009. An in-depth analysis of MMS in driving FI and paradigm shift in traditional payment systems was embarked on and focused on issues associated with services provided MMS Operators viz transaction fees, transaction value and count; stakeholders within the ecosystem, user experience and security of funds, policy and regulation on financial services delivery as well as inclusive participation of the government, regulatory bodies and infrastructure providers.

The findings showed that while the MMS have a huge potential to drive DFS in Nigeria, it would require deliberate actions by all stakeholders to establish an appropriate solution capable of transforming the economy and also the contribution of MMS to FI in reducing the financially excluded is critical to the nation. Advancing this therefore, the government and other critical stakeholders would need to create a framework that will enhance access to financial services.

Keywords: Digital Financial Services (DFS); Financial Inclusion.

Introduction

Financial inclusion (FI) in itself is access to basic, useful and affordable financial products and services that meet the needs of the excluded (unbanked and under-banked). Such needs include – payments, savings, credit and insurance, delivered to them in a sustainable and suitable way. This is driven by innovation and technology, e.g. mobile devices. And its implementation and adoption will culminate in bringing the excluded to the mainstream of banking and result into economic development as more monies are expended and saved.

In recent time, Nigeria has witnessed proliferation of mobile phones and growth in mobile network spread. For instance, in the country, there are over 143 million active mobile lines with a teledensity of 102.2 (Nigeria Communications Commissions, NCC, June 2017) and still growing. Virtually every home has, at least, a mobile handset. Thus, emergence of mobile telephony especially digital technologies such as social media (especially the millennials), online games and mobile applications, multimedia, productivity applications, cloud computing, and mobile devices have the potential to resolve lack of access to basic financial services for both unbanked and under-served.

According to EFINA Access to Financial Services (2017), over 60% of working adults have no access to the types of formal financial services delivered by regulated financial institutions. The availability of basic financial services that meet the specific demands or needs of households without boundaries is a key tool to reducing financial exclusion and driving economic growth.

However, recent events have hampered this progress. Hence, this research/study. The study is aimed at;

1. Evaluating the relevance of MMS in Financial Inclusion of the under-served
2. Strategies/ best approach to reduce financial exclusion and,
3. Assessing the impact of FI on economic growth and development.

**Problem statements**

Inspite of the increasing penetration of mobile phones and growth in mobile network spread, there have been concerns on the number of adults that are without bank accounts. These concerns are associated with:

a) Cultural and religious challenges, particularly Northern Nigeria, where women are constrained to their homes and deprived of appearing in the public;

b) The challenges brought about by high illiteracy and technology used for mobile financial services;

c) Lack of appropriate digital financial products and services that suit their need, e.g. micro-credit, micro-insurance;

d) Lack of trust resulting from cyber-security threats to financial transactions via digital platforms from illegal activities.

e) Stringent requirements to access financial services by banks which include but not limited to mode of identification, utility bill, Bank Verification Number (BVN), amongst others.

f) Proximity to the location of financial services. Most of the underserved live in remote locations, where vehicular mobility is limited.

g) The high cost of building and operating brick-and-mortar bank branches has been a major obstacle for extending financial services to the poor/low income households.

h) Nigeria being Africa’s most populous country with an estimated population of over 180 million, and out of 96.4 million adults, 40 million adults representing 41.6% are still financially excluded (EFInA Access to financial inclusion survey 2016).

i) The Proportion of Nigerian adult with access to formal and informal financial services shrunk marginally from 60.4% in 2014 to 58.5% in 2016 due to a slight reduction in appeal and coverage of informal services (EFInA Access to financial inclusion survey 2016).

All of the aforementioned have culminated in consumers having apathy to bank products and services and lacking full confidence in the security of using mobile technology to transactions.

**Existing solution**

One potentially effective way to accelerate financial inclusion and deliver a broader set of benefits is payments digitization. According to KPMG in its publication on “Understanding the Value Proposition of FinTech in Nigeria”, Innovation and technology have brought about a radical change in traditional financial services. The world has seen the emergence of more than 12,000 start-ups and massive global investment of USD 19 billion in 2015 in the FinTech space.

Presently, several digital financial services solution abound in the country to extend basic financial services to both unbanked and under-banked, and prominent amongst these are Mobile Money Service and Unstructured Supplementary Service Data (USSD) banking. The MMS is considered the most appropriate for the financial excluded, in that, users do not have own a bank account to carry out financial transactions. All that is required is virtual account, aka, ewallet. On the other hand, USSD banking requires users to have a bank account before they can initiate a financial transaction. Though, the unbanked can create a 1st-tier account that does not require mandatory account documentation, but it is important a customer registers for BVN to conduct any meaningful transactions.

On the basis of this, the MMS is now considered as the most used by the government and social welfare scheme campaigners such as UNICEF, Bill and Melinda Gates Foundation, USAID/AIDS, Catholic Relief Services (CRS) amongst others (in Nigeria) to drive financial inclusion. Since inception, Mobile Money Operators (MMOs) have established and created innovative digital products and services such as airtime top-up, fund transfer, bills payment, tokenization, purchases, conditional cash transfer schemes (cash disbursements) and retail payments. These services are not tied to any bank operative account. Rather, customers are able to open virtual account anywhere and anytime without, necessarily, visiting any bank branch, or banks could bulk register the beneficiaries of such schemes.

However, the use of digital financial services by previously excluded households and businesses brings not only benefits but also risks, due in part to the characteristics of a typical poor customer (inexperienced
with formal financial services and unfamiliar with consumer rights). Some of the risks are new while others, although well known, may take on different dimensions in the financial inclusion context. According to GSMA recent report, of the 4.8 billion Global Mobile Subscribers, 3.6 billion are located in low and middle income countries.

Examples where the MMS solution was deployed successful in Africa include the following:

a) Mobile phones are increasingly used for payments and collections with companies like PayAttitude, Visa and MasterCard offering contactless payments solutions. Other FinTechs are also expanding their payment options to create omni-channels for the customer. Virtually wallet (mobile money is on the fastest growing options for the unbanked segment).

b) Another example of digital financial inclusion in the digital age is the Kenya’s MPesa. Its growth has shown the potentials of collaborative partnerships within the financial & telecoms sectors and its dramatic transformational effect on money transfer & payment systems in Africa.

c) Approximately 255 mobile money services were operating across 89 countries in 2014. They are now accessible in more than 60 percent of developing markets. Sub Saharan Africa is the region where mobile money is most widely spread, followed by Southeast Asia and Latin America (Forbes, 2015).

d) In Nigeria for instance, several financial services providers, particularly the banks, are aggressively driving financial inclusion using both digital technologies and agent banking. The major players are FirstBank of Nigeria Ltd, GTBank, StanbicIBTC, Ecobank and Access Bank.

e) These banks have used digital innovation to extend basic financial services to the unbanked and under-banked. Today, Donors like EFfInA, UNICEF, Catholic Relief Services/ USAID, World Bank and the Federal Government of Nigeria have adopted the mobile money services to drive financial inclusive participation.

f) Specifically, FirstBank Nigeria Ltd, is not new to Digital Financial Services. Leveraging technology and innovation, in 2013, partnered UNICEF to implement its mobile money solution for the disbursement of payments to rural women in the Northern part of Nigeria on Polio Eradication Programme (PEP). Between June 2013 to May 2014, the bank disbursed about N880M to over 25,000 (cumulatively) rural women located in 536 wards across 82 Local Government Areas in Seven (7) Northern States (Bauchi, Kaduna, Kano, Katsina, Kebbi, Sokoto and Zamfara). The participants were Polio Survival Groups (PSGs) “the physically challenged”, Volunteer Community Mobilizers (VCMs) and Volunteer Ward Supervisors (VWS). As the pioneer bank of this innovative financial services, it was award “the Best Mobile Money Operator in 2014 by EFfInA”.

Limitations

In spite of the social impact and role of MMS in expanding financial inclusion and enhancing economic development, it is faced with technology and innovation, ICT, infrastructure, economic, communication and regulatory limitations. These are:

- Lack of trust/ confidence in financial products and services.
- Poverty as a result of unemployment and under-employment.
- Inadequate network coverage in remote locations, where financial inclusion is required to support their socio-economic activities such as farming and petty trading.
- Inadequate infrastructure to support the scheme.
- Interoperability challenge. Difficulty in inter-scheme financial transactions still persist and must be addressed to facilitate the desired growth.
- Socio-cultural complexities are also a major factor inhibiting financial inclusion. Most cultures in Nigeria limit public presence of the female folks.
- Low level of literacy about financial products and services.

Achievements

Without a doubt, MMS has positively impacted financial inclusion and economic development. Notwithstanding the limitations advanced above, households and businesses in Nigeria now use digital payments and financial accounts to interact seamlessly and efficiently, unleashing large gains in
productivity and investment, and prompting greater financial inclusion. Therefore, with the vision of reaching millions of adults and new customers in Nigeria, Financial Institutions and Financial Technology Companies (FinTech), have started offering digital financial services (DFS) for the financially excluded and under-banked, leveraging on the methods that were implemented and used for years to advance access channels for those who are already served by banks and other financial institutions.

Beyond this, Nigeria has recorded huge successes in financial inclusion through MMS. Examples include:

a) FirstBank of Nigeria Conditional Cash Transfer (CCT) partnership with UNICEF. Over N800 million was disbursed to over 8,000 beneficiaries across 8 Northern States in Nigeria, namely, Bauchi, Kaduna, Kano, Katsina, Kebbi, Sokoto and Zamfara. These beneficiaries comprised of Volunteer Community Mobilizers (VCM), Volunteer Ward Supervisors (VWS), Polio Survivor Groups (PSG). The FirstBank mobile money solution (Firstmonie) was deployed to cater for their monthly stipends for a period of 12 months (June 2013 to June 2014). This partnership resulted into beneficiaries opening bank accounts. Particularly, beneficiaries in Kaduna, Kano and Sokoto are well positioned now to use financial products and services.

b) Another achievement of FirstBank’s Firstmonie MMS is the successful deployment of stipends to CRS beneficiaries in Kebbi and Sokoto States.

c) Finally, partnership with New Incentives (All Babies Are Equal) helped women living with HIV/AIDS in some select States (Cross Rivers, Akwa Ibom, Anambra and Abuja) resulted in serving this segment with the bank’s financial services. Although, Cash tokenization was used to pay these women.

Methods

Nigeria is used as a case study to advance this discuss. Nigeria, located in West Africa Sub-Region, is the most populous country in Africa and has 2.5% of the world population with an estimated population of over 192 million. Nigeria is a multi-religion and ethnic country with 6 major geo-political zones, namely; North East, North West, North Central, South East, South-South and South West.

Experiment was carried out based on the following methods:

a) A priori knowledge derived from my instinctive skills.

b) Posteriori knowledge, derived from my experience driving digital banking and mobile financial services in FirstBank. With over 5 years’ cognate experience, I have driven and delivered several DFS projects which are today considered as the fastest growing mobile payment in West Africa.

c) Press and journal researches.

Statistical method adapted is factor and descriptive analysis. Statistical data were collected from different journals and desk research to analyse and summarize my findings.

Results

The study revealed that growing mobile network spread and penetration of mobile handsets have resulted into establishing regulated agent network, more agents are now available in key locations to serve the unbanked and under-banked, increased bank accounts, increased number of MMS customers and growing conditional cash transfer schemes by NGOs and Governments.

Thus, the proliferation of mobile money services does raise the need for banking and telecom regulators to work together to allow the ecosystem work without interference. It is also advanced here that as mobile money services continue to expand more proactive policies are required to ensure that the market can continue to grow and serve local consumers, which would lead to growth in economic activities.

It was also observed that Fintechs have been active across the value chain of the Nigerian Banking space and Financial Services Institutions. Example is the Interswitch Financial Inclusion Services (IFIS), a licensed Agent Network Operator. Nigerian Banks are beginning to take a strategic and structured approach such as Agent Banking and Mobile Money Agent in engaging the Fintech Community. Digital Financial Services have become a platform for extending basic financial services to the poor and the banked segment, real time and anywhere.
Also in with recent study by PWC, FinTechs are redrawing the competitive Financial Services landscape and blurring the lines that define players in the sector. Their offerings range from competing financial services such as alternative lending, to additive solutions atop existing banking services, to enabling technologies for the banks themselves. Capitalizing on the latest mobile, cloud and digital technologies, Nigeria is increasingly becoming home to many FinTech firms who are trying to shake up and be accretive to the banking value chain (Price Water – Price Waterhouse Coopers, 2017).

**Discussions**

Digital Financial Service is not only seen as a tool for solving the problem of proximity to the locations (physical distance), but also a platform to innovate and reach the target market. Today the unbanked and under-banked populations are increasingly gaining access to financial services through digital channels, thanks to global financial inclusion drive by organizations such as Bill & Belinda Gates Foundation, United Nations, World Bank, amongst others.

Financial Institutions (Banks, microfinance), Mobile Network Operators (MNOs), and third party providers (such as OEMs) are leveraging penetration of mobile phones, point-of-sale terminals, together with networks of mobile money agents, to offer basic financial services at greater convenience, scale and affordable price than what traditional banking offers.

The Central Bank of Nigeria has defined a strategy that sets clear target for financial inclusion which is to decrease financial exclusion from 40% in 2010 to 20% in 2020. The Financial Inclusion Strategy of the Federal Government of Nigeria clearly states that “All Nigerian adults, in particular the low income group, participate in a formal financial system that sustainably provides a suite of financial products that are affordable and accessible, thus reducing poverty and improving household economic wellbeing”

**Conclusion**

From the foregoing, it is becoming increasingly clear that for the financially excluded to be provided access to basic financial services together with addressing financial exclusion will require an all-inclusive and systematic tactic on the part of financial services providers and regulators in driving top-of mind awareness (TOMA) about financial products and services, education, and advice on how to effectively manage their funds, safety and reliability of infrastructures, driving savings culture and affordable micro-credit that would improve their economy which will subsequently impact economic development.

Therefore, Financial Institutions and Fintech would have to establish and create specific but innovative strategies to expand the scope of their products so as to stimulate and facilitate financial inclusion. One of the ways in which this can be achieved in a cost-effective manner is through forging linkages with microfinance institutions, NGO’s and local communities. Banks should give wide publicity. Technology can be a very valuable tool in providing access to banking products in remote areas. ATMs cash dispensing machines can be modified suitably to make them user friendly for people who are illiterate, less educated or do not know English. And one of such approach is Human Teller Machine (Mobile Agents).

From the above discourse, it is apparent that digital technology and innovations are key drivers of expanding the businesses of the banks and other financial institutions. Furthermore, with increasing threats of Fintech, Nigerian Banks are now left with no choice but to ‘innovate or die’ with the associated requirements to invest in these innovations and technologies for the provision of payment systems that would address the issues earlier identified.

As more people are financially included, financial institutions will experience multiplier effect on their businesses. As investments thrive, the unemployed/unbanked are economically engaged with jobs that will improve their economic life. These and other socio-economic initiatives will help the financial and technology industries develop new services and achieve the UN Sustainable Development Goals (SDGs).

Furthermore, as more participants are involved in driving financial inclusion, it is believed that large numbers of the unbanked will gradually decline. I recommend that the private sector should collaborate with Financial Inclusion Campaigners (CGPA, GSMA) to advance and champion the discourse that will culminate in new ways of thinking and innovation in financial inclusive products and services, which will...
help the underserved in Nigeria and other emerging economies to achieve better financial services delivery whilst improving cost to serve.

Finally, with greater adoption of mobile devices and spread of mobile networks, together with the desire of Fintechs and Financial Institutions to drive digital financial services together, the financially excluded will be provided with the needed platform to improve their well-being. This will further push the frontiers of retail banking through innovations in digital financial inclusion with attendant economic development.

Figure 1. Financial access performance across geo-political zones

Source: EFINA Access to Financial Services Survey 2016
Figure 2. Disbursement scheme with UNICEF (Zaria, Kaduna, Nigeria)

Figure 3. A VCM confirming the amount paid to her by Firstmonie Agent (Zaria, Kaduna)
Figure 4 Catholic relief services disbursement scheme with firstbank (Sokoto, nigeria)

Figure 5 Existing digital financial services solution in nigeria

References


[10]. PricewaterhouseCoopers, February 2016: Disruption of Nigeria’s Financial Service sector by FinTechs is underway.

The Role of Education on Small-scale Mining for Sustainable Development
A case of Banda/Nkwanta Community in the Bole District-Ghana

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Abstract

The activities of small scale miners in Ghana have had negative effects on the environment and this has hampered security within the environment. The study seeks to assess the role of education on small-scale mining for sustainable development in the Banda/Nkwanta community in the Bole District, the Northern part of Ghana. Small scale mining operations have been a major cause of most of the negative environmental impacts in most parts of Ghana. This activity has now found its way to the Northern part of Ghana which is a serious canker for sustainable development. The environmental effects of these activities are higher because most of the activities are not coordinated and monitored by authorities especially in the Northern part of Ghana. The methods of mining applied by operators determine the severity of threat to environmental security. The chemical method of processing gold is a severe health hazard, especially the amalgamation with mercury. Small scale mining activities have a lot of negative impacts on agricultural activities, the major occupation and source of livelihood for the people. It is recommended that Government and its agencies should encourage the illegal small-scale operators to formalize their operations in order to be accessible for supervision. The issuance of licenses and permit for surface mining should be reduced and most of these companies should be encouraged to explore the underground mining method with appropriate techniques and skills that meet international best practices. The Bole District Assembly should enforce environmentally friendly bye-laws, education and comprehensive environmental protection measures.

Keywords: Education, small-scale Mining, Sustainable development.

Type of paper: research paper

Background

“Banda Nkwanta was formerly called ‘Dua’. The first settler was a Sissala man who was driven down by war in the north and was later joined by a Dagarti friend. They decided to settle to do farming and hunting. The exact date the community was established is not known but speculated to be before the Second World War. The name Dua was changed to ‘Nkwanta’ (meaning junction in Akan) because it became a trading junction where cattle were bought and sold. It was a junction to Banda.”

Ghana’s major occupations in recent times is Mining of minerals. According to some scholars such as Monika Weber-Fahr and John Strongman, large-scale mining generates about 85 percent of the world’s nonfuel minerals and more than 95 percent of the world’s total mineral production. The mining industry in Ghana has largely been transformed from a fragmented industry characterized by small-scale operations to one dominated by a relatively concentrated group of multinational corporations managing massive operations in increasingly remote areas. Notwithstanding, the current surge in small scale mining in Ghana, popularly known as “Galamsey,” which can literary be translated as ‘gather and sell’ cannot be underestimated. Over the years for instance, over 650 registered small-scale mining groups were engaged in the mining of gold, diamonds and industrial minerals in Ghana. This increasing scale and intensity of small scale type of mining operations have not gone unnoticed and unconforned by the communities that host them. These communities – often rural, indigenous and poor – are particularly vulnerable to the
environmental and social impacts generated by the miners. The activities of small scale miners in developing countries such as Ghana to a large extent have had major effects on the environment. The most affected resources have been water bodies, land and forest resources.

The Northern part of Ghana which lacks much vegetation is also now one of the hotspots of small scale mining. Banda /Nkwanta the area selected for this study is home to significant mining activity, mainly on gold. It is one of the communities most affected by activities of small scale miners in the Northern part of Ghana.

For many centuries, the small-scale mining of precious minerals has made a significant impact on the socio-economic lives of people and communities involved directly or indirectly in the sector (Kesse, 1985; Hilson, 2002a). In Ghana, the precious minerals mined at the small-scale level are gold and diamonds. Since the regularization of small-scale mining in 1989, over 1.5 million troy ounces of gold and 8.0 million carats of diamonds have been produced by the sector (Ghana Minerals Commission, 2004). Due to its labor intensity, small-scale mining operations generally generate significant employment avenues, especially in remote rural areas where alternative job opportunities are scarce and low paying. However, production of these minerals has been at a cost to the environment and there is the need to develop the sector in a sustainable manner.

Sustainable development of minerals and other natural resources has been endorsed as a global management and development strategy and environmental, economic and social developments have been highlighted as the three pillars of sustainable development and their integration is encouraged WCED, (1987); Anon, (1992). There are, however, several arguments about the applicability of these concepts in the minerals industry, especially the small-scale minerals industry, since minerals are non-renewable resources that are subject to exhaustion in the course of production. The exhaustible nature of mineral resources places a limit on growth of these industries and hence their sustainability Lele (1991); Mikesell, (1994); Traore, (1997); Ednie, (2002); Anon, (2002).

In Ghana, there is an ongoing discussion by stakeholders in the mining industry on measures to mitigate the negative effects of small-scale gold and diamond mining and to help the industry to develop in a sustainable manner Yakubu, (2002); Hilson, (2002). This paper is a contribution to the debate. It focuses on how the general concepts of education for sustainable development can be applied specifically to the small-scale gold and diamonds mining industry in Ghana. Sustaining the sector is considered in the context of the mineral supply process, environmental and health implications, and the socioeconomic realities of the affected areas.

Methodology

The type of research strategy used for this work was exploratory, which was a case study because the study has been undertaken on a small scale and within a limited time to investigate the impact of education on small scale mining for sustainable development in the Band/Nkwanta community. A research design is a kind of blueprint that guides the researcher in his or her investigation and analyses (Onwumere, 2009), the study relies on interviews and questionnaire to obtain the needed information.

The target population of this study was community members and aliens living in Band/Nkwanta in the Bole District. This is due to proximity, time constraints, cost involved. The researcher depended on opinion leaders’ prerogatives to encourage other commutants to participate effectively and complete all the items seriously in order to get accurate results.

To meet the objectives set and consequently avoiding ambiguous interpretations coupled with time constraints, the sample was composed of 83 indigents of the community and opinion leaders in the Bole District. Convenience sampling technique was used in the selection of the respondents required to conduct this research and was supported by purposive sampling. Eighty-three questionnaires were administered.
Findings

The table below shows the questionnaire administered and their results presented.

<table>
<thead>
<tr>
<th>Questionnaire</th>
<th>Respondents</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Questionnaire returned</td>
<td>80</td>
<td>97</td>
</tr>
<tr>
<td>Questionnaire not returned</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Questionnaire spoiled</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>83</td>
<td>100</td>
</tr>
</tbody>
</table>

**Source:** Researcher’s field work (August, 2017)

From 3.1 above, it can be seen that most of the respondents were able to return their questionnaires. With the total of eighty-three (83) questionnaire administered, eighty (80) respondents returned their completed questionnaire to the researcher representing 97%, two (2) of the remaining were not returned and this represented 2%. The remaining one (1) spoiled representing 1%. The high rate of respondents returning their questionnaires explained the fact that, there was a favorable response to the questionnaires.

Again, from the field survey, majority of the respondents out of total respondents of 80 were males representing 85% response rate.

Also from the field survey, 61 of respondents representing as much as 76% of the total respondents were between the ages of 20 and 40. 10 of the remaining respondents representing 13 percent were between the ages of 41 and 60. Only 9 of the remaining respondents were between the ages of 61 years and above and this represent 11% of the total respondents. This indicates that majority of the respondents were between the ages of 20 and 40

The marital status of the respondents also indicates that about 15 percent were married whilst 65 percent were single. This means that the majority of the respondents were single.

From Table 4.5 below, 55 of the respondents representing 69% of the total population were secondary school leavers. 10 of the remaining respondents were diploma holders and this represents 13% of the total respondents. Only 15 of the remaining respondents had first degree and this represent 18% of the total respondents.

This indicates that majority of the respondents had completed secondary education.

<table>
<thead>
<tr>
<th>Level of education</th>
<th>Number of respondents</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Secondary education</td>
<td>55</td>
<td>69</td>
</tr>
<tr>
<td>Diploma</td>
<td>10</td>
<td>13</td>
</tr>
<tr>
<td>First degree</td>
<td>15</td>
<td>18</td>
</tr>
<tr>
<td>Total</td>
<td>80</td>
<td>100</td>
</tr>
</tbody>
</table>

**Researcher’s field work (August 2017)**

The researcher wanted to know the occupation of the respondents and this is represented on table 3 below.

56 percent of the respondents were farmers whilst 10 percent were miners. Other occupations include traders which constitute 5 percent, 18 percent fishermen and 2 percent public service workers this indicate majority of the respondents were females (see table 3 below).
Table 3. Occupation

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Number of respondents</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farmers</td>
<td>45</td>
<td>56</td>
</tr>
<tr>
<td>Traders</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Fishermen</td>
<td>18</td>
<td>23</td>
</tr>
<tr>
<td>Public service workers</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Miners</td>
<td>10</td>
<td>13</td>
</tr>
<tr>
<td>Total</td>
<td>80</td>
<td>100</td>
</tr>
</tbody>
</table>

Researcher’s field work (August, 2017)

Awareness of mining activities

The researcher wanted to know whether respondents are aware of small scale mining activities in the community. Some key information was obtained during the course of the primary survey. These have been analyzed below.

From the field survey, all respondents claim that they have heard and seen small scale operations going on with groups sometimes made up of strangers from other places. Thus, the awareness on small scale mining activities among the people is very high as presented in the Table 4 below.

Table 4. Awareness of small scale mining

<table>
<thead>
<tr>
<th>Responds</th>
<th>Number of respondents</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>80</td>
<td>100</td>
</tr>
<tr>
<td>Total</td>
<td>80</td>
<td>100</td>
</tr>
</tbody>
</table>

Researcher’s field work (August, 2017)

Illegal small-scale mining activities

Two categories of small scale mining activities occur in the area. One category is the registered small-scale operators and the other category is the unregistered ones who carry out mining activities without licenses or any permit. The second category of miners is referred to as the “galamsey”. The responses from the field indicate that there is high incidence of illegal mining activities. All of the respondents admitted that illegal mining activities are rampant as presented in the table 5 below.

Table 5. Illegal mining activities

<table>
<thead>
<tr>
<th>Responds</th>
<th>Number of respondents</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>80</td>
<td>100</td>
</tr>
<tr>
<td>Total</td>
<td>80</td>
<td>100</td>
</tr>
</tbody>
</table>

Researcher’s field work (August, 2017)

Methods of mining

The researcher wanted to find out the methods of mining implored in Banda Nkwanta community and whether the methods of mining applied by miners have profound effects on the environmental security. The results indicate confirming the following type of methods of mining in the Banda/Nkwanta Community: surface mining, Underground mining, dredging, galamsey method. Galamsey method is the highest method being used. (See table 6 below).
Table 6. Mining methods

<table>
<thead>
<tr>
<th>Responds</th>
<th>Number of respondents</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underground mining</td>
<td>10</td>
<td>13</td>
</tr>
<tr>
<td>Dredging</td>
<td>15</td>
<td>19</td>
</tr>
<tr>
<td>Galamsey method</td>
<td>55</td>
<td>68</td>
</tr>
<tr>
<td>Total</td>
<td>80</td>
<td>100</td>
</tr>
</tbody>
</table>

Researcher’s field work (August 2017)

Negative impacts of small-scale mining on farming activities

Again, the researcher wanted to know if mining activities especially small-scale operations in the Banda/Nkwanta community have proven to exert negative impact on farming activities in the area. The perceptions of the people are summarized below.

Table 7. Clearing of vegetation

<table>
<thead>
<tr>
<th>Responds</th>
<th>Number of respondents</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>80</td>
<td>100</td>
</tr>
<tr>
<td>Total</td>
<td>80</td>
<td>100</td>
</tr>
</tbody>
</table>

Researcher’s field work (August, 2017)

As a result of mining activities especially those activities which are carried out illegally, the environment is losing most of its natural vegetation. As part of the mining activities, forests are cleared and burnt to give space for miners to dig and scoop the soil deep down to minerals to be accessed. This has resulted in land degradation, deforestation and loss of top soils for agricultural purposes. Respondents of the field survey in table above have confirmed that small scale-operators burn and clear the vegetation and dig for mineral in Banda/Nkwanta.

Damage of agricultural landscape

The researcher wanted to know if Small scale mining operations lead to destruction of the environmental landscape and hence making farming unsuitable. This is seen in table below:

Table 8 Damage of agricultural landscape

<table>
<thead>
<tr>
<th>Responds</th>
<th>Number of respondents</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>80</td>
<td>100</td>
</tr>
<tr>
<td>Total</td>
<td>80</td>
<td>100</td>
</tr>
</tbody>
</table>

Researcher’s field work (August, 2017)

From the table, all respondents claimed that small scale mining activities cause destruction of the landscape to render it unsuitable for agricultural purposes

Competition between mining and farmlands

Currently in Banda/Nkwanta community, a stern competition is on-going between the small-scale miners/galamseyers and the farming communities for arable land. This fact was confirmed by 88 percent of the respondents as indicated in the table 9 below. In actual sense farming and other agricultural activities are seriously affected by dangerous activities of the miners in the community.
Table 9.

<table>
<thead>
<tr>
<th>Responds</th>
<th>Number of respondents</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>70</td>
<td>88</td>
</tr>
<tr>
<td>No</td>
<td>10</td>
<td>12</td>
</tr>
<tr>
<td>Total</td>
<td>80</td>
<td>100</td>
</tr>
</tbody>
</table>

Researcher’s field work (August, 2017)

Farmers deprived of farmland

In most cases farmers are being forced to sell their farm and the land to mining operators through the aid of the traditional rulers and sub chiefs. 63 percent of the respondents’ states that farmers in the community have been deprived of farmland for farming. 25 percent do not support that statement whilst 12 percent do not know of such incident ongoing in the community as presented in table 10

Table 10. Farmers deprived of farmland

<table>
<thead>
<tr>
<th>Responds</th>
<th>Number of respondents</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>50</td>
<td>63</td>
</tr>
<tr>
<td>No</td>
<td>20</td>
<td>25</td>
</tr>
<tr>
<td>Do not know</td>
<td>10</td>
<td>12</td>
</tr>
<tr>
<td>Total</td>
<td>30</td>
<td>100</td>
</tr>
</tbody>
</table>

Researcher’s field work (August, 2017)

Addressing environmental issues by government

Most of the respondents were of the view that the district assembly does not take environmental issues serious. According to them, the assembly does not undertake any proper steps to check and address the adverse effect of small scale mining on environment. 88 percent of the respondents claimed that environmental issues were not addressed by the Assembly whilst 12 percent claimed that the assembly put in place proper mechanisms in addressing such issues (See table 11).

Table 11. Addressing environmental issues by district assembly

<table>
<thead>
<tr>
<th>Responds</th>
<th>Number of respondents</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>70</td>
<td>88</td>
</tr>
<tr>
<td>No</td>
<td>10</td>
<td>12</td>
</tr>
<tr>
<td>Total</td>
<td>80</td>
<td>100</td>
</tr>
</tbody>
</table>

Researcher’s field work (August, 2017)

The researcher wanted to know if Government task forces operating in the southern part of Ghana have been deployed to the Northern part of Ghana to curb illegal mining for sustainable development. The government has constituted a task force known as “operation vanguard” to stop illegal mining in the communities for sustainable development. The president in one of the forums put his presidency on the line to curb illegal mining. From the field survey in table 3.15, these task forces are only operating in the southern part of Ghana and hence not in the Northern part of Ghana where Banda/Nkwanta community is located. From the table 12 below, all respondents were of the view that no Government task force has come around to stop them from illegal mining.
Table 12. Addressing illegal mining issue by Government task forces

<table>
<thead>
<tr>
<th>Responds</th>
<th>Number of respondents</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>80</td>
<td>100</td>
</tr>
<tr>
<td>Total</td>
<td>80</td>
<td>100</td>
</tr>
</tbody>
</table>

Researcher’s field work (August, 2017)

Small scale mining causes major health problems:

Small scale mining activities cause profound health problems especially through the use of mercury and cyanide in the amalgamation process to collect gold particles from sediments. This process leads to discharge of excess chemicals into the land and water resources. In table 13, a total of 70 out of 80 respondents stated that small scale mining causes serious health problems.

Table 13. Small scale mining causes major health problems

<table>
<thead>
<tr>
<th>Responds</th>
<th>Number of respondents</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>70</td>
<td>88</td>
</tr>
<tr>
<td>No</td>
<td>10</td>
<td>12</td>
</tr>
<tr>
<td>Total</td>
<td>80</td>
<td>100</td>
</tr>
</tbody>
</table>

Researcher’s field work (August, 2017)

The danger of the pits after small scale operation

94 percent of the respondents believed the pits dug by small scale operators normally filled with stagnant water and serve as breeding grounds for mosquitoes and reptiles. This usually causes diseases and hence threat to human settlement in the community. This is represented in table 14 below:

Table 14. The danger of the pits after small scale operation

<table>
<thead>
<tr>
<th>Responds</th>
<th>Number of respondents</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>75</td>
<td>94</td>
</tr>
<tr>
<td>No</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>80</td>
<td>100</td>
</tr>
</tbody>
</table>

Researcher’s field work (August, 2017)

The researcher wanted to know if respondents have any education on the effect of illegal mining and how this can affect sustainable development in the community and the country at large. This is represented in the table 15 below:

Table 15. Education on the effect of illegal mining

<table>
<thead>
<tr>
<th>Responds</th>
<th>Number of respondents</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>No</td>
<td>79</td>
<td>99</td>
</tr>
<tr>
<td>Total</td>
<td>80</td>
<td>100</td>
</tr>
</tbody>
</table>

Researcher’s field work (August, 2017)

From table 3.18 above, 79 out of the total respondents agree that they have no education on the effect of illegal mining and how this affects sustainable development. This represent 99 percent response rate. The
remaining 1 agree to have had education on the effect of illegal mining and this represents 1 percent response rate. This therefore indicates that majority of the respondents have no education on the effect of illegal mining.

Discussions

The survey revealed that there is high incidence of illegal mining activities in Banda/Nkwanta community. The respondents admitted that illegal mining activities are high in the community.

Secondly, Galamsey method of mining is the highest method being used in Banda/Nkwanta. Respondents of the field survey confirmed that small scale-operators burn and clear the vegetation and dig for minerals.

Majority of respondents also claimed that small scale mining activities cause destruction of the landscape to render it unsuitable for agricultural purposes. Respondents also claim there is competition between mining and Farmlands hence farmers in the community have been deprived of farmland for farming.

Furthermore, Majority of the respondents claimed that environmental issues were not addressed by the District Assembly. Respondents were of the view that no Government task force has come around to stop them from illegal mining.

Majority of respondents were of the view that Small scale mining activities cause profound health problems especially through the use of mercury and cyanide in the amalgamation process to collect gold particles from sediments, respondents believed the pits dug by small scale operators normally filled with stagnant water and serve as breeding grounds for mosquitoes and reptiles, and this usually causes diseases and hence threat to human settlement in the community.

The study also revealed that respondents who have no education on the effect of illegal mining were the majority.

Conclusions

It’s concluded that, there is negative effects of small-scale mining on farming activities in Banda/Nkwanta that affects sustainable development. There are also health hazards caused by mining to the local communities in Banda/Nkwanta. The methods of mining activities applied by mining operators determine the severity of the threat to environmental security. The methods of mining activities employed in the mining localities in Ghana specifically Banda Nkwanta, is the galamsey method of mining. Victims of small scale mining activities have no education on the effects of illegal mining and their activities contribute to unsustainable development. Government has taken steps to address illegal mining activities but only limited to southern part of Ghana. Education therefore has an important role to play in curbing illegal mining in the Band/Nkwanta community and this will lead to sustainable development.

Recommendations

This study has carried out a thorough and candid assessment of the impact of education on small scale mining for sustainable development in the Banda/Nkwanta community as a case study. Based on the findings and conclusions of this study, the following recommendations were made:

Government and its agencies should encourage the illegal small-scale operators to formalize their operations in order to be accessible for supervision, coordination and monitoring. The registered and legal large and small-scale mining operators should create employment avenues for the local people through training in order to mainstream them since most of the illegal and smaller operators (galamseyers) were believed to be natives and members of the mining communities who usually go into illegal practices for livelihood and this group see their illegal activities as their right to the land.

The issuance of licenses and permit for surface/ open cast mining should be reduced and most of these companies should be encouraged to explore the underground mining method with appropriate techniques and skills to meet international best practices. This could solve two problems: first the issue of competition and conflict between miners and farmers over arable land will be minimized, and secondly, because the underground mining is labour intensive most of the subsistent illegal miners could be employed into this.
The Government together with the Bole district where Banda/Nkwanta is located, must be able to require the mining operators to abide and ensure proper and comprehensive environmental protection measures. The Government should establish an independent and effective oversight mechanism to monitor small scale mining companies to fully comply with national and international health and environmental protection standards.

The government and the Bole District Assembly should set the laws and by laws on the mining activities in the district in order to allow most part of the forest and vegetation to be reserved for agricultural purposes especially for both food and cash crop cultivation.

The anti-galamsey task forces being set by the Government should extend their operations to the Northern part of Ghana where these illegal mining activities are going on.

It is also recommended that, there should also be stern and serious attempts to restore the deforested and degraded lands including covering and refilling pits and trenches developed during excavation and extraction processes of the small-scale miners in the communities of the District.

Acknowledgement

All praise and gratitude be given to God Almighty for giving me such a great strength, patience, courage, and ability to complete this project. Although any learning activity is a lonely personal, it requires help, support and encouragement of others to be successful. ‘‘Just as an eagle could not soar without the invisible strength of the wind’’, I could not have arrived at this place without all the invisible hands that provided me that strength. I would like to present my humble appreciation and gratefulness to all the people who made this journey possible especially TAU, and the Banda/Nkwanta community. I am indebted to those who knowingly and unknowingly were so helpful and important in the difficult moments. Firstly, my deepest appreciation goes to Ms. Yasotha S. who has provided unlimited amount of encouragement and professional support. She valued my commitment to self and lifelong learning and all the while supporting my academic endeavors. Thank you, Ms. Yasotha for your positive attitude and outlook; you are an incredible coordinator and an outstanding leader.

References

End Users Security Awareness Campaign from Information Security Threats, Vulnerabilities and Concurrent Cyber-Attacks

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Abstract

The intent study of this article is to fortify the protection of sensitive data and information from breach any means necessary from attack either an insider or an outsider in the organizations. In every firm, the core achievement of its information security is to entrust the CIA-Trid; Confidentiality, Integrity and Availability of all of their resources and the liable personnel to disclose confidential information from breach is the end users of the system, having them in their respective field of assignment accordingly. This year 2017, research and analysis information gathered on the incident which took event on May/June ransomware cyber-attacks “WannaCry and Petya” affected many organizations such as companies and government agencies in different countries around the world demanding a ransomware bitcoin $300 method of payment, failure to comply will be subject to accumulate in double every day repeatedly. The breadth of study is to introduce the End User Security Awareness Campaign in the Organizations as a routine practice to stay awake from numerous information security threats, vulnerabilities and concurrent cyber-attacks circulating in different organizations around the global countries. To achieve the objectives, end users will partake in continuous awareness training and assessment through social engineering practices and procedures on how to stay vigilant to prevent every user from such attacks. The organizational IT function will also partake the involvement of hardware and software firewall applications, regular windows updates and patches, consistent antivirus updates, which will restrain the vulnerabilities to risk and any associate attacks to that effect.

Keywords: End user security awareness from information security threats, vulnerabilities and cyber-attacks.

Introduction

Systems and security devices are installed to check the rampant attacks on an organization’s information system and reduce the its impacts, end users on the other hand, tend to have the weakest links to the system by exposing classified information knowingly or unknowingly, this could be as a source to the attacker causing a breach in the security. Information security and cyber security as defined to be the strategic process, policies and tools for ensuring and preventing unauthorized access to vital data and information from modification, disruption and disclosure. It has been partaking an acute role in our day to day business processes in different organizations and individual lives. Computers were designed to make work easier in the field of information system that also partakes the advantages and disadvantages of its usage in the information technology field. In this paper, we are going to scrutinize and disseminate the “pros and cons” why the need for the study topic end user’s information security awareness campaign from numerous threats, vulnerabilities and consistent cyber-attacks in everyday usage of the network and internet. Only this year, research and analysis captured depict the numerous ransomware attack through Server Message Blog Port, under the environment of the Microsoft operating product. This attack affected over 150 countries around the Globe, and 230 victims of computers and beyond. One important objective of this paper is to review the source of the rampant security threats, vulnerabilities and cyber-attacks, circulating in various organizations respectively, and then how can we partake in its resolution, introduce the end user’s security awareness training campaign to educate every user of the system from such risk by enforcing the
(CIA-Triad), Confidentiality, Integrity and Availability to protect sensitive data and information from breach by any hacktivist.

The below figure is an overview of the scope of study, end user security awareness campaign and its achievement from information security threats, vulnerabilities and cyber-attacks, associated to hacktivism;

An overview of end user security awareness campaign – achievement.

![Overview](image.png)

**Figure 1.0.** An overview

**Problem statement: “ransomware cyber attacks”**

Maintaining the integrity of information has become crucial to individual and business organizations of today. In the figures shown below, depict the consistent ransomware threats and attacks captured within the middle of the year 2017 and yet to be experienced more if inadequate policies and procedures are not met to be adhered, in order to mitigate the frequent occurrences. This type of ransom attacks; “WannaCry & Petya” uses the exploitation of Server Message Block, (SMB) Port “Eternal Blue” phishing mechanism to propagate into the operating systems. It has affected over 230 victims and more than 300,000 computer devices around the globe, subject to increase in accordance to research. The role of this “External Blue” exploitation vulnerability in the Microsoft Operating System environment is encrypted the user’s information and then demand a ransom payment “Bitcoin Crypto-Currency” $300 to be remitted by the victim, subject to increase in every three days $600 if delayed. This has affected the following organizations; Post office, Airport, Health Centers, Banks, Power Grid, Maersk Line, all of the global countries such as; Ukraine, Russia, Germany, Netherland, India, Brazil, Spain, China, Hong Kong, Italy etc.

**Any existing solution for the problem**

Most organizations involve the implementations of intelligent hardware devices” firewall” as a plus and the entry point to the internal resources, intent to protect their network resources from breach by any attacker. The best thing to do is to find the best palpable solution to secure your network from being invaded. The primary objective of an intelligent firewall device will be to scrutinize, limit and protect a network from any attack, this attack could be generated from within or from an external source to cause harm. When we look at the genesis of cyber-attacks, they are not limited to, firewalls protection why because, hackers are smart to invade into every system provided there’s a vulnerability, which can be possible through manipulation practices “social engineering” to iron out the loopholes on the network typical practice e.g.:
phishing, pretexting, quid pro quo, etc. Other measures that organizations also consider to ensure the integrity of their information is to have antivirus on their servers and client workstations, account login password, automatic windows or operating systems update, etc. All this solution has been in provision but still, there’s a deficiency in their information systems which is vulnerable to risk.

**Which one is the best one**

Well, preferably, with all of the above stated measures should be adequate to ensure the maximum required protection of every organizational data and information except, when the end users of the system do not familiar themselves with the internet for their day to day organizational business activities are neither accept any removal or hot swappable device but still, the system will be prone to risk why because in every information security, there’s nothing like hundred percent assurance of security. To maximize and mitigate the flaws in every organizational information security system, the best option and top priority in every information system is to safeguard the CIA – Triad, acronym Confidentiality, Integrity and Availability and this can be achieved through the end user security awareness campaign program mandated to be adhered by every user of the system to become familiar with the petrified threats, vulnerabilities and consistent cyber-attacks. One significant use of having a concurrent end user security awareness campaign is that, it abreast the user’s knowledge for understanding how they can be manipulated in the field of social engineering characteristic typical, phishing, quid pro quo, pretexting and so forth. With all this practice been factored in every organizational information system, controlled and monitored periodically, the possibility of a consistent cyber outbreak will be deduced to the least minimal percent, which will guarantee the integrity of sensitive information from breaches in returns to have access to your own data, you need to remit a ransom bitcoin payment to the attacker “hacker” not limited, possible to apply the principles of social engineering to impersonate someone for identity theft or credit card fraud etc. So in all, when this measures are restored in the organization as a mandated policy and procedures, monitored and controlled, periodic antivirus updates, server updates and patches, clients work stations scheduled updates, enforced CIA-Triad practice, end user security awareness campaign program mandated periodically inclusive on the topic, social engineering practice, then the maximum assurance of security can be achieved to protect the company vital and sensitive information and also to save money from such consistent ransom cyber-attacks.

**Limitations**

There are laid rules and policies governing how an organization’s information system, disseminated, these set the roadmap to what practices are generally accepted or rejected the regardless status or positon, in order to create an error for an attack. This article is not centered to only individuals, but rather, it is applicable to every organizational information system that partakes the use of computer systems as part of their daily business function in order to create awareness to every user of the system to stay vigilant from the consistent threats, vulnerability and cyber-attacks. As mentioned, this awareness practice will not be a nine-day wonder of implementation but a continuous practice to solidify the trust of the organizational information system. The end users will also be abreast to feel more secured from “social engineering” of their personal information such as, identity theft, credit card fraud, password compromised etc.

**Achievement: Aim**

The primary achievement of this article end user security awareness campaign on their respective influence about security threats, vulnerabilities and cyber-attacks, against social engineering practices, is to ensure the CIA-Triad Confidentiality, Integrity and Availability in the field of information systems in the organizations, to protect data and information from the breach by any attacks.

**Specific objectives**

- Mitigate the consistent cyber attacks
- Protect sensitive information from breach
- Maintaining the integrity of the information
• Securing the users of the system, which is at least as important as securing systems
• To establish a knowledge baseline for each user in the organizations
• Add the user’s component to defend in depth etc.

Methodology: approach

The research, analytical literature and methodology examined, reviewed within the year 2017 authenticate the source of this consistent ransom attack are through the manipulation and exploitation of Server Message Block, (SMB) Port, under the Microsoft Windows Operating Systems environments which affected many organizational computers, around the globe. This occurrence has become rampant in the field of information security why because, in accordance with the analysis examined in the literature on the subject topic, most people in the organization are prone to the following errors when policies and adequate procedures are not regulated to be adhered on the below;

- E-mail attachment which contains malicious files
- Uncontrolled PC’s, and Servers
- Weak encryption, password management
- Unauthorized attached and unattended workstations
- Inefficient antivirus software’s
- Unreported security threat, vulnerability and violations
- No updates, Patches and hot fix
- Poor perimeter protection that includes physical and electronic etc.

Online methodological surveys and theoretical analysis approach considered outlined that, fraudsters does acquire the required knowledge to invade into the system, through manipulation process and the way to entrust the safety aspect of this situation is to be very careful on what to click on their inbox when connected to the internet, applying the verification and authentication principles to be sure of first, not to download nor open untrusted software’s and applications, checking for ambiguous messages and grammar that dictates for payment of jackpot or lottery wins etc.

Graph results: WannaCry – Ransomware Cyber-Attack

![Graph: WannaCry – Statistical Graph Report](image)

Figure: 1.1. WannaCry – statistical graph
Graph Results: Petya – Ransomware Cyber-Attack

![Petya Ransomware Cyber-Attack Statistical Graph](image)

**Figure: 1.2.** Petya – statistical graph

**Results: Petya**

Why do people practice hacktivism?

Hacktivism; is considered as having someone practicing hacking, or invading into a computer system, for a personal or socially intent which is not a legal practice. Such people who do performs the act of hacktivism is said to be a hacktivist. Hackers are always hungry, developing a technique to intercept people information for their own intent shown in the figure below

**An overview of a hacker**

![An overview of hacking partitioning](image)

**Figure: 1.3.** An overview of hacking partitioning
Discussion

The issue of at hand poses serious security challenge us and thus need has come to the realization of security awareness in all fields we must therefore endeavor to heighten its impacts. As we know of that, in every information system, users are liable to share with confidential information to any social engineering practitioner, depending on the level of intelligent in the field of information system security for that manner.

It is a very good practice to every organizational information system to achieve the CIA-Triad in the organization which is not limited why because, users of the system factor most and they can be manipulated through the social engineering process by any attacker, if the below steps is examined to ascertain the vulnerabilities of the system:

- Quid pro quo
- Phishing
- Baiting
- Pretexting
- Tailgating

On the subject, these are some of the major social engineering practice that a hacker can formulate on one or beyond, to invade into the computer system on the network, when discovered the vulnerability and weakness to a certain adaptable level of risk. There are many questions that arises, why in spite of the many security checks and implementations of high-end devices and software’s to forestall the breach of system’s security; yet they are still vulnerable to attacks. Hypothetically, this should be the ideal solution, but in the midst of information security, ensuring the safety of information has to be a day-to-day practice and process.

Conclusion

With the consistent ransom cyber-attacks and its panacea, noted in this paper will not guarantee the hundred percent of assurance in the information security of the organizations, but rather, it will ensure the maximum protection of data and information from breach, that can be controlled and mitigate to the minimal, if “ONLY” the end user awareness campaign is adhered to as a routine experience, controlled, monitored and become a subject of the company learning and development safety and security policy.

Figures/ Image/Table

Ransomware cyber-attack – WannaCry.

![WannaCry Ransomware Attack](image-url)

**Figure 2.0.** WannaCry – attack display overview

Ransomware cyber-attack – Petya.
References

The Impact of Broadband Diffusion in Assessing Innovation at the Institutions of Higher Learning in Kenya

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Abstract

Objective: The aim of the research was to study the impact of broadband diffusion in assessing innovation in institutions of higher learning in Kenya.

Background: The Government of Kenya realized the importance of broadband provision to stimulate economic development through innovation and established the Kenya Education Network Trust (KENET) - a national research and education network that promotes the use of broadband in teaching, learning and research in institutions of higher learning in Kenya. The aim of KENET was to interconnect all the universities in Kenya by setting up a cost effective and sustainable private network with high speed access to the global internet.

Methodology: This study applied descriptive survey research design and a logistic regression model was used as an inferential analysis tool in the quantitative analysis. Inferential statistics used to analyse the model were; overall model evaluation, goodness-of-fit statistics, and statistical tests of individual predictors and validations of predicted probabilities.

Results: Reliability measures were above the recommended level of 0.70 as an indicator for adequate internal consistency. Inferential statistics used to analyse the model showed that the model performed well and was appropriate for the study.

Conclusion: Broadband diffusion in institutions of higher learning in Kenya is inhibited by poor infrastructural development attributed to high costs of connections and bandwidth acquisition and a high demand for broadband among the students and staff. Policies in broadband regulation from the national government and institutional governance are prudent in controlling and enabling access to this important resource for innovative purpose.

Keywords: Broadband diffusion, Innovation, Education, Internet, Bandwidth, Regression Model.

Introduction

The Government of Kenya has over the years improved the regulatory environment to promote growth of the ICT sector and increase availability of broadband Internet in the country. The Kenya Education Network Trust (KENET) was established by the government of Kenya to promote the use of ICT in Teaching, Learning and Research in Higher Education Institutions in Kenya. The main aim of KENET was to interconnect all the universities, tertiary and research Institutions in Kenya by setting up a cost effective and sustainable private network with high speed access to the global Internet. This network trust currently provides broadband to over 90 member institutions including universities both private and public in Kenya.

In their E-Readiness Survey of Kenyan Universities (2013) Report, Kashorda and Waema (2014) observed that the networked PCs available per 100 students ratio was 3.8 in Kenyan universities, which was considered quite low. The e-readiness survey also indicated that 16,174 student lab computers were available for 423,664 students at the 30 universities and only 17% of students accessed computers from their campuses. On the other hand, 53% of students owned over 200,000 laptop computers in the 30 universities. The report therefore recommended that universities invest in student computer labs in order to serve all students who do not have laptop computers or those who may not wish to carry their laptop computers to the campus in the university. It was further revealed by the e-readiness survey that universities in 2013 achieved broadband internet of 4.0 Mb/s per 1,000 students compared to only 0.431Mb/s per 1,000 students in 2008.
Even if all universities are inter-connected to the national fiber backbone network, they should invest sufficiently in their internal campus backbone and wireless network infrastructure that will make it easier for students to use their own laptops and smart phones on campus to access learning materials and other student services. Besides the low PC ratio, the students considered the campus networks slow and unstable (Kashorda and Waema, 2014). The current study uses KENET as a case study to assess the effectiveness of broadband collaborations in IHL for innovative projects.

Broadband communications is the foundation of developing a robust society that is informative and innovative. Widespread broadband diffusion encourages innovation, contributing to production and growth and attracts foreign investment (ITU, 2003). The International Telecommunication Union (ITU) defines broadband as a network offering a combined speed equivalent to 256 kilobytes per second (kbit/s) or greater in one or both upstream and downstream directions (ITU, 2006). In terms of the broadband penetration rate, by July 2015, there were over 36.113 million mobile subscribers and mobile penetration of 80.68 per 100 inhabitants in Kenya (ITU, 2016). Fixed broadband is the transmission capacity with sufficient bandwidth to permit combined provision of voice, video and data through a fixed line such as Digital Subscriber Line (DSL) and cable modem (ITU, 2006). Meanwhile, mobile broadband systems support data transport rates of at least 256 kbit/s for all radio environments, which exceed the rates under second generation wireless networks. These mobile broadband systems enable many advanced video applications such as mobile videoconferencing, video phone or mail, mobile TV or video player and digital audio or video delivery (ITU, 2003). Although there is an overall rapid growth in broadband diffusion, still many countries are in the early stages of broadband deployment and are assessing policy strategies to promote faster broadband adoption. Local loop unbundling (LLU) and facilities-based competition has been found out to be an important policy initiative to promote rapid fixed broadband diffusion in a number of countries around the world. Local loop unbundling refers to the process of requiring incumbent operators to open as a whole or in part, the last mile of their telecommunications networks to competitors (ITU, 2003). Platform competition (facilities-based competition among several different broadband platforms) is crucial for reducing prices, increasing the number of customers, improving the quality of service and promoting investment and innovation (ITU, 2003). Experts differ on whether single or multiple standards promote faster diffusion of mobile communications.

There were over 555 million fixed broadband subscribers and 940 million mobile broadband subscribers at the end of 2010 (ITU, 2010). This demonstrates a steady growth of broadband adoption throughout the world. The dominant fixed broadband access platforms in OECD countries are DSL with 58% of the fixed broadband market and cable modem (29%) (OECD, 2010). In the mobile broadband markets, standard mobile (with 73% of the mobile broadband markets) is a dominant access platform (OECD, 2010). Until June 2010, Netherlands, Denmark, South Korea, and Switzerland had the highest fixed broadband penetration rates among OECD countries (OECD, 2010). The extent of mobile broadband diffusion varies widely across countries and regions. In 2010, South Korea, Japan, Sweden and Norway were leading mobile broadband economies in terms of the mobile broadband penetration rate (OECD, 2010). CDMA 2000 and WCDMA are the two main standards for 3G wireless technologies. Most of the European Community countries adopted WCDMA for 3G wireless services (ITU, 2006) while many countries in the Americas, Africa and Asia adopted CDMA 2000 or both CDMA 2000 and WCDMA in their 3G markets (ITU, 2006).

There is a growing body of empirical research on fixed broadband diffusion. In some empirical studies, it was found out that inter-modal competition, LLU, and demographic variables such as income and population density increase fixed broadband diffusion (Grosso et al., 2006). Analysis of data from 14 European countries, Distaso et al. (2006) argued that inter-platform competition drives broadband diffusion while competition in the DSL market does not play a significant role. Some previous empirical studies on initial fixed broadband diffusion in the United States found inter-modal competition as a driver of fixed broadband diffusion in the United States (Denni and Gruber, 2005). Studies of 30 OECD countries by Cava-Ferrurela and Alabau-Muñoz (2006) found that technological competition, lower deployment costs of infrastructure and predilection to use new technologies are key factors for broadband demand and supply. By employing logit regression
analysis, Garcia-Murillo (2005) found out that unbundling an incumbent’s infrastructure only results in a substantial increase in broadband deployment for middle-income countries but not for their high income counterparts as a whole. Kim et al. (2003) suggests that the attitude toward information and technology and the cost conditions of deploying advanced networks are the most consistent factors explaining broadband uptake in OECD countries. It is confirmed that broadband infrastructure is increasingly recognized as fundamental for economic growth in many countries (OECD, 2010). Some empirical studies measured the economic impacts of the broadband infrastructure on growth (Lehr et al., 2006; Koutroumpis, 2009). Koutroumpis (2009) estimated the economic impact of broadband infrastructure on growth in OECD countries and found out that there are increasing returns to broadband telecommunications investments, which are consistent with the persistence of network effects. His study indicated there is evidence of a critical mass phenomenon in broadband infrastructure investments. While employing multivariate regression modelling, Lehr et al. (2006) as well found broadband diffusion enhances economic growth and performance, and that the economic impact of broadband is measurable.

Previous empirical studies on global mobile diffusion found that standardization policies, competition and low user cost are influential factors of global mobile diffusion (Rouvinen et al., 2006). In the economics of standards, studies have focused on the private and social incentives for standardization (Gandal, 2002). Even though market-mediated standards may lead to limited network externalities and economies of scale, multiple wireless standards and different types of services across technologies enable the existence of diverse competing systems that may lead to more and better mobile services (Gruber and Verboven, 2001). Early diffusion of digital technologies in mobile markets was faster in Europe-where most countries had adopted a single standard (Gruber and Verboven (2001). In their study, Koski and Kretschmer (2005) concluded that standardization has a positive but insignificant effect on the timing of initial entry of 2G services but can also lead to higher prices by dampening competition. The effectiveness of public policy in the context of competing standards with network externalities was examined by Cabral and Kretschmer (2007) who concluded that current mobile diffusion levels are quite similar between the United States (multiple standards) and Europe (mostly single standard). Rouvinen (2006) found that standards competition hinders while market competition promotes diffusion in both developed and developing countries. Even with a growing body of literature that addresses the factors contributing to fixed broadband diffusion, the results of empirical studies have not always been consistent while insufficient data has prevented previous studies from capturing the nonlinear nature of broadband diffusion. The results concerning the effects of broadband price, income and competition on broadband diffusion are mixed (OECD, 2010). Although there has been rapid diffusion of mobile broadband technology, only a few empirical studies have focused on the factors that affect mobile broadband diffusion globally. There is also no evidence of any study on fixed and mobile broadband diffusion examining whether mobile broadband is a complement or a substitute for fixed broadband. If mobile broadband is a complement, then it may offer the potential to increase aggregate broadband penetration. If mobile broadband is a substitute then its impact on aggregate broadband penetration is ambiguous. The effect is that it may help accelerate penetration through platform competition, and could also undermine investment in sunk and fixed-line broadband.

**Methods**

**Empirical model**

The study used a logistic regression model as an inferential analysis tool in the quantitative aspects of the research. In the research, IHL were viewed as adopters of broadband innovations. Once broadband innovations were adopted, consumers of broadband innovations (i.e., students, academic staff and administrative staff) intend to be satisfied by the systems adopted and implemented. This assumption is guided by utility maximization theory, and taking the rational choice theory, universities would expect to realize most of the outputs envisaged in each adoption. Consumers therefore, would get satisfaction if the innovations were effectively implemented U (α₁). If there was failure in effective implementation then utility would be U (α₂).

The utility maximization model therefore would be:
Where $U(a_i)$ and $U(a_f)$ denote the utility derived from the innovations' effective implementation $U(a_e)$ and failure ineffective implementation $U(a_f)$. The output of this utility model is a binary output (effective implementation(1) and ineffective implementation(0)). The dependent variable took binary response outcomes. Assuming $Y$ to represent successful innovation implementation, then:

$$Y_i = \begin{cases} 1 & \text{if an innovation was effectively implemented} - \text{probability } p \\ 0 & \text{if innovation implementation was not effective} - \text{probability } 1 - p \end{cases}$$

(2)

These values of 1 and 0 are chosen based on the binary outcome of:

$$p_i = \Pr(Y_i = 1 | X') = F(x_i \beta)$$

(3)

Where $F(.)$ is a specific function. In order to ensure that $0 \leq p \leq 1$, then it is natural to specify $F(.)$ to be a cumulative distribution function. The estimation model selected as appropriate for this research study was the logit model. According to Peng, Lee, & Ingersoll, 2002, Logit models are models that can be used to analyze and predict data whose outcome is categorical. Logistic regression analysis is thus suitable where there is a dichotomous outcome – of success or failure. Furthermore, a logit model is well suited for describing and testing relationships of categorical outcomes and one or more categorical or continuous predictors where errors are neither normally distributed nor constant across the entire data range.

Logistic regression is based on the logit concept, which is a natural logarithm of odds ratio. Peng et al. (2002) defined the logistic model as shown below:

$$\log(Y) = \ln(\text{odds}) = \frac{\ln(\pi)}{1-\pi} = \alpha + \beta X + \varepsilon$$

(4)

Where

- $\alpha$ is $Y$ intercept.
- $\beta$ is a vector of the regression coefficient.
- $\pi$ is the probability of the outcome of interest i.e., innovation effectiveness.
- $e=2.71828$ which is the base of natural log.

Taking the inverse therefore:

$$\pi_i = \Pr(Y_i = \text{outcome of innovation} | X_i = x_i) = \frac{\exp(\beta_0 + \beta_1 x_i)}{1 + \exp(\beta_0 + \beta_1 x_i)}$$

(5)

Where

- $X$ is a vector of categorical or continuous variables.
- $Y$ is always a categorical (dichotomous) variable.

The value of $\beta$ determines the relationship between $X$ and $Y$. If $\beta > 0$, larger or smaller values of $X$ are associated with larger or smaller values of the logit of $Y$. The converse also applies: if $\beta < 0$, larger or smaller values of $X$ are associated with larger or smaller value of the logit of $Y$. And where $\beta =0$ there is no linear relationship.

For a multiple predictor mode (Peng et al., 2002):

$$\logit(Y) = \frac{\ln(\pi)}{1-\pi} = \alpha + \beta_1 X_1 + \ldots + \beta_n X_n$$

(6)

Therefore:

$$\pi = \Pr(Y = \text{outcome} | X_1 = x_2 = x_3) = \frac{\exp(\alpha + \beta_1 x_1 + \ldots + \beta_n x_n)}{1 + \exp(\beta_1 x_1 + \ldots + \beta_n x_n)}$$

(7)

Where

- $\pi$ = probability of an outcome of technological innovation implementation. $\alpha = Y$ intercept term.
- $\beta$ = regression coefficients.
- $X$s = set of predictors.

$\alpha$ and $\beta$ were estimated using the Markov chain Monte Carlo (MC) method for maximum likelihood. Interpretation of results was done using odds ratio for both categorical and continuous
predictors. Broadband predictors were in the covariates section as independent variables while Innovation\((Y)\) was the dependent variable. The relationship between the likelihood of a broadband innovation’s effective implementation \((Y)\) and its determinants \((X1....X6)\) is described using the following equation:

\[
Y = \alpha + \beta_1 X_1 + \ldots + \beta_6 X_6 + \varepsilon_i
\]  

(8)

The logistic regression model is given as follows:

\[
\ln\left(\frac{P}{1-P}\right) = \alpha + \beta_1 X_1 + \ldots + \beta_6 X_6 + \varepsilon_i
\]  

(9)

Where

- \(P\): Probability that a broadband innovation was effectively implemented;
- \(1-P\): Probability that a broadband innovation was not effectively implemented;
- \(\ln\): Natural logarithms;
- \(\alpha\): Constant of the equation;
- \(\beta_1,\ldots,\beta_6\): The parameters to be estimated;
- \(X_1,\ldots,X_6\): The explanatory variables;
- \(X_1:BB\text{diffusion}1\)
- \(X_2:BB\text{diffusion}2\)
- \(X_3:BB\text{diffusion}3\)
- \(X_4:BB\text{diffusion}4\)
- \(X_5:BB\text{diffusion}5\)
- \(X_6:BB\text{diffusion}6\)

and

- \(\varepsilon_i\): the error term.

**Measurement development**

The items used for measurement in this research were either developed based on the literature review, adapted from previously validated measures or derived through consultation with ICT experts to ensure that they are valid and reliable. A five-point Likert scale arranged in order of magnitude was employed to assess responses. A representative sample was randomly chosen and used to conduct a pilot test of the measures. Partial least-squares (PLS) analysis technique was applied to test the measurement model to determine the internal consistency reliability and construct validity of the study variables. The technique was also used to test strength and direction of the relationships between variables used in the model (Lohmoller, 1989 and Fronell, 1982). There are only 39 universities in Kenya which represents a small sample population. Therefore PLS was preferred for the research. PLS is applicable for testing and estimating small sample sizes as it converges quickly even for large models with many variables and constructs (Lohmoller, 1989).

**Table 1. Summary of measurement scales**

<table>
<thead>
<tr>
<th>Variable construct</th>
<th>Measurement Code</th>
<th>Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Broadband diffusion</td>
<td>BBdiffusion1</td>
<td>Internet connection speed in my institution is very good</td>
</tr>
<tr>
<td></td>
<td>BBdiffusion2</td>
<td>There are many internet users in my institution</td>
</tr>
<tr>
<td></td>
<td>BBdiffusion3</td>
<td>The high cost of bandwidth limits its usability</td>
</tr>
<tr>
<td></td>
<td>BBdiffusion4</td>
<td>Amount of bandwidth available in my institution is adequate</td>
</tr>
<tr>
<td></td>
<td>BBdiffusion5</td>
<td>I can access the internet from within my institution</td>
</tr>
<tr>
<td></td>
<td>BBdiffusion6</td>
<td>I can use broadband comfortably to perform my academic work</td>
</tr>
</tbody>
</table>
Validation of the measurement scale

In order to assess the reliability and validity of the measures before using them in the research model, the study applied a two-step approach as suggested by Anderson and Gerbing (1988). Analysis of the measurement model was conducted first before testing the structural relationships between latent constructs.

\[
\text{Composite Reliability} = \sum_{i=1}^{n} x_i^2 / \left( \sum_{i=1}^{n} x_i^2 + (\sum_{i=1}^{n} y_i) \right) \\
\text{Average Variance Extracted} = (\sum_{i=1}^{n} x_i^2) / n
\]

(10) (11)

Where \( x \) is the factor loading, \( y \) is error variance and \( n \) is the number of indicators in each variable construct.

<table>
<thead>
<tr>
<th>Construct</th>
<th>Measurement Code</th>
<th>Loading</th>
<th>t-value</th>
<th>Composite reliability</th>
<th>Cronbach's alpha (( \alpha ))</th>
<th>Average Variance (AVE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4. Broadband Diffusion</td>
<td>BBdiffusion1</td>
<td>.751</td>
<td>27.035</td>
<td>0.883</td>
<td>0.741</td>
<td>0.548</td>
</tr>
<tr>
<td>(BBdiffusion)</td>
<td>BBdiffusion2</td>
<td>.767</td>
<td>22.421</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>BBdiffusion3</td>
<td>.652</td>
<td>21.055</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>BBdiffusion4</td>
<td>.735</td>
<td>31.202</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>BBdiffusion5</td>
<td>.768</td>
<td>38.935</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>BBdiffusion6</td>
<td>.765</td>
<td>31.622</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2 shows reliability measures above the recommended level of 0.70 as an indicator for adequate internal consistency (Hair, Anderson, Tatham and Black, 1995). Convergent validity is adequate when constructs have an average variance extracted (AVE) of at least 0.5 (Fronell, 1982) or when items loading on their associated factors are above 0.5 (Hair, Anderson, Tatham and Black, 1995). Furthermore AVE from the construct should be greater than the variance shared between a particular construct and other constructs in the model (Chin, 1998). Therefore, the constructs used in this study illustrated satisfactory convergent and discriminate validity.

Results

Broadband diffusion in assessing technological innovation

To study the role of broadband diffusion in assessing technological innovation, a logistic model was constructed using BBdiffusion variable. The variable constructs used were BBdiffusion1, BBdiffusion2, BBdiffusion3, BBdiffusion4, BBdiffusion5 and BBdiffusion6 as the independent variables while Innovative was used as the dependent variable on the other hand. Below is a table that represents the correlation matrix obtained. This correlation matrix shows all values different from 0 indicating that there was a correlation between the dependent variable and each of the explanatory variables. The relationships between variables in the correlation matrix were significant at 5% level and the results also showed that there existed a weak association between the independent variables themselves. In addition there was no evidence of multicollinearity. This meant all the variables were acceptable in predicting the dependent variable, Innovative.
Fourthly, another descriptive measure of goodness of fit used in the inferential analysis was $R^2$. This study utilized the Cox and Snell $R^2$ and the Nagelkerke $R^2$. Cox and Snell $R^2$ had a value of .041 while the Nagelkerke $R^2$ had a value of .055. This is a clear indication that the predictor variables explained only between 4.1% and 5.5% of the changes in innovation implementation effectiveness as per the data collected in this study.

Fourthly, to test for inferential goodness-of-fit, this study utilized the Omnibus tests of model coefficient which yielded a chi square of 6.203 and a $p$-value of 0.023. The null hypothesis could have stated that the data fits the logistic regression model, with the alternative stating that the data does not fit the logistic regression model. A $p$-value of 0.407 which formed the basis for rejecting the null hypothesis. It showed that there was evidence for poor goodness of fit of the data.
The data collected on the variable constructs for this model showed little capacity to predict innovation since the approach to prediction was correct 59.3% of the time for the null model and after regression, the model correctly classified the outcome for only 60% of the cases compared to 59.3% in the null model. The difference is an improvement of only 0.7% which was very small!

| Table 5. Inferential statistics for broadband diffusion regression model |
|---------------------------------|------|
| Statistic                        | Value |
| Hosmer and Lemeshow Test Chi-square p-value | 8.273 Sig. 0.407 .407 |
| Log likelihood                   | 196.484 |
| Cox & Snell R Square             | .041 |
| Nagelkerke R Square              | .055 |
| Omnibus Tests Chi-square         | 6.203 |

This section sorts to establish how IHL in Kenya have embraced broadband technology. The study particularly wanted to find out the extent to which broadband had diffused in this institutions. The study seek answers on the impact of broadband speed, cost, number of users, amount of bandwidth available, accessibility and usability. Only 18% agreed that broadband speed is good, 35.3% agreed that there were many broadband users in their institutions, 13.3% agreed that the high cost of bandwidth limits its usability in their institutions, 12% think the mount of bandwidth available in their institution is adequate, 31.3% could access the internet from within their institutions and only 9.3% of the respondents strongly observe that they can use broadband comfortably to perform their academic work in their institutions. Figure 1 below represents these opinion by respondents.

![Figure 1. Responses for broadband diffusion](image_url)
Table 6. Descriptive statistics for broadband diffusion

<table>
<thead>
<tr>
<th></th>
<th>BBd1</th>
<th>BBd2</th>
<th>BBd3</th>
<th>BBd4</th>
<th>BBd5</th>
<th>BBd6</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>150</td>
</tr>
<tr>
<td>Mean</td>
<td>2.2000</td>
<td>2.5333</td>
<td>1.7800</td>
<td>2.2467</td>
<td>2.8467</td>
<td>3.2200</td>
</tr>
<tr>
<td>Std. Deviation</td>
<td>.99664</td>
<td>1.38383</td>
<td>1.03541</td>
<td>.88186</td>
<td>.89545</td>
<td>1.24712</td>
</tr>
<tr>
<td>Variance</td>
<td>.993</td>
<td>1.915</td>
<td>1.072</td>
<td>.778</td>
<td>.802</td>
<td>1.555</td>
</tr>
<tr>
<td>Minimum</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Maximum</td>
<td>4.00</td>
<td>5.00</td>
<td>4.00</td>
<td>4.00</td>
<td>4.00</td>
<td>5.00</td>
</tr>
</tbody>
</table>

Table 7. Response for broadband diffusion

<table>
<thead>
<tr>
<th></th>
<th>BBd1</th>
<th>BBd2</th>
<th>BBd3</th>
<th>BBd4</th>
<th>BBd5</th>
<th>BBd6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Disagree</td>
<td>23.3%</td>
<td>28.7%</td>
<td>53.3%</td>
<td>16.7%</td>
<td>2.0%</td>
<td>15.3%</td>
</tr>
<tr>
<td>Disagree</td>
<td>51.3%</td>
<td>34.0%</td>
<td>28.7%</td>
<td>54.7%</td>
<td>42.7%</td>
<td>13.3%</td>
</tr>
<tr>
<td>Neutral</td>
<td>7.3%</td>
<td>2.0%</td>
<td>4.7%</td>
<td>16.0%</td>
<td>24.0%</td>
<td>14.7%</td>
</tr>
<tr>
<td>Agree</td>
<td>18.0%</td>
<td>26.0%</td>
<td>13.3%</td>
<td>12.7%</td>
<td>31.3%</td>
<td>47.3%</td>
</tr>
<tr>
<td>Strongly Agree</td>
<td>9.3%</td>
<td>9.3%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
</tbody>
</table>

Even after the government of Kenya through the ICT Authority implemented Phase 11 of the National Optic Fibre Broadband Infrastructure (NOFBI), which was complete in June 2016, the cost of broadband still remains high to date. This is despite the fact that it was advertised that the prices with drop tremendously. The price of bandwidth connection in Mbps has improved by a very small margin. For a 5 mbps band and below, the price improved by 17% from US $300 to US $250 per unit. In some cases there was no change in the prices. For a 30-49.99 band, the price improved by 17% from US $120 to stand at US $100 per unit. The table below shows the price changes for different bandwidth band subscription categories.

Table 8. Price changes for different bandwidth band subscription categories.

<table>
<thead>
<tr>
<th>Bandwidth band Mbps</th>
<th>Previous Unit Price $ Old</th>
<th>New Prices w.e.f July 2016 Unit Price $ New</th>
<th>Percentage Reduction%</th>
</tr>
</thead>
<tbody>
<tr>
<td>under 5</td>
<td>300</td>
<td>250</td>
<td>-17%</td>
</tr>
<tr>
<td>5-9.99</td>
<td>250</td>
<td>200</td>
<td>-20%</td>
</tr>
<tr>
<td>10-14.99</td>
<td>150</td>
<td>150</td>
<td>0%</td>
</tr>
<tr>
<td>15-29.99</td>
<td>130</td>
<td>120</td>
<td>-8%</td>
</tr>
<tr>
<td>30-49.99</td>
<td>120</td>
<td>100</td>
<td>-17%</td>
</tr>
<tr>
<td>50-74</td>
<td>110</td>
<td>100</td>
<td>-9%</td>
</tr>
<tr>
<td>75-100</td>
<td>100</td>
<td>90</td>
<td>-10%</td>
</tr>
<tr>
<td>101 – 150</td>
<td>80</td>
<td>80</td>
<td>0%</td>
</tr>
<tr>
<td>151-200</td>
<td>80</td>
<td>70</td>
<td>12.50%</td>
</tr>
<tr>
<td>201-500</td>
<td>60</td>
<td>60</td>
<td>0%</td>
</tr>
<tr>
<td>501-1250</td>
<td>50</td>
<td>50</td>
<td>0%</td>
</tr>
<tr>
<td>Above 1250</td>
<td>50</td>
<td>40</td>
<td>-25%</td>
</tr>
</tbody>
</table>

Source: Kenet data
The effect of a change in bandwidth prices has seen an increase in the number of universities purchasing bandwidth from KENET. Some universities have even increased their bandwidth subscriptions. The figure below shows the number of universities that subscribed to different bandwidth band categories in May, 2017.

![Bandwidth Subscription per university in May, 2017](image)

**Figure 2.** Bandwidth subscription per university

![Cost of Bandwidth](image)

**Figure 2.** Cost of bandwidth

Broadband speed is a determinant of innovation. Streaming video is rapidly growing as a percentage of internet traffic, requiring increasingly large amounts of bandwidth and raising requirements for timely packet delivery. Advanced internet-based applications such as telemedicine...
deliver many benefits but require low latency and high quality of service. The Internet promises to vastly increase the number of devices communicating via Internet and hence the amount of data transmitted and number of broadband connections. Growth in Cloud-based services create greater demand for bandwidth, especially in combination with Big Data applications that capture and process vast quantities of data derived from everyday activities. The figure below shows online applications requirements for transmission speed.

![Figure 3. Online applications requirements for transmission speed](image)

Figure 3. Online applications requirements for transmission speed

Source: Deutsche Bank Research, 2014

The table below shows a comparison of broadband services possible at different speeds

Table 9. Broadband services possible at different transmission speeds

<table>
<thead>
<tr>
<th>Speed range</th>
<th>Possible services that can be supported</th>
</tr>
</thead>
<tbody>
<tr>
<td>500 kbps – 1 Mbps</td>
<td>voice over Internet protocol (VOIP), short message service (SMS), basic email, web browsing simple sites, streaming music using caching low quality and highly compressed video</td>
</tr>
<tr>
<td>1 Mbps – 5Mbps</td>
<td>Web browsing complex sites, email with larger file attachments, remote surveillance, internet protocol TV-standard definition (IPTV-SD), small and medium size file sharing, ordinary telecommuting, one channel of digital broadcast video, and streaming music</td>
</tr>
<tr>
<td>5 Mbps – 10 Mbps</td>
<td>Advanced telecommunicating, large size file sharing multiple channels of IPTV-SD, broadcast SD video two to three channels of video streaming high, definition (HD) video downloading, low definition telepresence, gaming, basic medical file sharing and remote diagnosis, remote education, and building control and management</td>
</tr>
<tr>
<td>100 Mbps – 1 Gbps</td>
<td>HD telemedicine, multiple educational services, full HD broadcast video, full IPTV channels, video on demand HD, immersion gaming, and telecommuting with remote server services</td>
</tr>
<tr>
<td>1 Gbps – 10 Gbps</td>
<td>Research applications, uncompressed HD video streaming telepresence, live event digital cinema streaming telemedicine with remote control of medical</td>
</tr>
<tr>
<td>instruments, interactive remote visualization and virtual reality, sharing terabyte size datasets, and remote supercomputing</td>
<td></td>
</tr>
</tbody>
</table>


**Discussion**

The objective of the study was to study the role of broadband diffusion in assessing technological innovations. Analysis of the regression model constructed revealed that the data fitted the model well. Firstly, the Hosmer and Lemeshow Test Chi-square indicated that the model as a whole fitted significantly better than a null model. Secondly the log likelihood showed that the model fitted the data.

Thirdly, Cox and Snell $R^2$ and the Nagelkerke $R^2$ indicated that the predictor variables explained only between 4.1% and 5.5% of the changes in innovation implementation effectiveness. Fourthly, to test for inferential goodness-of-fit, this study utilized the Omnibus tests of model coefficient which formed the basis for rejecting the null hypothesis that stated that the data did not fit the logistic regression model.

The data collected on the variable constructs for this model showed little capacity to predict innovation since the approach to prediction improved by only 0.7% which was very small! This is supported by responses obtained from the research during data collection. The study seek answers on the impact of broadband speed, cost, number of users, amount of bandwidth available, accessibility and usability. Only 18% agreed that broadband speed is good, 35.3% agreed that there were many broadband users in their institutions, 13.3% agreed that the high cost of bandwidth limits its usability in their institutions, 12% think the mount of bandwidth available in their institution is adequate, 31.3% could access the internet from within their institutions and only 9.3% of the respondents strongly observe that they can use broadband comfortably to perform their academic work in their institutions.

**Conclusion and recommendation**

Institutions of higher learning in Kenya should ensure that adequate bandwidth is available to staff and students to comfortably perform their activities related to academic work. Connection speed is related to the number of users accessing the internet at the same time. Policy should be put in place to ensure the ratio of users to available bandwidth is acceptable. Access to broadband should not be limited to laboratory or classrooms use but should be available even outside within the institutions. This enables those with laptops and other portable devices access to broadband.

Competition is healthy in any business environment. It encourages adoption of more sophisticated methods of operation and service delivery in order to have a competitive edge from other business rivalries. Universities compete amongst themselves to increase enrolments in order to improve their capital base. They achieve this by increasing the number of programs they offer as well as improve the quality of services they provide. Competition also arises among technologies and among broadband Internet service providers. Technologies competing for BI provision in Kenya include; satellite, Digital Subscriber Line (DSL), cable mode provision and wireless.

Broadband internet service providers operating in Kenya include safaricom, orange Telkom, airtel and essar. Others include Jamii Telecom, liquid Telecom, access Kenya Group, Kenya Education Network (KENET), Wananchi Group, Internet solutions and MTN. Competition brings down the costs of BI, improves BI penetration levels, improves the quality standards of services delivered and improves cooperate governance standards. This has the effect of encouraging foreign investments, better salaries and incentives as well as encourage intellectual property protection laws.
References

A Model to Assess Technological Innovations at Institutions of Higher Learning in Kenya

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Abstract

Objective: The aim was to develop an innovation assessment model to analyse the impact of broadband in spurring innovations in Kenya by studying the role of broadband diffusion, the impact of broadband collaborations, the influence of electronic research and the role of online broadband products usability.

Background: Many countries in Africa invest in broadband infrastructure because they have realized that broadband encourages innovation leading to economic development and prosperity. Understanding the relationship between universities, business enterprises and government enabled by broadband is critical in assessing a country's innovative capacity.

Methodology: This study applied descriptive survey research design. It used a logistic regression model as an inferential analysis tool in the quantitative aspects of the research. The target population for this study was institutions of higher learning (IHL) operating in Kenya by 31st December, 2015 which included both private and public accredited universities in Kenya.

Results: The response rate from the sampled population was at 75% Reliability measures were above the recommended level of 0.70 as an indicator for adequate internal consistency. The overall model evaluation, goodness-of-fit statistics, statistical tests of individual predictors and validations of predicted probabilities. Showed that the data fitted the model and the model performed well.

Conclusion: Institutions of higher learning in Kenya have a positive but low capacity in technological innovation implementation. Broadband diffusion is inhibited by poor infrastructural development attributed to high costs of connections and bandwidth acquisition and a high demand for broadband among the students and staff.

Keywords: Broadband, Innovation, Internet, Education, model.

Introduction

The role of broadband (BB) technology in Institutions of Higher Learning (IHL) cannot be underestimated. Jhurree (2005) asserted that technology has the potential to drive educational, political and social transformations and advised that developing countries cannot ignore technology if they are to remain competitive in globalization era. Technology has become a non-negotiable aspect of students’ lives and is a major attractor to students and the corporate sector in joining different IHL (The Economist Intelligence Unit (2008)). Research indicates that though there is a degree of application of technology in teaching and learning, this application is not commensurate to technology use in administration and social circles.

McGregor (2002) and Dodds (2007) viewed technology as a powerful contributor to strengthening IHL. Dodds (2007) believed technology had emancipator power that is able to assist institutions to move from the status quo and perform their functions in a much improved way. He categorized ICT’s role as a contributor to innovation into three broad areas namely, building communities of innovation, changing institutional processes and implementing infrastructure and tools that enable people to succeed. ICT could create new possibilities for collaboration, remove barriers to effectiveness, assist in establishing continual communication and help build trust among people. While technology cannot be taken as a panacea for all educational challenges, “it does leverage and extend traditional teaching and learning activities in certain circumstances and hence has the potential to impact on learning outcomes” (Jaffer, Ng’ambi, & Czerniewicz, 2007).
The massive investment by IHL in broadband technology is evidence that institutions are cognizant of technology’s potential in revolutionizing their operations (Jhurree, 2005). This indicates the readiness on the part of IHL management to make the most of potential benefits attributed to technology integration in their functional areas. Several studies presented evidence that despite significant investment and claimed benefits, the impact of BB technology on education has often been disappointing (Dawson, et al., 2012). Although most technological innovations are now emerging from developing countries, the massive spending in ICT with little to show for these investments, gives rise to a ‘technology complex’. In fact Bertrand (2010) refers to this technological innovation transfer as the effect of “Technosclerosis” and contended that modern universities have fallen behind the pace of technological change and have become irrelevant in the real life of an interconnected and globalizing world.

Oliver (2002) supports Bertrand by claiming that the impact of technological innovations in IHL has not been as extensive as in other fields. He argued that there is a lack of congruence between the belief in technology’s potential and the actual realization of the benefits that should accrue from adopting these innovations. It can be stated that IHL often invest in technology with alacrity but having limited understanding of how to manage the implementation process. Though there is much literature on technology adoption, the understanding of what leads to effective implementation and assessment once technology has been adopted remains blurred (Dong, et al., 2008). There is also limited information and understanding of the determinants and criteria applicable in assessing effective implementation of technological innovations in IHL. Literature is replete with information on key barriers to the successful implementations of BB innovations in IHL (Bertrand, et al., 2010).

Bertrand (2010) called for critical examination of factors related to education and administration that make institutions unable to be innovative. Unfortunately, failure to achieve effective implementation of innovations has negative consequences. They include; loss of the finances already sunk into the project, loss of the potential benefit of technology integration, opportunity costs relating to other resources that were sunk into the project, tarnished credibility of the management involved and the likelihood that management will in future be skeptical regarding use of broadband for innovation (Sawang & Unsworth, 2007; Osei-Bryson, Dong, et al., 2008). The reason that most technology project implementations are ineffective and that institutions fail to reap the benefits of BB usability for innovative purposes is ineffective implementation arising from lack of knowledge rather than failure of the innovation being adopted (Sawang & Unsworth, 2011). IHL in Africa need to understand what determines effective implementation of BB technology for innovative purpose and the criteria applicable for assessing innovation in this institution. This represents the main knowledge gap in the current study. The study endeavoured to bridge the gap between the high costs of investment in BB technology and its effective application for innovation in IHL.

**Triple helix systems**

This study adopts the Triple Helix system model of innovation. The Triple Helix idea is that the potential for innovation and economic development in a knowledge society lies in a more prominent role for the university and in the hybridisation of elements from university, government and industry to generate new institutional and social formats for the production, application and transfer of knowledge. This vision encompasses not only the creative destruction that appears as a natural innovation dynamics (Schumpeter, 1942), but also the creative renewal that arises within each of the three institutional spheres of university, industry and government, as well as at their intersections. This enhanced role of the university in the Knowledge Society arises from several specific developments. The first is the recent addition of the university involvement in socio-economic development, then next to the traditional academic missions of teaching and research (Etzkowitz, 2003).

This is to a large extent the effect of strong government policy to strengthen the links between universities and the rest of society such as business, but also an effect of firms’ tendency to use universities’ research infrastructure for their R&D objectives, indirectly transferring part of their costs to the state which provides a large part of university funding (Slaughter and Leslie, 1997). The network linkages with the other Triple Helix actors have enhanced the central presence of universities
in the production of scientific research over time (Godin and Gingras, 2000) disproving former views that increasing diversification of production loci would diminish the role of universities in the knowledge production process (Gibbons et al. 1994). The second is the university’s capacity to continuously provide students with new skills and entrepreneurial talent has become a major asset in the Knowledge Society. This makes students not only the new generations of professionals in various scientific disciplines, but they can also be trained and encouraged to become entrepreneurs and innovators contributing to economic growth and job creation.

Universities are also extending their capabilities of educating individuals to educating organizations through entrepreneurship and incubation programmes and new training modules at venues such as inter-disciplinary centres, incubators, academic spin-offs and science parks (Etzkowitz et al., 2012). The third is universities’ capacity to generate technology has transformed its responsibility from a traditional source of human resources and knowledge to a new source of technology generation and transfer, increasing internal organizational capabilities to produce and formally transfer technologies rather than relying solely on informal ties. The Triple Helix literature body has been developed consisting the following two main complementary perspectives:

A (neo)institutional perspective (Etzkowitz et al., 2008) encompasses case studies and comparative historical analyses that explore different configurations arising from the positioning of the university, industry and government institutional spheres relative to each other and their movement and reorientation, with one as a gravitational centre around which the others rotate (Fig.2.3). Government may play the lead role for instance in a statist regime, driving academia and industry but also limit its capacity to initiate and develop innovative transformations (such as in Russia, China, some Latin American and Eastern Europe countries). Meanwhile in a laissez-faire regime, characterised by a limited state intervention in the economy (such as the US and some Western European countries), industry is the driving force with the other two spheres as ancillary support structures and limited roles in innovation.

The university here acts mainly as a provider of skilled human capital while government mainly as a regulator of social and economic mechanisms. A balanced regime is emerging in the transition to a Knowledge Society, whereby university and other knowledge institutions play increasing role acting in partnership with industry and government and even taking the lead in joint initiatives (Etzkowitz, 2008). The balanced model offers the most important insights, as the best environments for innovation are created at the intersections of the spheres. Here, creative synergies emerge and set in motion a process of “innovation in innovation”, creating new venues for interaction and new organisational forms, as individual and organisational actors not only perform their own role, but also “take the role of the other” when the other is weak or under-performing (Etzkowitz et al., 2003). Through this creative process, relationships among the institutional spheres of university, industry and government are continuously reshaped to enhance innovation (Etzkowitz and Leydesdorff, 1998) bringing forth new technologies, new firms and new types of relationships in a sustained systemic effort.
A (neo) evolutionary perspective (Luhmann, 1984) inspired by the theory of social systems of communication and mathematical theory of communication (Shannon, 1948), that views the University, Industry and Government as co-evolving subsets of social systems. The interaction between them occurs through an overlay of recursive networks and organizations which reshape their institutional arrangements through reflexive sub-dynamics (such as markets and technological innovations) (Leydesdorff et al., 2009). Such forms of interaction are part of two processes of communication and differentiation between science and markets, and between private and public control at the level of universities, industries and government that allow various degrees of selective mutual adjustment (Etzkowitz et al., 1998). Furthermore, internal differentiation within each institutional sphere generates new types of links and structures between them creating new network integration mechanisms (Etzkowitz et al., 1998).

The institutional spheres are also seen as selection environments while the institutional communications between them act as selection mechanisms that generate new innovation environments and ensure 'regeneration' of the system (Etzkowitz et al., 1998). The activities of the Triple Helix actors are measured in terms of probabilistic entropy which when negative suggests a self-organizing dynamic that may temporarily be stabilized in the overlay of communications among the carrying agencies (Etzkowitz et al., 1998). This dynamism systemic nature of the Triple Helix interactions is an underlying dimension of both perspectives originating from their common vision of Triple Helix interactions as manifestations of social systems (Luhmann et al., 1984). However, an explicit analytical framework for conceptualizing Triple Helix systems has not been provided so far.

**Conceptual framework**

The conceptual framework for the present study shows the relationship between independent variables and the dependent variable. Independent variables include broadband diffusion, broadband collaboration, electronic research and online broadband products while technological innovation is the...
dependent variable. Technological innovations are the effect of new online products usability, broadband processes, and broadband services that may arise as a result of widespread broadband application. Broadband diffusion influences all the other independent variables namely, broadband collaboration, electronic research and online broadband products which is depicted in the framework with a link. Broadband collaborations, online products usability and electronic research (e-research) are the processes, products and services that arise from dynamic interactions and network formations between academia, industry and government through broadband diffusion. This is because this study adopts a system dynamic structure. Broadband policy is taken as the moderating variable in the model. Policy implication on broadband influences the direction and vigour in technological innovativeness of organizations within Kenya.

**Methods**

**Empirical model**

The study uses a logistic regression model as an inferential analysis tool in the quantitative aspects of the research. In the research, IHL were viewed as adopters of broadband innovations. Once broadband innovations were adopted, consumers of broadband innovations (i.e., students, academic staff and administrative staff) intend to be satisfied by the systems adopted and implemented. This assumption is guided by utility maximization theory, and taking the rational choice theory, universities would expect to realize most of the outputs envisaged in each adoption. Consumers therefore, would get satisfaction if the innovations were effectively implemented $U(a_i)$. If there was failure in effective implementation then utility would be $U(a_f)$.

The utility maximization model therefore would be:

$$U(a_i) > U(a_f)$$  \(1\)

Where $U(a_i)$ and $U(a_f)$ denote the utility derived from the innovations' effective implementation $U(a_i)$ and failure ineffective implementation $U(a_f)$. The output of this utility model is a binary output (effective implementation (1) and ineffective implementation (0)). The dependent variable took binary response outcomes. Assuming $Y$ to represent successful innovation implementation, then:
\[ y_i = \begin{cases} 1 & \text{if an innovation was effectively implemented} \quad \text{probability } p \\ 0 & \text{if innovation implementation was not effective} \quad \text{probability } 1 - p \end{cases} \] (2)

These values of 1 and 0 are chosen based on the binary outcome of:

\[ P_i = \Pr[y_i = 1 | X] = F(x_i \beta) \] (3)

Where \( F(.) \) is a specific function. In order to ensure that \( 0 \leq p \leq 1 \), then it is natural to specify \( F(.) \) to be a cumulative distribution function. The estimation model selected as appropriate for this research study was the logit model. According to (Peng, Lee, & Ingersoll, 2002), Logit models are models that can be used to analyze and predict data whose outcome is categorical. Logistic regression analysis is thus suitable where there is a dichotomous outcome – of success or failure. Furthermore, a logit model is well suited for describing and testing relationships of categorical outcomes and one or more categorical or continuous predictors where errors are neither normally distributed nor constant across the entire data range.

Logistic regression is based on the logit concept, which is a natural logarithm of odds ratio. Peng, et al., (2002) defined the logistic model as shown below:

\[ \log (Y) = \ln (odds) = \frac{\ln (\pi)}{1-\pi} = \alpha + \beta X + \epsilon \] (4)

Where
\( \alpha \) is \( Y \) intercept.
\( \beta \) is a vector of the regression coefficient.
\( \pi \) is the probability of the outcome of interest i.e., innovation effectiveness.
\( \epsilon = 2.71828 \) which is the base of natural log.

Taking the inverse therefore:

\[ \pi_i = \Pr(Y_i = \text{outcome of innovation} | X_i = x_i) = \frac{\exp (\beta_0 \beta_1 x_{1i} \ldots \beta_n x_{ni})}{1+\exp (\beta_0 \beta_1 x_{1i} \ldots \beta_n x_{ni})} \] (5)

Where
\( X \) is a vector of categorical or continuous variables.
\( Y \) is always a categorical (dichotomous) variable.

The value of \( \beta \) determines the relationship between \( X \) and \( Y \). If \( \beta > 0 \), larger or smaller values of \( X \) are associated with larger or smaller values of the logit of \( Y \). The converse also applies: if \( \beta < 0 \), larger or smaller values of \( X \) are associated with larger or smaller value of the logit of \( Y \). And where \( \beta = 0 \) there is no linear relationship.

For a multiple predictor mode (Peng, et al., 2002)

\[ \logit(Y) = \frac{\ln (\pi)}{1-\pi} = \alpha + \beta_1 X_1 + \ldots + \beta_n X_n \] (6)

Therefore

\[ \pi = \Pr(Y = \text{outcome} | X_1 = x_1, X_2 = x_2, X_3 = x_3) = \frac{\exp (\alpha + \beta_1 x_{1i} + \ldots + \beta_n x_{ni})}{1+\exp (\beta_1 x_{1i} + \ldots + \beta_n x_{ni})} \] (7)

Where
\( \pi = \) probability of an outcome of technological innovation implementation.\( \alpha = \) \( Y \) intercept term.
\( \beta = \) regression coefficients.
\( X_5 = \) set of predictors.
\( \alpha \) and \( \beta \) were estimated using the Markov chain Monte Carlo (MC) method for maximum likelihood. Interpretation of results was done using odds ratio for both categorical and continuous predictors. The compound predictors were: Online broadband products (X1); e-Research (X2); Broadband diffusion (X3); Broadband collaboration(X4) and Broadband policy(X5) – against an independent variable: Innovation(Y). As noted, independent variables (X1…..X5) were composite variables and therefore factor analysis was used to combine the sub-variables to one composite variable to fit into the model. A three-predictor logistic model was used to fit the data for testing. The relationship between the likelihood of broadband innovation’s effective implementation (Y) and its determinants (X1…..X5) is described using the following equation:
\[ Y = \alpha + \beta_1 X_1 + \ldots + \beta_5 X_5 + \varepsilon_i \quad (8) \]

The logistic regression model is given as follows:

\[ \ln \left( \frac{P}{1-P} \right) = \alpha + \beta_1 X_1 + \ldots + \beta_5 X_5 + \varepsilon_5 \quad (9) \]

Where

- P probability that a broadband innovation was effectively implemented; 1-P probability that a broadband innovation was not effectively implemented;
- In natural logarithms;
- \( \alpha \) Constant of the equation;
- \( \beta_1, \ldots, \beta_5 \): The parameters to be estimated
- \( X_1, \ldots, X_5 \): The explanatory variables;
- \( X_1 \): Online broadband products;
- \( X_2 \): e-Research;
- \( X_3 \): Broadband diffusion
- \( X_4 \): Broadband collaboration
- \( X_5 \): Broadband policy
- and
- \( \varepsilon_i \): The error term.

**Definition of measurement variables**

Technological Innovation (Y): This is the dependent variable. It was measured on the basis of whether a technological innovation was effectively implemented or not. In order to be effectively implemented meant that the innovation was in use and had achieved 60% of other objectives. A value of 1 meant effectiveness in implementation while 0 indicated not effectively implemented.

Online broadband products (\( X_1 \)): This independent variable measured the impact broadband diffusion played in implementation of online broadband technological innovation products. This was measured by assessing users and stakeholder’s perceptions of the products effectiveness in running the day-to-day activities in IHL.

E-research (\( X_2 \)): This independent variable measured the impact broadband diffusion played in implementation of electronic research in IHL. It is an innovation metric that measured the levels of conducting research effectively from a user’s point of view by utilizing broadband technologies. A stakeholder view was necessary to ascertain the degree at which e-research innovation was implemented.

Broadband diffusion (\( X_3 \)): This independent variable influenced all the other independent variables. It had an impact on broadband products, e-research and collaboration. The factors in this variable construct that the research focused on are: broadband price; bandwidth availability; broadband accessibility; broadband usability and broadband speed. The research seek opinion on their influence on broadband diffusion within IHL.

Broadband collaboration (\( X_4 \)): This independent variable measured the impact broadband diffusion played in implementation of collaborative engagements of IHL and other organizations and institutions. It measured impact of collaborative network formations and was obtained from stakeholder perceptions in realization of their expectations and benefits from these interactions.

Broadband Policy (\( X_5 \)): This is a moderating variable and it influenced all the other variables. Policy on broadband determined the capacity of innovation, the direction and vigour of innovation implementation.

**Measurement development**

The items used for measurement in this research were either developed based on the literature review, adapted from previously validated measures or derived through consultation with ICT experts to ensure that they are valid and reliable. A five-point Likert scale arranged in order of magnitude was employed to assess responses.
A representative sample was randomly chosen and used to conduct a pilot test of the measures. Partial least-squares (PLS) analysis technique was applied to test the measurement model to determine the internal consistency reliability and construct validity of the study variables. The technique was also used to test strength and direction of the relationships between variables used in the model (Lohmoller, 1989 and Fronell, 1982). There are only 39 universities in Kenya which represents a small sample population. Therefore PLS was preferred for the research. PLS is applicable for testing and estimating small sample sizes as it converges quickly even for large models with many variables and constructs (Lohmoller, 1989).

<table>
<thead>
<tr>
<th>Variable construct</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Online Broadband Products</strong></td>
<td></td>
</tr>
<tr>
<td>Code</td>
<td>Measure</td>
</tr>
<tr>
<td>DLibrary</td>
<td>Indicate the popularity of digital library in your institution</td>
</tr>
<tr>
<td>eLearn</td>
<td>Indicate the level of popularity of the e-learning program in your institution</td>
</tr>
<tr>
<td>LMS</td>
<td>The Learning Management System(LMS) is very effective in my institution</td>
</tr>
<tr>
<td>ARMS</td>
<td>The academics record management system is used effectively by all faculty in my institution</td>
</tr>
<tr>
<td>Portal</td>
<td>ALL students in my institution access and use their portal effectively</td>
</tr>
<tr>
<td>onAdm</td>
<td>Online admission is effectively used for admission purposes</td>
</tr>
<tr>
<td><strong>2. e-Research</strong></td>
<td></td>
</tr>
<tr>
<td>onLiJournals</td>
<td>Online journal repository is easily accessible in my institution</td>
</tr>
<tr>
<td>Conferences</td>
<td>International conference, workshop or symposia are common in my institution</td>
</tr>
<tr>
<td>onLiJourn</td>
<td>Indicate the level of popularity of online journals in your institution</td>
</tr>
<tr>
<td>Incubators1</td>
<td>Technology incubator(s) or accelerator(s) are popular in my institution</td>
</tr>
<tr>
<td>Incubators2</td>
<td>Technology incubator(s) or accelerator(s) in my institution have produced many useful technological applications</td>
</tr>
<tr>
<td>Incubators3</td>
<td>Many members of my institution have benefited from these incubator(s) or accelerator(s)</td>
</tr>
<tr>
<td><strong>3. Broadband collaborations</strong></td>
<td></td>
</tr>
<tr>
<td>Collab1</td>
<td>My institution collaborates with many institutions and organizations</td>
</tr>
<tr>
<td>Collab2</td>
<td>Many members of my institution have benefited from these collaborations</td>
</tr>
<tr>
<td>Collab3</td>
<td>My institution has benefited immensely from the collaborations</td>
</tr>
<tr>
<td>Collab4</td>
<td>Most of the collaborations are broadband based</td>
</tr>
<tr>
<td>Collab5</td>
<td>There are many completed and ongoing broadband based projects undertaken jointly with other organizations in my institution</td>
</tr>
</tbody>
</table>

Table 1. Summary of measurement scales
Collab6 Broadband based projects undertaken jointly with other organizations have resulted in many innovative products/applications

4. Broadband diffusion

BBdiffusion1 Internet connection speed in my institution is very good
BBdiffusion2 There are many internet users in my institution
BBdiffusion3 The high cost of bandwidth limits its usability
BBdiffusion4 Amount of bandwidth available in my institution is adequate
BBdiffusion5 I can access the internet from within my institution
BBdiffusion6 I can use broadband comfortably to perform my academic work

5. Influence of Broadband policies

BBP1 Adequate training is provided on the use of digital library and other ICT-based academic management tools in my institution
BBP2 My institution procures adequate bandwidth to sustain broadband requirements
BBP3 My institution encourages the use of online tools in admission and students' records management
BBP4 My institution has implemented a distant online learning or e-learning program that is very popular
BBP5 Broadband collaborations and linkages with other organizations are common in my institution
BBP6 My institution encourages broadband collaborative research

6. Broadband on Innovations

BBD-INN1 Broadband diffusion influences online product innovation in my institution
BBD-INN2 Broadband diffusion impacts positively on collaboration in my institution
BBD-INN3 Broadband diffusion has an influence on e-research in my institution
BBD-INN4 Broadband policy has an impact on innovation in my institution

Results

Validation of the measurement scale

In order to assess the reliability and validity of the measures before using them in the research model, the study applied a two-step approach as suggested by Anderson and Gerbing (1988). Analysis of the measurement model was conducted first before testing the structural relationships between latent constructs.

\[
\text{Composite Reliability} = \frac{\sum_{i=1}^{n} x_i^2}{\sum_{i=1}^{n} x_i^2 + (\sum_{i=1}^{n} y_i^2)} \quad (10)
\]

\[
\text{Average Variance Extracted} = \frac{(\sum_{i=1}^{n} x_i^2)}{n} \quad (11)
\]
Where $x$ is the factor loading, $y$ is error variance and $n$ is the number of indicators in each variable construct.

Table 2. Psychometric properties of the constructs

<table>
<thead>
<tr>
<th>Construct</th>
<th>Measurement Code</th>
<th>Loading</th>
<th>t-value</th>
<th>Composite reliability</th>
<th>Cronbach’s alpha ($\alpha$)</th>
<th>Average Variance (AV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Online broadband products</td>
<td>DLibrary</td>
<td>.887</td>
<td>29.048</td>
<td>0.897</td>
<td>0.740</td>
<td>0.726</td>
</tr>
<tr>
<td></td>
<td>eLearn</td>
<td>.910</td>
<td>20.324</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>LMS</td>
<td>.812</td>
<td>27.879</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ARMS</td>
<td>.844</td>
<td>33.642</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Portal</td>
<td>.815</td>
<td>39.634</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>onAdm</td>
<td>.840</td>
<td>26.948</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. e-Research</td>
<td>onLiJournals</td>
<td>.820</td>
<td>24.870</td>
<td>0.860</td>
<td>0.784</td>
<td>0.503</td>
</tr>
<tr>
<td></td>
<td>Conferences</td>
<td>.650</td>
<td>28.187</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>onLiJourn</td>
<td>.678</td>
<td>22.944</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Incubators1</td>
<td>.595</td>
<td>43.465</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Incubators2</td>
<td>.788</td>
<td>38.447</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Incubators3</td>
<td>.701</td>
<td>43.958</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Broadband Collaborations</td>
<td>Collab1</td>
<td>.887</td>
<td>29.048</td>
<td>0.549</td>
<td>0.726</td>
<td>0.671</td>
</tr>
<tr>
<td></td>
<td>Collab2</td>
<td>.910</td>
<td>20.324</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Collab3</td>
<td>.812</td>
<td>27.879</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Collab4</td>
<td>.844</td>
<td>33.642</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Collab5</td>
<td>.581</td>
<td>32.870</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Collab6</td>
<td>.840</td>
<td>26.948</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Broadband Diffusion</td>
<td>BBdiffusion1</td>
<td>.751</td>
<td>27.035</td>
<td>0.883</td>
<td>0.741</td>
<td>0.548</td>
</tr>
<tr>
<td></td>
<td>BBdiffusion2</td>
<td>.767</td>
<td>22.421</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>BBdiffusion3</td>
<td>.652</td>
<td>21.055</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>BBdiffusion4</td>
<td>.735</td>
<td>31.202</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>BBdiffusion5</td>
<td>.768</td>
<td>38.935</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>BBdiffusion6</td>
<td>.765</td>
<td>31.622</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Broadband policies</td>
<td>BBP1</td>
<td>.630</td>
<td>22.602</td>
<td>0.875</td>
<td>0.876</td>
<td>0.492</td>
</tr>
<tr>
<td></td>
<td>BBP2</td>
<td>.543</td>
<td>25.974</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>BBP3</td>
<td>.834</td>
<td>27.271</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>BBP4</td>
<td>.769</td>
<td>25.647</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>BBP5</td>
<td>.635</td>
<td>23.068</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>BBP6</td>
<td>.755</td>
<td>26.513</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2 shows reliability measures above the recommended level of 0.70 as an indicator for adequate internal consistency (Hair, Anderson, Tatham and Black, 1995). Convergent validity is adequate when constructs have an average variance extracted (AVE) of at least 0.5 (Fronell, 1982) or when items loading on their associated factors are above 0.5 (Hair, Anderson, Tatham and Black, 1995). Furthermore AVE from the construct should be greater than the variance shared between a particular construct and other constructs in the model (Chin, 1998). Therefore, the constructs used in this study illustrated satisfactory convergent and discriminate validity.

Overall regression model

In order to develop a model to assess technological innovation, a logistic regression model was constructed using Innovative as the dependent variable while broadband diffusion (BBdiffusion), e-
Research (eResearch), broadband Collaboration (COLLAB) and online broadband products (OnLineProd) as covariates or independent variables.

**Overall regression model analysis**

The underlying section provides inferential statistical results and their interpretation as provided in the Logistic regression model adopted in this study for analysis. Peng et al. (2002) guidelines provided the basis for analysis. Peng et al. (2002) claimed that to test the soundness of a logistic regression model, the following tests were important considerations: overall model evaluation; goodness-of-fit statistics; statistical tests of individual predictors and validations of predicted probabilities.

The Omnibus Tests of Model Coefficients is used to check that the new model (with explanatory variables included) is an improvement over the baseline model. The test uses chi-square tests to see if there is a significant difference between the Log-likelihoods (specifically the -2LLs) of the baseline model and the model created. If the new model created has a significantly reduced -2LL compared to the baseline, then it suggests that the new model is explaining more of the variance in the outcome and is an improvement! The $R^2$ values tell us approximately how much variation in the outcome is explained by the new created model.

Before the data was subjected to logistic regression analysis, it was necessary to run multi-correlation, validity and reliability tests to determine the constructs necessary for the model. These tests were done earlier and explanations were provided. The following table shows results for the logistic regression model estimation.

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>S.E</th>
<th>Wald</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>OnLineProd</td>
<td>4.081</td>
<td>1.346</td>
<td>7.582</td>
<td>.002</td>
</tr>
<tr>
<td>eResearch</td>
<td>-.377</td>
<td>.281</td>
<td>6.799</td>
<td>.181</td>
</tr>
<tr>
<td>BBdifussion</td>
<td>-.338</td>
<td>.280</td>
<td>8.372</td>
<td>.227</td>
</tr>
<tr>
<td>COLLAB</td>
<td>-3.119</td>
<td>1.308</td>
<td>6.297</td>
<td>.017</td>
</tr>
<tr>
<td>BBPtotal</td>
<td>.121</td>
<td>.249</td>
<td>8.146</td>
<td>.625</td>
</tr>
</tbody>
</table>

The Hosmer and Lemeshow Test Chi-square of 46.405 with a p-value of 0.000 indicated that the model as a whole fitted significantly better than a null model (an empty model without a predictor). With a log likelihood of 37.804 showed that the model fitted the data. Looking at the data, the chi-squared statistic on which it is based is very dependent on sample size so the value cannot be interpreted in isolation from the size of the sample. As it happens, this $p$ value may change when we allow for interactions in our data. Exp (B) stands for confidence interval and this option requests the range of values that we are confident that each odds ratio lies within. The setting of 95% means that there is only a $p < .05$ that the value for the odds ratio, exp (B), lies outside the calculated range.

Another descriptive measure of goodness of fit is $R^2$. Peng et al. (2002) explained that in a linear regression, $R^2$ is the proportion of the variations in the dependent variable that could be explained by predictor variables. However, in logistic regression, $R^2$ is not well defined and in this study it was supplemented by the Cox and Snell $R^2$ and the Nagelkerke $R^2$. The results of the model showed that Cox and Snell $R^2$ was 0.667 while the Nagelkerke $R^2$ was 0.900. This meant the predictor variables explained between 66.7% and 90.0% of the changes in innovation implementation effectiveness as per the data collected in this study.

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hosmer and Lemeshow TestChi-square</td>
<td>46.405</td>
</tr>
<tr>
<td>p-value</td>
<td>0.000</td>
</tr>
<tr>
<td>Log likelihood</td>
<td>37.804</td>
</tr>
<tr>
<td>Cox &amp; Snell R Square</td>
<td>0.667</td>
</tr>
<tr>
<td>Nagelkerke R Square</td>
<td>0.900</td>
</tr>
</tbody>
</table>
The inferential goodness-of-fit test is the Omnibus tests of model coefficient test, which yielded chi square of 164.883 and a p-value of 0.000 (p<0.005). The null hypothesis could have stated that the data fits the logistic regression model, with the alternative stating that the data does not fit the logistic regression model. A p-value of 0.000 means that the null hypothesis was rejected. It shows that there was evidence for goodness of fit of the data. This findings supported Peng et al., 2002 and Dwivedi et al., 2010 studies.

In this section the model always guesses ‘no’ because variable constructs were not innovative and therefore the approach to prediction was correct 59.3% of the time. After regression the model correctly classified the outcome for 98.7% of the cases compared to 59.3% in the null model. This was a great improvement. Below is the graph showing the outcome classification and the predicted probabilities.

Discussion

Overall, the findings of the study revealed that institutions of higher learning in Kenya are not technologically innovative and have a low level of broadband adoption. These findings were supported by the frequencies of the responses from the respondents which were presented in the form of percentages. All the four factors that were used to assess technological innovation presented a low level of influence on technological innovation assessment. Furthermore, broadband policy had little impact on technological innovations assessments in these institutions.

Conclusion

Based on the findings of the research, it can be concluded that institutions of higher learning in Kenya have a positive but low capacity in technological innovation. The adoption of broadband by this institutions has the potential to improve technological innovations. Although this institutions have continued to perform well in terms of student enrolments, this could have been made better by adopting modern innovative techniques in the day to day activities of management and teaching. Adoption of distance and e-learning programs could boost further student enrolments by enhancing widespread access to education to those at a distant across East Africa or further.

The application of online admissions, student portals, and digital libraries, learning management systems, academic records management, e-research and e-collaborations could not only boost research output but also improve management of large data and information available in this institutions. Broadband diffusion is inhibited by poor infrastructural development attributed to high costs of connections and broadband acquisition and a high demand for broadband among the students and staff. Policies in broadband regulation from the national government and institutional governance are prudent in controlling and enabling access to this important resource for innovative purpose.

Areas for further research

This study adopted system dynamic modelling using swarm technology to assess technological innovation for a country as a whole or a particular sector. Dynamics system modelling involve broadband interaction and network formation between government, academia and industry. Studying the networks involving government, academia and industry together is very wide. Due to limitations and time constraints, this study was only able to study network formations only in academia. Further research therefore is recommended to study network formations in the other two sectors namely government and industry. This will complete the model of system dynamism for the whole country, Kenya.
References


Adolescents’ Antisocial Behavior in Schools: Examining the Influence of Poverty on Adolescents from Low Socio-Economic Families and Schools

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Abstract

The phenomenon of adolescents’ antisocial behavior in schools has become a globally discussed issue. Even though there are various factors leading to antisocial behavior in adolescents in schools, poverty has been identified as one of the contributing factors. Adolescents from low socio-economic status families are confronted by environmental pressures that lead to aggressive behaviors. This does not only lead to high failure rate, but also hinders the country’s progress in terms of nurturing future human resource pool and the nation’s productivity. The aim of this study was to examine the influence of poverty on adolescent misbehavior in Windhoek High Schools. A quantitative methodological technique was used to conduct the study. The adolescents for this investigation were from the age of 13 to 17 years who were in public secondary (high) schools in Windhoek, Namibia. The sample consisted of 300 participants who were chosen using stratified sampling throughout Windhoek from under privileged settings. A questionnaire was used to collect data. Ethical considerations were cautiously adhered to before and during the research process. Consent forms were given to parents and the purpose of the study was clearly explained to both parents and participants during data collection. The instrument’s reliability was tested by means of a pilot study. Statistical Package for Social Sciences (SPSS) was used to analyze the data. The results were in the context of the influence of poverty on adolescents’ behavior. Lastly, suitable recommendations were highlighted to fit the observed trends.

Keywords: Antisocial behavior, economic status, environment, school, Poverty and teenagers.

Hypotheses

Hypothesis 1: Prevalence of adolescent misbehavior from low income families will be significantly be evident in schools.

Hypothesis 2: There will be a significantly positive relationship between adolescents’ antisocial behavior and poverty.

Introduction

An introduction/background of the study

The negative behavior of most adolescents have become a cause of concern in many African countries (Mahati et al. 2006 & Matshalaga 2004). Governments, ministries, churches and Non-Governmental Organizations are facing challenges in shaping the behaviors of these children (Chingono et al; 2006). A lot of teenagers have serious behavior problems in schools that sometimes becomes very disruptive and mostly likely lead them to dropout from school. Educators encounter difficulties in dealing with adolescents who exhibit antisocial behavior. One of the most contributing factors to antisocial behavior in adolescents is due to poverty which paves way to inadequate schooling, to poor school performances increase the number of school drop-outs due to lack of parental care. This loop hole leads to delinquent and criminal behavior since no adults will be much concerned on the whereabouts these teenagers, (Chingono et al.; 2006 & Mahati et al.; 2006). Research has proved that poverty is the major contributor to vulnerability of teens more so, if they are OVCs. 80% households with OVCs aged between 6 – 14 years were reported not have enough money to meet their basic needs. This highlights that guardians/parents of OVCs teenagers are confronted by food, financial and educational crisis. Hence, research is also offering an insight into the
conceptualization of the of influence poverty on teenage misbehavior in schools. (Owens, 2002: 462) defines some teenagers as those, who have inappropriate behavior as, “Children, who are very violent, troublemakers, very active, and talkative, with short attention span in the classroom, the least co-operative and do not intermingle well with peers, intimidate others, fight and overall, just parade incorrect behavior.”

This does not leave the Namibian community as an exceptional (Shirina, 2012). A teenager is defined as any between the age of 13 and 18 (Roos, 2011). To worsen matters, some teenagers are left to head households, some take up responsibility of caring their ill parents and are vulnerable to a number of ill effects, since they will be lacking precautionary guidelines as they grow up.

According to research, natural disasters, unemployment, underqualified and general credit crunch and numerous diseases such as cancers, malaria, tuberculosis HIV and AID (Hadi, 2001) have instigated poverty. The worst hit commodities of being already with inadequate infrastructure and limited access to basic services in most African Countries has a hand too. A study that was done by Dynah (2002), found that teenage misbehavior hardly happen in separation, and that severe behavioral difficulties commonly have a collection of problems. This study examined how poverty negatively influence behavior of teenagers in Windhoek High Schools. Furthermore, the study compared the relationship between adolescent behavior and poverty.

Method

There were 18 secondary schools in Windhoek, Namibia. The time this study was done. Six public schools in disadvantaged suburbs were randomly selected from the Ministry of Education list. All sampled schools had children coming low income families. Therefore the total population of these schools was 3045. Of which 2993 learners are aged between13 to 19 years. These students account for 98% of the total population. This became the study population and sampling frame. The sampling frame of learners’ names was used to randomly select 300 participants. 50 adolescent learners were selected from each of the randomly selected from these six schools. The population study consisted of both boys and girls despite their ethnic groups. This research study used a quantitative methodological design which investigated the influence of poverty on adolescents from low socio-economic families and schools adolescents’ antisocial behavior in Windhoek’s High Schools. The statistical analysis (SSPS) was engaged to confirm and disapprove the pre-defined hypotheses for ensuing relationships between variables of the study (Higson, Smith & Kagee, 2006; Mouton, 1996). A correlation research design was a statistical test to determine the trend or pattern for two or more variables (Cresswell; 2008).

Results

Presentation and analysis of respondents’ bio-data

This section of the research work present the results of the statistical enquiry that has been conducted for the study. The results are obtainable as the results are shown as (1) descriptive information about low socio-economic status of families and adolescent’s antisocial behavior (2) the interactive characteristics between school environments and adolescents’ misbehavior (3) analytical characteristics of adolescents antisocial behavior in different family environments. In this study, a diversity of statistical calculations were executed. Statistical Package for the Social Sciences 18 (SPSS) was used for all the statistical calculations.

The following table is a guide to abbreviations used in the analysis of the data:

<table>
<thead>
<tr>
<th>Table 1. Abbreviations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abbreviation</td>
</tr>
<tr>
<td>IBCL</td>
</tr>
<tr>
<td>AMB</td>
</tr>
<tr>
<td>ASB</td>
</tr>
</tbody>
</table>
An overview of the analyses

The hypotheses below for this study were framed centering on the aims and objectives of the research topic and are as follows:

Hypothesis 1: Prevalence of adolescent misbehavior from low income families will be significantly be evident in schools. This hypothesis was tested by independent t tests, Means (M) and Standard Deviations (SD).

Hypothesis 2: There will be a significantly positive relationship between adolescents’ antisocial behavior and poverty. This hypothesis was tested by a dependent t-tests and Spearman Correlations.

Internal consistencies of measures

This research study concentrated on construct validity. This helped the researcher to explore the degree to which the constructs were effectively operationalized. This was depicted by the scales selected to measure the influence of poverty on antisocial behavior of adolescents from disadvantaged families or home and school environments which allowed inferences about the relationships between variables (internal validity). More so, the sample was a good representation of the population from which it was drawn (external validity). In addition, adolescent misbehavior properties reliability testing was used by applying a recognized measure, the Cronbach’s alpha. This was a test reliability procedure that required merely a single test administration to give a distinct estimation of the reliability for the test given (Gliem et al. 2003).

The Exposure Peer Pressure Instrument (EPP) was used (Allen & Yen, 2002) together with the Child Behavior Checklist (ICBCL) as questionnaires. The EPP was used to as a measure to control the peer pressure exposure of adolescents. The ICBCL was used to measure the individual adolescent’s behavior. The Cronbach alpha was also was applied as the reliability technique since it needs a single test administration to give a distinctive estimate of the reliability for a given test (Gliem, et. al.2003). Table 2 shows the Cronbach alpha coefficients for antisocial behavior in adolescents in schools.

<table>
<thead>
<tr>
<th>Instrument n (items) Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICBCL 40 .82</td>
</tr>
</tbody>
</table>

The Cronbach Alpha coefficient for the ICBCL was .82. This Cronbach Alpha coefficient is within the standard limits according to Mckillup (2006) because they it is above .75. Therefore the instrument was regarded dependable.

A description of the adolescents’ demographic set up

Living arrangements

Demographics were measured by using a questionnaire demographic survey which requested participants to include age, gender, culture, type of families they were currently living in. The table below shows the population’s households. The results show that 72% of the participants came from single headed (mother / father alone) or other people such as friends, pastors. This category also have children that came child-headed families. This information also shows that 39% of the participants lived with relatives. These relatives were indicated as aunties, brothers or any family member. This can be also an ingredient that leads in promoting adolescents misbehavior in schools because the nature of the home where the child is coming from has an impact in molding behavior. This also have a negative set up in providing for the individual adolescent adequately. Ethnicities represented comprised mostly of Vambos, Damara Namas, Hereros and Afrikaners.
Table 3. A description of the adolescents’ demographic set up

<table>
<thead>
<tr>
<th>Variable</th>
<th>Frequency n=300</th>
<th>Percent %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Who do you live with?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Both parents</td>
<td>85</td>
<td>28</td>
</tr>
<tr>
<td>Single headed family</td>
<td>90</td>
<td>30</td>
</tr>
<tr>
<td>family member</td>
<td>69</td>
<td>23</td>
</tr>
<tr>
<td>Child-headed family</td>
<td>26</td>
<td>09</td>
</tr>
<tr>
<td>other</td>
<td>30</td>
<td>10</td>
</tr>
</tbody>
</table>

Number of members in household

The number of family members living under one roof was an important finding. It indicated a living style and how food, attention and other necessary support system were being distributed in the house. Nowadays, people are living together as extended family due to deaths and other pressing needs such as illness that lead capable family members to take care of their relatives’ children. This strain resources in the house and it triggers the survival of the fittest norm. This leaves the teenager in the house vulnerable. According to the findings, the data showed that the families consisted with members between three to seven (3-7) people. The biggest number was 28. This participant lived in an Orphanage Home. 10% of these adolescents survived in a families with members ranging from 8-13.

Accommodation of respondents

The study shows that 79 percent respondents lived in shanty towns. There is high crime rate in this places such that teenagers who grow up there are already affected by life-style and are exposed to the society’s misdeeds. This may lead children to become victims of manipulators who are older than them. They may end up being involved in different crimes such as alcohol and drug abuse, stealing, banking lessons fighting at school, robbery, just to mention but a few. These shanty town or informal settlement fails to provide conducive environments to adolescents since they are a lot of Shabeens or taverns (local bars) in their surroundings. As a result, one can claim that living in such environments has contributed an extra affliction to an adolescent who is already affected by poverty and lack of parental guidance.

Parents’ educational level and statuses

It was discovered that 72 percent of the participants lived without both their parents. Most of these teenagers’ parents were Grade 10 and 12 failures. Only 6% of them had passed Grade 12 but could not afford to enroll in universities and colleges. The average salary of these parents was N$1500 per month. Most of them are street vendors and some rely on piece jobs. Others as cleaners and in shops. Middle aged men work as car washers. So it becomes extremely difficult for such parents to nurture their children properly and offer them with good guidance, education and health care. Some mothers had no schooling at all. Speaking English is a challenge, they only communicate in their mother tongue. So, the chances are so high that such parents will fail to raise their children well and afford them with health food, proper clothing and good education.

It was also found out that due the nature of their jobs, these parents live below the poverty line hence the fail to provide for their children’s needs. Since these parents are always in search of part-time jobs and vending, there is no family time. So many things unnoticed in the house. As for adolescents, peers come to being and replaces their parents totally, hence they become vulnerable to abusive adults.

Antisocial Behavior: Table 4 below represents the mean and standard deviation for each of the 20 ICBCL-items for all the participants from poverty stricken homes and informal settlements in Windhoek.
Table 4. Means and SD of items for child behavior checklist

<table>
<thead>
<tr>
<th>ICBCL (individual behavior checklist)</th>
<th>n=300</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable (Have you ever...............?)</td>
<td>Mean</td>
</tr>
<tr>
<td>Damaged school property (e.g. doors)</td>
<td>1.30</td>
</tr>
<tr>
<td>Fought with another learner</td>
<td>1.58</td>
</tr>
<tr>
<td>Smoked cigarettes</td>
<td>1.23</td>
</tr>
<tr>
<td>Used drugs</td>
<td>1.11</td>
</tr>
<tr>
<td>Drank alcohol</td>
<td>1.42</td>
</tr>
<tr>
<td>Bullied another learner</td>
<td>1.40</td>
</tr>
<tr>
<td>Stolen things from home/school/shops e.t.c</td>
<td>1.65</td>
</tr>
<tr>
<td>Miss out lessons at school (s)</td>
<td>1.34</td>
</tr>
<tr>
<td>Bribed other school learners/ prefects</td>
<td>1.51</td>
</tr>
<tr>
<td>Disrespected teachers</td>
<td>1.26</td>
</tr>
<tr>
<td>Written/drawn some things in school toilets</td>
<td>1.16</td>
</tr>
<tr>
<td>Written/drawn some naughty graffiti in (bad things) school textbooks</td>
<td>1.23</td>
</tr>
<tr>
<td>Lied to teachers/ other learners</td>
<td>1.86</td>
</tr>
<tr>
<td>Do chats using a cellphone when the teacher is teaching</td>
<td>1.41</td>
</tr>
<tr>
<td>Failed to do your school work/ home work</td>
<td>1.85</td>
</tr>
<tr>
<td>Fought physically with a teacher(s)</td>
<td>1.09</td>
</tr>
<tr>
<td>Argued with a teacher(s)</td>
<td>1.23</td>
</tr>
<tr>
<td>Cheated in class</td>
<td>1.48</td>
</tr>
<tr>
<td>Had a romantic/ a sexual relationship</td>
<td>1.75</td>
</tr>
<tr>
<td>Brought home clothes to school without permission</td>
<td>1.37</td>
</tr>
</tbody>
</table>

The highest mean scores are found for the item “Lied to teachers/ other learner(s) (M = 1.86, SD = .40). The second highest mean scores are found for the items “Failed to do your school work/ homework” (M = 1.85, SD = .35) and “Had a romantic/ a sexual relationship” (M = 1.75, SD = .33). The lowest mean score is found for the item “had fought physically with a teacher(s)” (M =1.09, SD = .20). These numbers are indicated in bold in the above table.

Discussions

Introduction

This section incorporates the results in Chapter 3 in order to discuss the drawn hypotheses of the study. The limitations of the study will then be presented. Limitations for the study will be presented. A conclusion will be clearly stated and recommendations for future research will be specified.

Two hypotheses were formulated to explore and investigate the specific objectives formulated. These hypotheses were:

Hypothesis 1: Prevalence of adolescent misbehavior from low income families will be significantly evident in schools.

Hypothesis 2: There will be a significantly positive relationship between adolescents’ antisocial behavior and poverty.

Living arrangements and number of members in a household

The living arrangement of any family matters much for every child, let alone an adolescent. Research has proven that parents with low income or low paying jobs have limited time spent with their children (Altschul, 2012; Duncan, 2010; HSRC, 2007; Chingono et. al., 2006, Hill & Taylor, 2004). It has been established children from poor background are confronted with many barriers in life. For instances, lack of resources that are essential for use at home and school. These children are said that they end up being
traumatized due their living arrangements and the big number of people living under one roof (Steadman, 2010 & Ellis, 2008). This has a potency to negatively sway adolescent to antisocial behavior due to not having enough parental guidance. In addition, most single parents face financial challenges to provide for their teens, hence they are forced to indulge in mischievous activities in order to fill the gap being created by parents. The result showed that 39% of the adolescents were staying with relatives. These relatives were indicated as aunts, brothers or any family member.

**Accommodation of respondents**

As evident in the results section that 79 percent of the respondents lived in an informal settlements. The houses are made out of iron sheets, plastics or wood. There is no proper sanitation and the area is too crowded. There is a high crime rate in this places such that teenagers who grow up there are already affected by life-style and are exposed to the society’s misdeeds. With the same voice, (Rima 2008) pointed out that residential settings must have decent qualities, which are supportive and developmental not dangerous and destructive since this have a big influence on adolescents’ lives (Gutek, 1984). This may lead children to become victims of manipulators who are older than them. As a result, one can claim that living in such environments has contributed an extra affliction to an adolescent who is already affected by poverty and lack of parental guidance.

**Parents’ educational level and statuses**

The family background has an important role to play in adolescents. Research proves that the parents’ educational level and income are major contributor towards adolescents’ behavior and their academic at school (Altschul, 2012 & Noble et. al. 2015). Most parents that are less educated have difficulties in spending time with their children. They find it worthy to spend most of their time searching for work, laboring for food and money (Smith 2016). Some men decide to become drunkards to hide their feelings and to console themselves (Green, 2010). This is so much true because these parents are even ashamed to air their views because they undermine themselves. In agreement, Pryor & Rodgers (2001) highlighted that if adolescents senses that they are not given attention by their parents, they engage in stressful activities. This has a negative impact on the teen who ends up imitating their parents, and do away with mischiefs and end up dropping out from school. Then, they become parents who will raise their children the same way they were raised and it will then became a poverty trend for the family.

**Antisocial behavior**

It was discovered that almost every adolescent that took part in the survey had strayed in one way or another. A questionnaire that was given to them showed that these teens are already active in adultery, drugs and drinking. This is the reason for high failure rate in Windhoek. Teenagers are busy with such activities instead of studying. Misbehavior with high scores were associated with drinking, drugs, smoking, bunking lessons, absenteeism and not paying attention in the classroom. Among these, bullying others and being involved in fights were evident misbehavior traits in most learners. This tallies with Owens (2002)’s finding in which it was mentioned that nowadays adolescents are being tangle in different crimes such as alcohol and drug abuse, stealing, fights at school, robbery, just to mention but a few. These are results of what they see in the shanty towns or informal settlement they live.

**Conclusion**

Adolescence are children between the ages of 13 to 17 years. During this phase, these children are very vulnerable and issues like poverty of the family destroys their ego. This research has revealed that issues such as the family structure, its arrangement, the location they are being raised, their parents’ educational level and status a has a big impact on their behavior. The environment factor should not be left out. Children learn through imitation. So by raising a child in an informal settlement such as shanty towns or squatter were crime rate is high and indecent behavior is being displayed, is only risking the life of the teenager. However, no one want such a life, it is due to low income that lead people to be left with no choice but to live in indecent areas. Most adolescents are who they are because life experiences have taught them that.

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Nevertheless, as disturbing and complex the situation may seem, the adolescent can be helped in order for them to secure better future lives. Some remedies for this situation are outlined below.

**Recommendations**

The emphasis of this developmental research has often focused on the influence of poverty on adolescents’ antisocial behavior schools. Vital insights were provided in this study to widen our understanding the behavior of high school children in informal settlements. The following recommendations are based on the results of this study:

- The Government of Namibia should see to it that the Harambee Prosperity Plan is accomplished and that it should benefit the rightful people that is, those living in poverty.
- Sport activities are not a priority to the countries. Free Leisure Facilities must be available to all in order to remove teens from the streets. Recreational activities will remedy the situation. Form compulsory social clubs e.g. sports clubs which will also accommodate the less privileged adolescents who cannot afford to affiliate to current expensive clubs that are in existence.
- Lastly, the food banks must managed by people with people at heart. Food rotes in Food banks while people are hungry out there. If these parents are guarantee of having food on the table they may refrain from crime and also be able to spend time with their children as expected of them.

**References**

Intricacies of Secured Multi-Biometric System

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Abstract

The Multi-biometrics system is designed as a measure for security purposes to recognize individuals using all available features. It is a thrilling research domain carried out to boost the security level of a country or of an organization. The integration of multi-modal biometrics in real time application resolves the limitations of the uni-modal applications. Although, the design and assessment of the multi-biometrics systems raises much issues, this paper tends to unravel the clumsiness and trade-offs in its applications, the benefits of fusion level, integration strategies and check to spoofing. In conclusion, a thorough reviewing of multi-modal secured biometrics techniques and approaches was carried out to ensure data identification integrity. Some points were suggested for consideration as subjects of interest for future research.

Keywords: Multi-Biometrics; Multimodal application; Unimodal application; Secured Biometrics; fusion levels Spoofing.

Introduction

Verification is an authentication method of identifying a person in a biometric security system. It is a very essential and challenging practical and secured authentication technology. The customary techniques of user authentication is categorized into two; the Token Techniques (use of key and smart cards) and the Knowledge-based Techniques (use of text and picture passwords) [13]. These techniques are vulnerable and the authentication tools can be easily lost, wear-off or forgotten. These customary techniques are considered not secured or reliable in a contemporary security checks and hence, are not sufficient to be applied in the global security challenges. The basic benefit of biometrics authentication over the traditional techniques is that the biometrics cannot be stolen, forgotten, wear-off, misplaced or spoof biometric traits [11]. Considering the larger accuracy and higher recognition of biometric authentication, it becomes imperative and preferred technique to analyze individual traits for security identification purposes. The system is free from spoofing, misused or counterfeited.

Basically, biometrics information considered most secure method is used in areas such as; security system, surveillance systems, access control, physical buildings, verification and authentication, forensic investigations, border control, e-commerce, parenthood determination, online banking, medical records management and security monitoring. Its application has cut across diverse fields of endeavour.

Generally, Biometric technology is defined as the computerized technique of verifying and recognizing the identity of a human being, a living individual using the following traits: (a) the Physiological biometrics, which includes facial, ear, hand and hand vein infrared thermogram, hand and finger geometry, retina, fingerprint, Iris, Voice, DNA and palm print. (b) the Behavioral biometrics such as gait, signature and Keystroke, which is the traits that measure human actions [10].

The biometric systems operate in two modes depending on application context – the verification mode and the identification mode. In the verification mode, the biometric system verifies the identity comparing the registered biometric traits with the biometric model stored in the system [5]. This mode used for positive recognition is aimed at preventing multiple users from using the same identity.

The enrolled sample in the identification mode is compared with existing templates stored in the central database to identify the user. The identification mode is important in negative recognition
applications that aim to avert a single user from using multiple identities during enrollment [18]. The negative identification can be known as screening. Apparently, the verification is less expensive and more encompassing, while identification is more expedient and less obtrusive [22].

Multi-biometric systems address the issue of noisy data, non-universality and expedite the indexing of large-scale biometric database, unlike the out-of-date uni-biometric systems. In addition, it is very difficult for an imposter to carryout spoof attack on all the biometric traits of an individual enrolled in the database and also essential to fraudulent technologies, which is difficult to forge multiple biometric features. The multi-biometric recognition systems have the benefits especially in the continuous monitoring of a user in treat situations when a single trait is not enough to track him. The system continues to function even when any part of the biometric sources (such as software malfunction, sensor malfunction or deliberate user manipulations) fails or become unavailable [30].

**General idea of biometric technologies**

The term "Biometric technologies" can be defined as a programmed method of verifying and recognizing the identity of an enrolled individual based on these two categories: (1) Physiological Biometrics, which includes (fingerprints, retina, facial, hand and hand vein infrared thermogram, ear, finger geometry, DNA, voice and palm print) [15], and (2) the Behavioral biometrics, which includes (keystroke, gait and signature) that measures human actions [15]. The human electrocardiogram (ECG) signal is also considered as one of the biometric traits used in an individual recognition and authentication [29].

The reliability of a biometric system depend on the following characteristics:

- Availability – (Universality): Indicates that an individual should have distinct characteristics. Availability or universality is measured by FTER (“failure to enroll” Rate).
- Distinctiveness: This asserts that two individuals should adequately have different characteristics. Distinctiveness is measured by FMR (False Match Rate), which is also called ‘Type (II) Error’.
- Robustness – (Permanence): It declares that characteristics should be constant over a period of time with respect to matching characteristics; hence, the traits should be stable over age. The Robustness or Permanence is measured by FNMR (False Non-Match Rate, which is also called ‘Type (I) Error’.
- Accessible – (Collectability): It asserts that the features can be measured using quantitative method, and can also be easy to image with electronic sensors [14].
- Resistance to Bypass tests and verify how the system resists spoofing and fraudulent methods easily.

All the biometrics traits can be used to verify and authenticate an individual enrolled in the database. Each trait is characterized by FRR (false reject rate) and FAR (false accept rate).

**Limitations of unimodal biometric systems**

The vulnerability of biometric sensor to bad or noisy data as a result of distorted and imperfect acquisition of captured biometric trait. This limitation can be generally seen in the applications that use facial recognition, where the quality of the enrolled facial images could be affected by illumination and facial conditions, and hence results to False Reject Rate (FRR). A similar scenario is the fingerprint recognition, where an image scanner fails to read dirty fingerprints obviously and hence, leads to a false database match. In unimodal biometrics system, an enrolled individual can be erroneously rejected and however, an impostor can be falsely accepted [12].

Certainly, unimodal system cannot work perfectly with definite groups of population. For instance, fingerprint images might not be accurately captured from much younger children and elderly people because of underdeveloped fingerprint ridges and faded fingerprints respectively [17]. Although, biometric traits are likely to exist among every person, there could be some exemptions where a person is unable to make available a particular biometric trait due to pathological conditions. For example, iris images might not be acquired from an individual with pathological eye condition. All these stated limitations might not provide accurate match in a unimodal biometrics system because there is no other biometric trait of the same individual to fuse and determine the identity of the enrolled user.
With large population to enroll, the unimodal biometrics is susceptible to inter-class similarities of biometric features. Facial recognition may not perfectly work for identical twins, even as it could be difficult for the camera to make a distinction between the two subjects that could lead to erroneous matching. The unimodal biometric systems are relatively exposed to spoof attacks, where enrolled data can be easily forged or imitated. For example, rubber fingerprints can be used to spoof fingerprint recognition systems.

Unimodal biometric which rely on evident single source of data for authentication may not achieve the preferred performance requirements because it has plenty of error rates [22]. The error rates the system contends with are:

1. Noise in sensed data due to faulty or inappropriately maintained sensors from buildup of dirt on fingerprint sensor. In addition, voice could be distorted by cold, iris recognition performance can be altered by wearing glasses and light variations cold distort face recognition system.
2. Uniqueness (Inter-class similarities and Intra-class variations) – Biometric trait is expected to vary considerably across two individuals. When an individual interacts with the sensor erroneously, the intra-class variations occur, while the individual characteristics form the inter-class similarities.
3. Spoof attack – with single source of biometrics data, a fake trait of an enrolled user can be introduced and saved as template in the database. In this case, an impostor might attempt to use artificial fingerprint to spoof the sensed data when the trait is used

Multimodal biometric systems

A Multimodal biometric system fuses multiple biometric technologies such as fingerprint, facial recognition, iris scanning, voice recognition and hand geometry. The multimodal system measures two or more different biometric characteristics by taking input from single or multiple sensors [10]. The system that combines iris and face characteristics for biometric identification is known as a multimodal system, notwithstanding whether the iris and face images were captured by same or dissimilar biometric imaging devices. For instance, a biometric system that combines face and fingerprint recognition and permits users to be verified and identified using either of the modality.

Multimodal systems

*Given below is the block diagram of multimodal systems.*

![Multimodal System Diagram](image)

**Figure 1.** A diagram of multimodal system

The multimodal biometric system is made up of four modules

i. Sensor

ii. Feature Extraction

iii. Matching and
iv. Decision-Making modules

Fusion in multimodal biometric system is achieved by combining two or more biometric traits alongside two or more different algorithms that is used to work out a decision. The technique is extremely useful in a large scale, where the identity of millions of individuals have to be authenticated at a time [23].

Types of multimodal biometric systems

1. Multi-Algorithmic Biometric System: This biometric system takes a single biometric trait from a single sensor, analyze and process it using different algorithmic procedures.
2. Multi-instance biometric system: This biometric system uses one or more sensors to capture two or more various samples of the same biometric trait. For instance, the system that captures images of multiple fingers is an example.
3. Multi-sensorial Biometric System: This biometric system uses two or more different sensors to capture the same example of a biometric trait. A single or a combination of algorithms is used to process the captured samples. Example of multi-sensorial biometric systems is where the same facial image is captured using a visible light camera and an infrared camera fixed with a particular frequency.

Multimodal biometric systems fusion

More biometric modality is used in multimodal biometric systems, to give more than one channels of decision. This system designs a mechanism that can combine the classification result from each of the biometric channel; hence this mechanism is called biometric fusion [16]. Fusion strengthens authentication accuracy by combining the measurements from different biometric traits and reduces the weaknesses of the singular measurements.

Fusion addresses lots of challenges in implementation of biometric systems. These issues include efficiency, accuracy, applicability, robustness, and universality. Sensor, feature, matching score level fusion and the decision level fusion are different levels of fusing (combining) biometric traits that can be used to increase the strength of multimodal biometric system [31].

The figure below shows the fusion levels of a multimodal biometric system.

Figure 2.1. Showing different levels of fusion in multimodal biometric systems
Sensor level fusion

The biometric traits captured by different sensors like iris scanner, fingerprint scanner, video camera etc. are fused in sensor level fusion to form a merged biometric trait and then the processes.

Feature level fusion

The signals emanating from different biometric channels in feature level fusion are first processed and thereafter, the feature vectors are taken out individually from every biometric trait. The extracted feature vectors are then fused (combined) to form a merged feature vector using a particular fusion algorithm. Only the useful feature vectors are selected and used, using some reduction techniques. It is evidence that the feature level fusion provides more significant accuracy when the features of various biometric modalities are well-matched with each other.

Matching score level fusion

The feature vectors in matching score level fusion are processed independently rather than combining the vectors, and then a separate matching score is found. We fuse the matching level to find a multiple matching score that can be used for classification based on the accuracy of every biometric channel. We can use different techniques like logistic regression, Bayes rule, mean fusion and highest rank to combine match scores [27]. We can also use different techniques like Min-max, piecewise linear and z-score to realize normalization of match scores gotten from different modalities.

Decision level fusion

Every biometric trait in decision level fusion is pre-classified individually and the separate biometric trait is firstly captured, and the feature vectors are extracted from the traits captured. Based on the extracted features, the traits are categorized as either ‘accept’ or ‘reject’. The final classification is achieved by combining the results of different modalities.

Benefits of multimodal biometric systems as the best solution

1. The unimodal biometric systems encounter image acquisition errors, which include failure-to-enroll (FTE) and failure-to-acquire (FTA) rate, and also the matching errors consisting of false match rate (FMR), which makes and intruder to be granted access and the false non-match rates (FNMR) where an enrolled individual can be rejected. Multimodal biometric system accuracy is measured by matching the biometric traits and the errors in image acquisition. The Multimodal systems have nearly zero FTE, FTA, FMR and FNMR rates [15].
2. In some situations where millions of people will be enrolled in the system and some individuals are facing challenges with a particular biometric trait, the multimodal systems can best be applied to overcome the limitations of FTE and FTA rates by using different biometric capture for the segment of that population. The multimodal system will certainly ensure almost zero failure-to-enroll (FTE) and failure to acquire (FTA) rate.
3. Multimodal biometrics system reduces data distortion algorithm. In a scenario where the quality of a biometric sample is rejected, the other biometric sample can be used to determine accuracy. For instance, if the fingerprint scanner rejects fingerprint image as a result of poor quality, the use of another biometric modality like facial or iris will reduce the false rejection rates.
4. Multimodal systems are difficult to spoof because it is very hard to imitate all the biometric templates captured in the database, unlike the unimodal systems where a single biometric template can be imitated. Even when one biometric modality is spoofed, the user can be authenticated by using the other biometric identifiers.
Limitation of multimodal biometrics system

Some deficiencies are still found in multimodal system such as noise. Deficiencies such as scratches in the fingerprint and facial marks can lead to the increase in FRR. In some instances, the failure of one biometrics trait will make the entire multi-biometric system to fail [22]. However, the setting up of multimodal biometric systems incurs more expensive and complex due to the requisite of additional hardware, software, storage facilities and matching algorithms [13]. In addition, in some instances, all the biometric traits may be required for authentication, and if any of the biometric templates is rejected, authentication might be difficult.

Conclusion

Multi-biometrics system gives more accurate result compared to unimodal biometric system and this topic has attracted greater interest in today’s research. It is often used to identify the physiological and behavioral characteristics of an individual specifically for security purposes. The limitations of singular (unimodal) biometric system, especially spoofing necessitated the recent clamour for multimodal biometric implementation suitable for all applications, administration policies, technologies and populations to accomplish higher performance. The enormous benefits of multi-biometrics, different levels of fusion and matching process were highly discussed as a solution to security lapses. Finally, some interesting points were suggested to be considered in a future research to enhance applications.

References


Diet Concepts for Healthy life

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Abstract

In the current world, in this 21st century being healthy is very important and is linked to the food we eat. Having nutritious diet helps to maintain healthy Body Mass Index and also helps to reduce the risk of having diseases like cancer, cardiovascular, diabetes, arthritis and stroke. In the present situation it is a challenge to nurses working with patients on improving both their nutrition and overall health depending on the diseases. Medical Nutrition Therapy gives us an idea about Causes of the disease and the Diet to be followed for each individual disease (Roth. R. A, 2016). Here are 10 diet concepts for maintaining overall quality of health with respect to that disease. In this article diet concepts for Weight Control, Diabetes, Cardio vascular disease, Renal Disease, Gastro intestinal, Cancer, Blood Pressure, Arthritis, Asthma and Fever have been discussed.

If we change our life style and have healthy eating habits we can avoid being excess weight or obese. Diet for weight control should not focus on weight loss rather follow healthy diet plan. Most of the diseases controlled by Replacing saturated and trans fats with unsaturated fats include omega-3 fatty acids; Increasing consumption of fruits and vegetables and adequate folic acid intake; Consuming high fiber diet such as whole-grain; Limiting consumption of sugar and sugar based products and sodium intake. Even though genetics play important role, a diet plan (vegan diet) which is high in fiber and low in fat with minimum amount of saturated food is recommended for Diabetes disease. By avoiding fatty and fried food and having high fiber diet which is rich in raw fruits and vegetables is recommended for Heart diseases.

Once we realize the connection between good health and wholesome balanced diet, then our food will become our medicine for maintaining good health. The health conditions such as making right food choices and leading healthy lifestyle helps to prevent, treat and cure of the diseases.

Diet concept – weight control

Usually normal weight means average desired or standard weight which is meant to maintain good health which is known as “rule of thumb method” which is only an estimate, it may vary on various other factors. Over weight is 10-20% more than average weight, excessive body fat is 20% more than the average weight which is also called as obesity. Underweight is 10-15% below the average weight. It is measured by Body Mass Index (BMI) based on the height and weight in order to assess health risks.

Standard Body Mass Index (BMI) is used to determine person health risk against weight which 19-25 BMI indicates fewer health risks. BMI of 25-30 indicates overweight and BMI over 30 indicates obesity. Distribution of fat also indicates for example fat at abdominal cavity has more risk than fat in thigh, buttock and hip area which might cause the risk of health problems such as hypertension, coronary heart disease, Type 2 diabetes and some form of Cancers.

According to National Center for health statistics show 73% of adults who are 20 years and above are obese or overweight. Center for Disease control and Prevention is focusing on policy and environmental strategies to make healthy eating and living accessible and affordable for everyone. Some of the Strategies to prevent and manage obesity are Community efforts, early care & Education, Salad bars to school, Healthy food environments, Healthy Hospitals,
Healthcare. Adult overweight & obesity awareness programs such as Defining Adult Obesity, Adults obesity causes & consequences. Children obesity programs such as Defining childhood obesity, childhood obesity causes & consequences. Data Statistic, Resources & publications about Adult and child obesity facts. Data trend obesity maps, fact sheets and social media tools are maintained and focused by Center for Disease control and Prevention (CDC, 2017).

Currently over weight in children has increased to 40.8% leads to strain on Heart, Lungs, Muscles, bones & joints which increases risk of diabetes mellitus, hypertension and some form of cancers. Changing eating habits is the main key for reducing & maintaining the weight. Also one should prefer to eat less than what they would prefer and also exercise 90 minutes most of the days in a week. Foods that are allowed are fat free milk, butter milk, yogurt, cheese and eggs; Lean beef, lamb, veal, pork, turkey, chicken and fish; Whole grain bread; Coffee or Tea without milk and sugar; Have lots of vegetables and healthy snacks. Now a days surgical treatments such as gastric by-pass and stomach banding are done for fat reduction but these are causing complications such as dumping syndrome, bleeding, infections, gastritis, gallstones, and iron, Vit B12 and calcium deficiencies. Under weight is dangerous to health, counseling and high calorie diet is recommended for such people.

**Diet concept – diabetes mellitus**

Diabetes Mellitus is a chronic disorder which affects metabolism of carbohydrates characterized by hyperglycemia (abnormal amounts of glucose in blood). This is major cause of death and various diseases such as blindness, heart & kidney diseases, infectious diseases and Amputations of legs, feet & toes.

For maintenance of good health distribution of glucose must be managed carefully, this is controlled by Pancreas by providing insulin hormone which helps glucose to enter in to cells. The binding of insulin receptor on the cell signals pancreas to stop sending insulin. This causes reduction of glucose in the blood. Inadequate production of insulin or if body unable to use insulin causes hyperglycemia which means glucose accumulates in blood. Causes are not confirmed, may be viruses or obesity may precipitate the disease in people who have genetic tendency. Symptoms are polyuria, polydipsia, polyphagia. Also diabetes causes diseases such as vascular, Artherosclerosis which might further cause retinopathy, neuropathy.

Recent Researches are planned through Diabetes Research and clinical practice, some of the research reviews and articles shows the effect of diabetes on Renal, Cardio metabolism, overweight with different scenarios and environmental conditions (Science Direct, 2017). Research on Renal glucose metabolism in diabetes highlights “Renal glucose metabolism in normal physiological conditions, when facts affecting. Abnormalities in Type1 and Type 2 diabetes” (Alsahli,M&Gerich,J,2017).The Research review of Cardio metabolic health in Asians with diabetic in the US highlights “ Non-Hispanic Asians had lower levels compared to other race & ethnicities and they had adjusted levels of hypertension and LDL cholesterol and their BMI can underestimate their cardio metabolic risk” (Menke,A,&Cowie,C,C,2017).

Treating diabetes includes diet, medication and exercise in which diabetic diet is used. Diets are usually prescribed by physician or dietitian in consultation with client based on diets based on exchange lists which is most commonly used diet for Diabetes. American Diabetics Association or American Dietetic Association has multiple lists which contain approximately equal amounts of carbohydrates, protein, and fats by providing freedom to choose food substitution with one list with other still providing required amount of nutrients and calories. Some of the examples of exchange list are Carbohydrates bread, milk & fruits; Meat: lean meat, medium meat, high meat & plant based meat. Starch exchange list: Bread, peas, lentils, starchy vegetables, fruits, milk & yogurts. Non starchy vegetables: spinach, Broccoli, Asparagus, sprouts, celery etc. recommended. High fiber intake reduces insulin needed to the body by lowering the blood glucose. Intake of water should be high so that high absorption of mineral increases. Avoid using Dietetic foods, use
only general public food it has no difference rather Dietetic foods are more costly. Alcohol consumption is not recommended only fat free & sugar free products are recommended.

**Diet concept – cardiovascular disease**

The Cardio Vascular Disease affects heart & blood vessels which is the leading cause of death or permanent disability in the US. Risk factors such as Abdominal obesity, High blood lipids such as triglycerides, low HDL, and high LDL, High blood pressure, Insulin resistance which might cause risk of coronary heart disease, stroke, peripheral vascular disease and type 2 diabetes.

Cardiovascular Disease can be acute or chronic. The example of acute form is Myocardial Infarction (MI). The chronic heart disease causes loss of heart function and develops over the period. The two types of chronic heart disease are compensated heart disease where heart can maintain blood circulation, here heart beat unusually fast. In decompensate heart disease heart cannot maintain circulation and it is enlarged where congestive heart failure occurs which in turn affects myocardium, endocardium, pericardium and blood vessels. Arteriosclerosis is another term for vascular disease in which arteries harden making passage of blood difficult which causes the heart attack. Risk factors are Hyperlipidemia, hypertension and smoking. Contributing factors are obesity, diabetes etc.

The British Heart Foundation (BHF) had organized an event aimed to raise awareness of heart disease of Cardiovascular research which is happening in Wales. *Purpose of the research activities was to educate the public about possible reasons of cardiovascular diseases; reducing happening of incidences; about BHF funded research activities to understand disease and new treatments; Informing about health diets to reduce risk of heart diseases* (CardiffUniversity, 2017). As part of prevention works CDC had implemented Strategies for Healthy heart and stroke-free. Aim of these strategies is heart disease & stroke prevention- The controlling risk factors such as high blood pressure & cholesterol; Recognizing signs & symptoms of heart attack and stroke; Improving emergency responses and quality of care. Strategies provide awareness about healthy eating, physical activity & tobacco use, diabetes & obesity in order to improve overall cardiovascular health in US (CDC, 2017).

The risk of heart disease can be reduced by maintaining ones weight and diet limiting salt & fat intake and keeping activities at healthy level. Foods with fat-restricted and low-cholesterol are allowed. Foods which need to be included are whole grain breads & cereals; Meats with trimming & skin removed i.e lean beef, pork, veal and egg whites; Fat-free dairy products such as low fat milk, cheese, curd etc., Other foods i.e oils such as olive, canola, peanut; limited nuts such as walnuts and almonds. Avoid foods like Breads made out of egg or cheese, fatty meats and dairy products. Heart disease with hypertension must use sodium restricted diet and need to avoid canned and processed food.

**Diet concept – renal disease**

The main function of Kidney is to filter the blood, excrete wastes and help to maintain both the composition and volume of body fluids which in turn maintains fluid balance, acid balance and electrolyte balance. Renal failure occurs when kidneys fail to eliminate nitrogenous waste.

Primarily disorders of kidney caused by infection, degenerative changes, diabetes, high blood pressure, renal stones or trauma. Renal failure can be Acute or Chronic. Usually Acute Renal failure occurs along with other medical problem such as crushing injury, or cardiac arrest and may last 1 or few weeks. Chronic kidney disease occurs slowly by causing functioning nephrons to diminish affecting the function of kidney protein wastes are circulated in the blood which in turn causes Uremia. In case of severe renal failure death occurs unless dialysis or kidney transplantation is performed.

O’Brien kidney centers i.e multiple universities support interdisciplinary investigations basic, clinical applied aspects of physiology & pathophysiology of renal. Some of the examples are
Duke University research the profound impact kidney disease imparts on cardiovascular morbidity and mortality (NIH, 2017). Indiana O’Brien Center researching on Advanced Microscopic Analysis to develop new optical methodologies for investigators. UAB-UCSD core center for acute kidney injury research which supports shared core facilities to enhance further research and collaborations. University of Pittsburgh research aims to facilitate multidisciplinary research which includes kidney cell biology, physiology, pathobiology and translational research. University of Michigan aims to develop improved diagnosis, treatments and prevention strategies for patients with kidney diseases. UT Southwestern Medical Center support research in kidney development and genetics, renal physiology and chronic kidney disease. Yale University aims to facilitate translational and clinical research which advances the treatment and prevention of kidney diseases. Polycystic Kidney Disease Research and Translation Centers (Mayo Clinic Rochester, UAB and University of Maryland Baltimore) support research in cilia-related diseases and foster basic and clinical research of cystic diseases of kidney patients (NIH, 2017).

Due to multifaceted nature of the kidney functions diet therapy for renal disorders is extremely complex. Dietary treatment for chronic renal diseases requires sufficient protein with sodium, potassium & phosphorus restriction to prevent malnutrition and muscle wasting. For kidney transplant patients the diet or restriction on protein, carbohydrates and sodium, calcium and phosphorous depends on medications given at that time. Dietary treatment for renal stones would be higher dietary calcium intake, reduce animal protein.

**Diet concept – gastro intestinal problems**

The food digestion and absorption occurs in gastrointestinal tract. The mouth, esophagus, stomach, small and large intestine are the primary organs and liver, gallbladder and pancreas also involve digestion and absorption process. Disorder in these organs causes Gastro intestinal problems.

Disorders of primary organs cause problems such as Dyspepsia, esophagitis, Hiatal Hernia could be caused by physical or psychological and treatment could be relieving the stress, small frequent meals, avoiding irritants such as citrus fruits, juices, spicy foods etc. Chronic diseases like inflammatory bowel diseases cause inflammation in gastrointestinal tract which often due to malabsorption which in turn leads to malnutrition. Some of the examples of IBDs are ulcerative colitis and Crohn’s diseases which affects small or large or both intestines.

Johns Hopkins School of medicine supports multiple research programs which related to gastrointestinal tract and liver. The Basic Science Research Program conducts investigates on physiology or pathophysiology of the digestive system and applies to improve care of patients. Johns Hopkins Center for Epithelial Disorders research on epithelial cells of gastrointestinal tract, liver, pancreas and kidney. The research of Conte Digestive Diseases Basic and Translational Research Core Center is regulation of epithelial function (JOHNHOPKINS, 2017). Ongoing training programs for Digestive diseases were funded by National Institutes of Health (NIH) by National Institute of Diabetes, Digestive and Kidney Diseases (NIH, 2017).

National Cancer Institute of NIH researches on several factors and provide information about better ways to diagnosis, causes, treatment and prevention of the cancer. Some of the latest researches are mentioned here. In study “forgoing Conventional Cancer treatments for Alternative Medicine increases risk of death”, patients with nonmetastatic breast, lung or colorectal cancer patients have less survival rate if they have taken their initial treatment with Alternative therapies rather than conventional treatment. “Immunotherapy using the immune system to treat cancer study”, shows the new immunotherapy as new system to restore immune system’s natural ability to fight cancer. “The study on “CAR T-cell: Engineering patients’ Immune cells to treat their cancers” primarily useful for cancers such as leukemia and lymphoma. The effect of Chemotherapy before surgery for breast cancer can increase risk of the cancer
spreading to other parts of the body is researched by “Study uncovers previously unrecognized effect of chemotherapy”. (NIH, 2017).

The Gastrointestinal tract problems such as Peptic ulcers need sufficient low-fat protein but not excess to avoid gastric acid secretion; less spicy food should be taken. Indigestion is usually caused by coffee, tea, or caffeine related products. Avoid smoking, alcohol consumption and consumption of irritative foods. Diverticulitis / Diverticulosis caused by a diet lacking fiber, so consumption of high-fiber diet is recommended. Inflammatory Bowel Disease low residue diet is used to avoid danger of obstruction & irritated inflamed area. Celiac disease malabsorption of virtually all nutrients, gluten-free diet would be recommended i.e barley, oats, rye and wheat. Cholecystitis & Cholelithiasis clients require fat-restricted diet.

**Diet concept – cancer**

Cancer is caused by abnormal cell growth and can occur in any organ genes lose control of cell growth and reproduction becomes excessive and unstructured. Cancer is called as neoplasia and is malignant.

Even though mortality rate is high in cancer patients, in case of cancer found in early stages with prompt and proper treatment can eradicate the disease. The negative part of this disease is, if it is not diagnosed in early stage and is metastasized death can be occurred and patient goes through lots of pain as result of treatment.

National Cancer Institute of NIH researches on several factors and provide information about better ways to diagnosis, causes, treatment and prevention of the cancer. Some of the latest researches are mentioned here. In study “Forgoing Conventional Cancer treatments for Alternative Medicine increases risk of death”, patients with nonmetastatic breast, lung or colorectal cancer patients have less survival rate if they have taken their initial treatment with Alternative therapies rather than conventional treatment. “Immunotherapy using the immune system to treat cancer study”, shows the new immunotherapy as new system to restore immune system’s natural ability to fight cancer. “The study on “CAR T-cell: Engineering patients Immune cells to treat their cancers” primarily useful for cancers such as leukemia and lymphoma. The effect of Chemotherapy before surgery for breast cancer can increase risk of the cancer spreading to other parts of the body is researched by “Study uncovers previously unrecognized effect of chemotherapy”. (NIH, 2017).

Diets with high in fiber can help against colorectal cancer. Diets of vitamin C can help against cancers of stomach and esophagus. Cancers of lung, bladder and larynx can be treated with diet with sufficient carotene and vitamin A. Plant based foods such as fruits and vegetables are anti-carcinogenic agents. Daily 9 or more servings of fruits and vegetables should be taken. Lentils contain vitamins, minerals, protein and fiber, legumes such as soybeans, dried beans may protect against cancer. Protein foods are essential for the maintenance of immune system.

**Diet concept – blood pressure**

A condition which the blood vessels have persistently raised pressure also known as raised or high blood pressure. Blood pressure is created by force of blood pushing against walls of arteries (blood vessels) when it is pumped by heart (WHO, 2017).

Normal Blood pressure is 120 over 80mm of mercury, which is necessary for healthy life style. Even though low blood pressure causes problems like dizziness and recurrent falls, it can be treated by proper diet. Hypertension or high blood pressure can severely have impact on quality of life and it also increases the risk of heart disease, stroke and death. Population around 85 million in United States have high blood pressure, this is mainly due to processed foods (MacGill, 2017).

Latest research which is funded by BHF to Professor Julian Paton for the study of the brain could help us to better understand, and control, high blood pressure. Blood pressure is necessary
to all parts of our body along with oxygen and nutrients and it is bone by heart and kidneys. Usually in stressful situations our body can become hyperactive and can cause raise in blood pressure briefly. Professor Paton further research “Selfish brain hypothesis of hypertension”, which says that when blood flow to brain is reduced, sympathetic nervous system messages blood vessels around the body causing increase in blood pressure which provides more blood to brain. Professor Paton’s research aim is to find out “whether reduced blood flow to brain causes hypertension or decrease in brain blood flow triggers the hypertension” (BHF, 2017).

Life style contributes a lot for the treatment and prevention of raised or high blood pressure which in turn have benefit for heart and overall health. Usually salt intake under 5g a day benefits people with or without hypertension which is recommended by WHO. Alcohol consumption should be minimized as per the American Heart Association recommendation. Hypertension patients are recommended to have minimized fat with more fruit and vegetables. Foods recommended are Whole-grain, high-fiber foods; variety of fruit and vegetables; beans, pulses and nuts; Omega-3-rich fish; skinless poultry and fish and low-fat dairy products (MacGill, 2017).

Diet concept – arthritis

Inflammation of the joints is called Arthritis, it can be single joint or multiple joints. Usually adults over 65 have Arthritis, now a days it is affecting children, teens, and younger adults (healthline, 2017).

Most common types of Arthritis are Osteoarthritis (OA) and Rheumatoid Arthritis (RA). The connective tissue in our joints called Cartilage protects joints against our movements and reduction in the normal amount of tissue cartilage cause of various arthritis. Most common arthritis is OA which is caused by normal wear and tear causes infection or injury in the joints which in turn affects cartilage tissue. An autoimmune disorder that occurs when body’s immune system attacks soft tissue in our joints, produces lubricant fluid which nourishes the cartilage. The synovium in disease RA invade and destroy further leads to destruction of bone and cartilage inside the joint (healthline, 2017).

Scientific Strategy 2015-2020 an ongoing scientific research provides direction for the Foundation’s scientific discovery of activities for next 5 years. The aim of Arthritis Foundation is to improve lives through leadership in prevention, control and cure of arthritis & related diseases. Scientific strategy goals are: “Delivering on Discovery-” Improved decision making & better lives through improved prevention by earlier diagnosis of arthritis and related diseases & new treatments through prevent, control and cure. “Decision making with Metrics “In order to improve the health & life span of people with arthritis & related diseases based on Fact-based metrics. “Building Human Capital “For Arthritis related disease scientific research pipeline is strengthened & scientific discovery is catalyzed. Collaborations together accelerating the movement of scientific knowledge for faster cure by strategies: Accelerating medicines partnership; The Biomarkers Consortium; The childhood arthritis & rheumatology research alliance; Healthy people 2020 (Arthritis Foundation, 2017).

Treatment to Arthritis is regular exercise such as swimming and healthy diet is important. Maintaining healthy weight reduces risk of developing Osteoarthritis or its symptoms. Healthy diet includes lots of antioxidants such as fresh fruits, vegetables and inflammation-reducing herbs, fish and nuts. Fired foods, processed foods, dairy products and high intakes of meat should be minimized or avoided. Sometimes patients who have Rheumatoid arthritis research recommend gluten-free diet.
Diet concept – asthma

The airways in the lungs are involved in a chronic disease called Asthma, airways or bronchial tubes allow air to flow in or out of lungs. During the Asthma muscles around airways gets swollen making breathing difficult (NIH, 2017).

Asthma is a chronic disease which inflames and narrows the airways causes coughing, wheezing, chest tightness, shortness of breath. When symptoms are mild it goes away by itself or else it gets worse. When symptoms get intense we will have an asthma attack which may require emergency care which can be fatal (NIH, 2017).

Recent research summaries are: “Prevalence of food allergy in Australia remains remarkably high” – study shows prevalence of food allergy decreased in under 4 years old, but it increased in 4 years old. “Can school-age asthma be predicted during first year of life?” - Study says that virus etiology and atopic status at the time of first severe wheezing episode are important for early intervention strategies for asthma prevention. “Import and specific role for basophils in human anaphylaxis” – pathophysiology of human anaphylaxis indicates circulation in organs and have long term implications for development of novel biomarker assays for diagnosing & therapeutic interventions to prevent anaphylaxis. “Prenatal Vitamin D supplementation to prevent asthma” – study indicates that it needs to be reconfirmed in other studies, but Vitamin D supplementation in pregnancy may help in preventing wheezing illness in early childhood and asthma. “Asthma & blocked lungs in HIV-infected youth” – as Most of the HIV-infected have asthma and obstructive pulmonary disease which is leading to complex lung disease further long-term follow-up studies is getting difficult for definitive treatment (AAAAI, 2017).

Actually there is no conclusive specific diet which has effect on asthma attacks, but having fresh, nutritious foods may improve overall health and symptoms of asthma. Foods which might help lung function are Vitamin D-rich foods - milk and eggs; Beta carotene-rich vegetables - carrots and leafy greens; Magnesium-rich foods – spinach and pumpkin seeds. Foods which needs to be avoided are Sulfites found in wine and dried fruits; Foods which cause gas – beans, cabbage and onions; Artificial ingredients – chemical preservatives and flavors (healthline, 2017).

Diet concept – fever

If a human body temperature goes above normal range of 36-37 centigrade (98-100 Fahrenheit) known as Fever also called as hyperthermia. The body temperature is affected by many factors such as eating, exercise, sleeping etc. (Nordqvist, 2017).

Elevated body temperature is one of the ways of combating an infection from our body by our immune system. It is helping to neutralize the bacterium or virus causing the infection. Sometimes human temperature may raise very high causing serious complications with symptoms with extreme irritability, confusion, delirium and seizures (Nordqvist, 2017).

In the research “Fever as an important resource for infectious diseases research” - it became important to evaluate the effects of pyrexia or fever which Viruses and bacteria are responsible for infectious diseases which ultimately helps to develop new treatments. Observing if fever has a negative impact over the pathogen or if it increases virulence, helps in development of new treatments for intractable diseases (NCBI, 2016).

When we are suffering from fever our diet should be simple not to be difficult to cope with digestive system. Take more fluids fruits or vegetable juice extracts, herbal teas, broths and gelatin; but if fever is along with diarrhea then our diet should include more semi-solid or soft nourishment such as mashed rice, vegetable soups, supplie simmered eggs, cooked with steam vegetables, yogurt and porridge. During fever avoid taking soft drinks which increases sugar intake, milk products, meat which are high in cholesterol, coffee, tea, alcohol, tobacco and smoking (WHO, 2017).
Conclusion

In the current world, in this 21st century being healthy is very important and is linked to the food we eat. Having nutritious diet helps to maintain healthy Body Mass Index and also helps to reduce the risk of having diseases like cancer, cardiovascular, diabetes, arthritis and stroke.

If we change our life style and have healthy eating habits we can avoid being excess weight or obese. Diet for weight control should not focus on weight loss rather follow healthy diet plan. Most of the diseases controlled by Replacing saturated and trans fats with unsaturated fats include omega-3 fatty acids; Increasing consumption of fruits and vegetables and adequate folic acid intake; Consuming high fiber diet such as whole-grain; Limiting consumption of sugar and sugar based products and sodium intake. Even though genetics play important role, a diet plan (vegan diet) which is high in fiber and low in fat with minimum amount of saturated food is recommended for Diabetes disease. By avoiding fatty and fried food and having high fiber diet which is rich in raw fruits and vegetables is recommended for Heart diseases.

Once we realize the connection between good health and wholesome balanced diet, then our food will become our medicine for maintaining good health. The health conditions such as making right food choices and leading healthy lifestyle helps to prevent, treat and cure of the diseases.

References

Mobile Phone: A Smart and Healthy Device

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Abstract

Research into health communication seeks to refine communication strategies to inform people about ways to enhance health or to avoid specific health risks. As per many reports, current scenarios the health risks are generally like Cardiac arrest, Blood pressure, Sugar etc. This paper proposes a Smart Wrist Watch which will measure the Blood pressure, sugar and Pulse rate of the individual and if risk has been found it will inform the group of persons with the location of the mobile.

Keywords: Health Communication, Mobile health, Smart Watch, Healthy app, Wrist Watch BP monitor, Wrist Watch Glucose monitor & Wrist Watch pulse rate monitor.

Introduction

The health and the safety of people must be taken into account with high answerability. In India most of the deaths are due to delay in first aid or absence of first aid. Even sometimes it happen that person sleeping at night found lifeless in morning. If contraption would be developed such incidence can be reduced to a great extent. Presently, India has the largest number of mobile users. If the mobile phone can be smart phone then why not healthy phone? How about, if mobile phone gives message to near once and doctor that there is something wrong with its user, also informs the Location of the user. The aim of the paper is to minimize the involuntary loss of life. Here, two units have been proposed which are as follows:

Smart Wrist Watch: This will measure the signal and transmit it to the mobile unit.

Mobile Application (Healthy App): It will be installed in the mobile unit. In this application the reference value will be fed by the user manually. The reference value is fed manually because the value of these parameters varies from person to person. After receiving the signal from the watch, it will compare this value with the reference value. If the difference is great then critical it will be treated as serious matter and an emergency will be transferred to the group of people. If the difference is less than critical level a warning message will be send to the user, which will remind the user to take the medicine and if there is no difference then the process will continue.
Case Study: As mentioned earlier it needs two main things
1. Smart Wrist watch
2. Mobile application (healthy app).

In starting user need to have the smart wrist watch and install healthy app. The “Smart” word is used because this wrist watch will measure the glucose level, blood pressure and pulse rate instead of showing time. The watch act like a transducer and measure the above said parameters on real time basis. This smart watch is connected to mobile phone via internet. It is important to note here 24×7 that Internet connection is mandatory for this app. Once the reading has been taken it is send to the application in mobile phone. Here, each value i.e. glucose level, blood pressure and pulse rate is compared with their reference value (as mentioned earlier reference value of each parameter is entered manually in mobile app in starting phase). The result is than compared with the critical value. After comparing based on the result there are three cases: For Example: Consider four persons Mr. ABC, Ms. XYZ, Mr. PQR and Ms. DEF is using the app. Mr. ABC is a healthy person with normal pulse rate, blood pressure and glucose level, while Ms. XYZ is suffering from hypertension and diabetes due to which her pulse rate also increases sometimes, Mr. PQR’s blood pressure switches rapidly and Ms. DEF is suffering diabetes. They have set the reference level as under:

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Mr. ABC</th>
<th>Ms. XYZ</th>
<th>Mr. PQR</th>
<th>Ms. DEF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood Pressure</td>
<td>80-120</td>
<td>120-160</td>
<td>70-120</td>
<td>80-120</td>
</tr>
<tr>
<td>(Systolic/Diastolic)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pulse Rate (per minute)</td>
<td>78</td>
<td>100</td>
<td>90</td>
<td>75</td>
</tr>
<tr>
<td>Glucose Level (mg/dl)</td>
<td>160</td>
<td>200</td>
<td>172</td>
<td>205</td>
</tr>
</tbody>
</table>
And the critical level as under: * Single vale or range of value

Table 2. Critical value table

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Mr. ABC</th>
<th>Ms. XYZ</th>
<th>Mr. PQR</th>
<th>Ms. DEF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood Pressure (Systolic/Diastolic)</td>
<td>60-140</td>
<td>140-180</td>
<td>60-140</td>
<td>60-140</td>
</tr>
<tr>
<td>Pulse Rate (per minute)</td>
<td>90</td>
<td>115</td>
<td>110</td>
<td>100</td>
</tr>
<tr>
<td>Glucose Level (mg/dl)</td>
<td>190</td>
<td>215</td>
<td>190</td>
<td>215</td>
</tr>
</tbody>
</table>

Case 1: If there is either no difference or less difference between the reference value and the reading taken, that means the situation is normal. No need to do anything. The app will work in background.

Case 2: If the difference is less: Suppose a case when Mr. ABC’s Blood pressure shoots up to 90-140 and the rest thing are normal. But if situation is normal nothing to panic. It can be due to heavy exercise and Mr. ABC has already set the emergency level to 140. So this case will be considered as normal case and a warning message will prompt to let the user know about it. At the same time Ms. XYZ is suffering from hypertension is rise in his BP can be a serious problem. In Mr. ABC case 20 rises in BP cause no issue, but 20 rise in Mr. XYZ will cause problem. Since then only a message will be forwarded to the user to take precautions to avoid the state of affairs. This message can also help him to remind him to take medicine, if forgotten.

Case 3: As Mr. PQR is suffering from blood pressure. His blood pressure switched between low and high and Ms. DEF is suffering from sugar. It will be difficult for both of them to take any medicine without checking. In both the cases the smart watch will help them. Suppose Mr. PQR BP rises to 140-190 and Ms. DEF’s rises to 220 which is dangerous level. So the machine will locate the position of the user and send the emergency message with the current location of the user to its near once.

Figure 1. Screenshot of warning message at user’s mobile
Figure 2. Screenshot of emergency message at user’s mobile.

Table 3. Showing deviation

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Case 1</th>
<th>Case 2</th>
<th>Case 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood Pressure</td>
<td>Little Deviation</td>
<td>No deviation</td>
<td>Critical Value</td>
</tr>
<tr>
<td>Pulse Rate</td>
<td>Little Deviation</td>
<td>No deviation</td>
<td>Critical Value</td>
</tr>
<tr>
<td>Sugar Level</td>
<td>Little Deviation</td>
<td>No deviation</td>
<td>Critical Value</td>
</tr>
</tbody>
</table>

Note: The application will continue to give reminder message until the message is open because if the message remains unread the objective of the machine will defeat.

How does it work: In beginning the user ties the wrist watch on his/her arm and set the both reference level and critical level according to his requirement. After that the wrist watch will start measuring all the three things. And send the signal to mobile phone via Bluetooth/wifi.

And the results are as under:

Table 4. Deviation from Reference value

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Name</th>
<th>Diagnostic</th>
<th>BP level</th>
<th>Glucose Level</th>
<th>Pulse</th>
<th>Action</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>All*</td>
<td>Normal</td>
<td>Normal</td>
<td>Normal</td>
<td>Normal</td>
<td>No action</td>
<td>Continue to work in background</td>
</tr>
<tr>
<td>2.</td>
<td>Mr. ABC</td>
<td>Normal</td>
<td>BP rise (90-140)</td>
<td>Normal</td>
<td>Normal</td>
<td>BP rises between critical level: Warning Message</td>
<td>Critical Level is (90-140)</td>
</tr>
<tr>
<td>3.</td>
<td>Ms. XYZ</td>
<td>Hypertension</td>
<td>Hypertension (120-160)</td>
<td>Normal</td>
<td>Normal</td>
<td>General BP is high: Warning Message</td>
<td>Critical Level is (140-180)</td>
</tr>
<tr>
<td>4.</td>
<td>Mr. PQR</td>
<td>Hypertension/ Hypotension</td>
<td>Hypertension (140-190)</td>
<td>Normal</td>
<td>High (110)</td>
<td>BP &amp; PR high: Emergency</td>
<td>Blood pressure switches.</td>
</tr>
</tbody>
</table>
Objectives of the proposed project

The proposed study aims at
1. To enhance Health communication with the help of mobile phone.
2. To give fast and accurate reading
3. It will help the family member to know about if there is any emergency with their loved once.
4. Provides reminder message if someone miss the first message.

**Benefit to society**

1. It will reduce the sudden death rate.
2. Provide the location and details of the patient.
3. Let others know about the emergency condition so that first aid can be provided timely.
4. Rapid diagnose will help to provide first aid immediately.

**Future plans**

Further it can be extended to diagnoses more diseases. The location of the nearest hospital can also be send to the user’s so that he/she can be rushed to nearest hospital without any delay. Cloud storage can be linked so that patient’s history can be saved.

**References**

The Legal Aspect of Insidious Diseases in the Workplace: A Case Study of Jwaneng Diamond Mine in Botswana

Article by Comfort Matthew Tanko
E-mail: royalconmy@yahoo.co.uk

Abstract

The purpose of this study is to examine the legal aspect of insidious diseases in Botswana mining sector. Sixty respondents from Jwaneng mine will take part in this study involving top management and the rest of the staff members. And they will be served with questionnaires as a primary source of data collection. The approach gives opportunity to collate, process, present and analyse data from courts and authors. In so doing the study will identify the gap and inability of workers in Jwaneng mine to file a claim for compensation when faced with insidious diseases.

Early in the life of a Botswana miner, the legal aspect of insidious diseases wasn’t necessary; because insidious diseases take a long time to manifest and most miners are not aware of their rights to compensation and so it becomes very difficult and complicated to file for a claim. Although Jwaneng mine has a good safety management record, there are instances when accidents still happen and therefore requiring some form of compensation and one way this can be done is by having it clearly stated in a contract of employment agreement. Employees may also be sensitized on their rights so they know the channels to take in seeking redress. This is aimed at ensuring there is harmony between the top management and workers in their respective endeavours.

Keywords: Botswana, Compensation, Debswana Diamond Mine, Jwaneng, legal aspect, Insidious diseases.

Introduction

In Botswana the legal aspects of insidious diseases in the mining sector present a major challenge facing the miners especially those in Jwaneng mine. The problem is compounded by the fact that number of miners who should be compensated as a result of insidious diseases contracted in their workplace are wallowing in ignorance of the rights available to them. This study seeks to sensitize and enable Debswana Jwaneng miners to file for compensation for any occurrences of insidious diseases as a result of exposures to workplace hazards generated by dust particles carrying silica inhaled by the miners and such other related lung diseases called pneumoconiosis. An insidious disease is any disease that comes on slowly and does not have obvious symptoms at first but developing in an individual, and he or she is not aware it is developing.1

Although safety is a strategic priority at Debswana Jwaneng mines and the company has a rigorous standards and processes in place to prevent injuries and diseases from occurring , all operations run initiatives to promote a common culture of zero harm and deploy processes to facilitate swift reporting and investigation of every incident to identify root causes, initiate remedial action and to disseminate lessons learned; it however did not provide for adequate, equitable and commensurate compensation as a right fill a claim over insidious diseases contracted in the course of carrying out their duty.

The best solution is to provide a detailed provision in the miner’s contract of employment of how it is a right accrued to them to file for a claim in their contract of employment. Surveillance of occupational exposures and insidious diseases is weak, despite the efforts of Debswana Diamond Company. Although provision for compensation for occupational lung diseases.

Ignorance of the law is said to be no excuse, but most of the miners in Debswana Jwaneng mines are not really aware of their rights and so they won’t be able to and wouldn’t even care to file a claim. This has really limited them from claiming their rights to compensations.

This study relates to the methods or strategies for sensitizing and bringing to the knowledge of the Jwaneng miners in Botswana and thereby advocates for a comprehensive details in their contract of employment agreement.

Methods to be followed

Description of the site

Jwaneng is a setswana word in Botswana which simply means where a small stone is found. The Jwaneng pipe was discovered in the Naledi River Valley also known as “Valley of the stars”, in Southern Botswana in 1972.

Debswana Jwaneng Mine is owned by Debswana, a partnership between the De Beers company and the government of Botswana. It is an open pit mine. It is located at the south centre Botswana, about 160 miles southwest of Gaborone in Kalahari Desert and produces 12 to 15 million carats of Diamond per year on average basis.

Jwaneng Mines is the richest diamond mine in the world by Value. It was officially opened by the then President of the Republic of Botswana, His Excellency Sir Ketumile Masire. This later became fully operational in August 1982.

Currently Jwaneng mine is mining to a depth of 400 metres and is reaching 624 metres this year. The resource consists of three separate volcanic pipes/vents namely; north, south and centre pipes, two additional small kimberlite bodies have also been intersected within the pit, which erupted through Transvaal strata and the overlying karoo sediments.

Description of the research done

The approaches used in this study are analytical and comparative. The analytical approach is adopted for literature review. The comparative is used while comparing and looking at what is happening in the other mining sites in sites in Botswana.

The analytical method or approach gives the opportunity to collate, process, present and analyse data from courts, desk tops and authors. This attempts to clarify and to sensitize the miner of their rights. In so doing the text identifies gaps in the existing literature on the subject of the study which, at the end will enable the research to reach logical conclusions and offer solutions.

Similarly the adoption of comparative approach creates an insight into how the mining sector in Botswana promote compensation through the enforcement of human rights which helps in no small measure in the examination of the legal aspects of insidious diseases and identifies their problems when it comes to filing for claims.

The main aim of the comparative analysis is to discover the best approach deployed by Debswana Jwaneng Mine to promote filling for a claim.

Member of Parliament Mr. Kgoroba said Debswana is exploiting its workers by increasing its use of labour brokering in a bid to avoid the consequences of the legal obligations. In Botswana there are currently no legislative inroads aimed at curbing or regulating the industry. In the current economic climate and the high rate of unemployment, currently and controversially set at 17% by statistics in Botswana, the unemployed and particularly the youth are increasingly vulnerable to being traded as a “commodity” by a company seeking to employ short to medium term employee without the obligations imposed on them by the employment Act.4

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Jwaneng mine is an open pit mine with the symbol of DK2 currently down to +300 meters below ground level (mbgl).

The fact that international labour law obligations have not been introduced locally does not however prevent the ideals espoused in those conventions being used by government and the high Court which is done at the Industrial court to give direction as to the approach to be opted for.

This study also shows that under the common law a contract of employment can only be between two parties and no place for a third party.

The Botswana law inherited from independence, affirms the fact that the contract of employment without certain legal aspect of liability and the right to compensation amounts to slavery, under normal labour brokering the agreements, labour brokers provide workers to meet the clients specific employment needs; which includes their rights as employees of the company, amongst many is the right to file for a claim as a result of constant exposure to dust which resulted to the employee contracting an insidious disease in his/her workplace.

**Description of the methods used**

The collection of primary data by way of interviewing and serving questionnaires revealed a number of divergent opinions and answers from individuals ranging from Debswana Diamond Company contractors, top management officers, spouse of a miner and miners themselves in Debswana Jwaneng mines.

<table>
<thead>
<tr>
<th>S/N</th>
<th>Workers in jwaneng mines</th>
<th>Affected by insidious diseases</th>
<th>File for a claim</th>
<th>Compensated</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Top management officers</td>
<td>Not diagnosed as yet/no sign yet</td>
<td>No</td>
<td>Not yet</td>
</tr>
<tr>
<td>2</td>
<td>Miner 1</td>
<td>Yes, slight pains/coughing</td>
<td>Not aware</td>
<td>No</td>
</tr>
<tr>
<td>3</td>
<td>Miner 2</td>
<td>Severe chest pains</td>
<td>Not aware</td>
<td>No</td>
</tr>
<tr>
<td>4</td>
<td>Spouse of miner</td>
<td>Frequent chest pains</td>
<td>They said she is not an employee but a spouse of employee</td>
<td>Not eligible</td>
</tr>
</tbody>
</table>

**Compensation to insidious diseases**

In investigating the reality in labour brokering it was found that various unreported industrial court decisions that looked beyond the contract of employment to ascertain who bore the ultimate responsibility for the workers’ wellbeing and who bore the legal responsibility of ensuring obligation to workers under the Employment Act were adhered to.

The industrial court variously held that the application of these test must take account of the realities of the particular situation rather than the form in the parties choose to the relationship. In contrast however the Court of Appeal recently applied a strict adherence to the terms of the employee and employer relationship based on contract.

Legal scholars argued that applying the Court of Appeal judgement on termination of contract of employment based purely on the terms of the contract and the Industrial Court decisions that look beyond the contract would likely lead to legal uncertainty based on whether a claimant approached the High Court or Industrial Court for help.

This uncertainty undermines the legal certainty principle is a corner stone of the Rule of Law, stated an attorney. Though common Law and Botswana’s International obligation under the International Labour Organisation Convention (ILO) can protect workers and address some of the disparities of interpretations of workers’ rights they are not however binding on the Courts as they have not been introduced as local legislation. Zimbabwe, Namibia and South Africa have introduced legislation to
address such disparities and override the Common Law and incorporate International Labour Obligations into local law. This has not yet been done in Botswana.

Additionally, Botswana’s International Obligations under the ILO have increasingly come under scrutiny with government being reported by the Botswana Federation of Public Service (BOFEPUSU). In May this year, for violating workers’ rights under the joint bargaining council.

<table>
<thead>
<tr>
<th>Selected few that were served with questionaires</th>
<th>Availability of silica/abestos</th>
<th>Debswana jwaneng mines /contractors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Miners under 18 to 35 years</td>
<td>Affirmed the availability of asbestos in jwaneng mine in large deposits where the diamond sits.</td>
<td>Contractors denied that there wasn’t any large deposites of abestors in the mines</td>
</tr>
<tr>
<td>Miners above 35 years</td>
<td>Affirmed the presence of insidious diseases</td>
<td>It became almost impossible to file for claims for ignorance of their rights and are not aware such rights and are afraid of losing their jobs at such age.</td>
</tr>
<tr>
<td>The community</td>
<td>Affirmed affected by dust from the mines</td>
<td>Contractors said they have no any form of relationships to warrant such legal obligations</td>
</tr>
</tbody>
</table>

The results

In Botswana surveillance of occupational exposures and insidious diseases are very weak notwithstanding efforts of Debswana Diamond Company. It has excellent Site Rules and Regulations for employer/employee and contractors\(^3\). The miners often go underground to get the Diamond with inadequate masks, most of the diamond are sitting on asbestos.

De beers who are partners with Botswana government to carry out mining activities denied that asbestos was not any problem. They also argued that most of the aged elderly miners that worked in South Africa, brought their insidious diseases to Debswana Jwaneng Mines and such their claims wouldn’t suffice for the legal right to claim compensation.

Compensation is a form of insurance providing award to someone in recognition of loss, suffering or injury or in other words it is the total cash and non-cash you give to an employee in exchange for the work, workplace injury he or incur during the course of his or her carrying out her duty in the workplace, but as Debswana Diamond Company are denying that such insidious diseases don’t exist because of their excellent health policies even if they do; the health policies and health officers in place would have carried out the routine checks and had tackled it since before it gets to the terminal stage.

Ventilation systems in the mines are always breaking down and yet they have to go deeper to get the diamond in such conditions where they must breath, and if they must breath they can only breathe the air around them, and the air is the air that is saturated with dust, this dust may contain one or two air pollutant like asbestos, silica sand and the likes which later becomes an insidious disease. Their problems were very different and yet dangerous, the Doctors kept a very tight hold on the miners’ health record saying that such issues were not directly affecting the miners. Diseases due to respiratory air-

\(^3\) STD/SHE/SHE/017 Mar 8\(^{th}\) 2012.
borne dust such as silicosis, asbestosis and chemical inhalation remain very harmful to the miners’ health.

Botswana uses the most dangerous method of mining which is the open-pit mining. This is technically complex way of extracting ore and recovering diamond. It is used when open pit mining becomes uneconomic, as the open pit excavating around the Kimberlite pipe goes deeper, the cost of removing waste materials against the rate of diamond recovery against the rate of diamond recovery.

Botswana international obligations under the International Labour Obligation (ILO) have increasingly come under scrutiny, with the government being reported by the Botswana Federation of Public Service (BOFEPUSU) as failing in its obligations. In May this year 2017, for violating workers’ rights under the joint bargaining council. The fact that International labour law obligation have not been introduced locally does prevent the ideals espoused in those convention being used by government and the High Court.

Discussion

Relationship of the results to the objectives

(1) In principle, Debswana Jwaneng Diamond Mine compensation systems should exclude ineligible claims and provide benefits to eligible claims. However, for certain reasons, hindrances are there and are put in place to exclude ineligible claims will likely screen out some arguably compensable work related injuries as well.

(2) The 1990 workers’ compensation claim frequency has shown a steady decline a steady decline, this also shows a decline in injuries reported by the Bureau of Labour Statistics. However available evidences suggest that the number of reported workers’ compensation claims greatly underestimates the actual number of workplace injuries eligible for benefits.

(3) Restrictions on the benefits eligibility and increased hindrances to claims approval that had been adopted by many legal systems.

Workers’ compensation indemnity frequency rates 2012 -2017

Consistency with other researchers
Elmer I. Schwartz and Byron S. Krantz\textsuperscript{6} said in their article that in order to preserve a right to remedy for this form of injury, some courts have taken the position that a cause of action accrues, and the statutes begins to run when the insidious disease results.

It is at this juncture that it would become pertinent to note the reasons for the enactment of limitations statute and to determine whether the interests of justice are served through modification of the concepts in order to cope with the problem of insidious diseases. They further stated that statutes of limitation were enacted in England as early as 1236 AD, and in Rome as early as 424 A.D\textsuperscript{7}, at the present time statutes take many forms and govern most types of actions. The obvious purpose of the statutes is to prevent suits upon fraudulent or state claims, where much evidences and many witnesses are no longer available\textsuperscript{8}.

The prevailing view is that claims are not usually allowed to remain neglected over a period of years with no attempt to enforce them. Further it is to relieve courts of the burden of adjudicating stale or tenuous claims.

A realistic approach to the problem of insidious diseases was reached in the landmark case of Urie v. Thompson\textsuperscript{9}. Plaintiff alleged that in 1940 he was forced to cease work as a fireman on a steam locomotives as a result a pulmonary disease diagnosed as silicosis. This permanently disabling affliction had been caused by continuous inhalation of silica dust blown or sucked into cabs of the locomotives on which he worked. The injurious concentration of silica dust in the air arose from the rail road of the mines and had affected his health as a result of exposure to the harmful dust in his workplace.

Michael D. Green\textsuperscript{10} said in his article that Toxic substances litigation has moved front and centre on the contemporary civil litigation stage. Its scope is massive its influence on doctrine is substantial, its challenges for administration of the civil justice system is unique. Toxic substances litigation and the compensation question it spawns present political, social, technological and economic challenges with which we have just begun to grapple and which we will continue to face for decades to come.

The most compelling problems posed by toxic substances litigation are its voracious appetite for civil justice system’s resources and the difficulty of resolving factual issues of causation given the limited state of scientific understanding.\textsuperscript{11}

Since the first reported asbestos decision in 1973\textsuperscript{12} tens of thousands of suits have been filed, and in some jurisdictions they continue to be filed at twice the rate at which they are being resolved.\textsuperscript{13}

Judge Edward Becker of the Third Circuit Court of Appeals, for instance, characterized asbestos litigation, with some hyperbole as the most serious crisis the Federal Court had faced in its history.\textsuperscript{14}

\textsuperscript{6} State of limitations in cases of insidious Diseases Cleveland State Law Review, EngagedScholarship@CSU, 1963.
\textsuperscript{7} Pollock and Maitland, History of English Law 81 (2nd ed. 1898); Sohn, The Institute of Roman Law 318-22 (3rd ed.1907).
\textsuperscript{8} Comments, Developments in the Law-statutes of Limitations, 63Harv.L.Rev. 1777 (1950).
\textsuperscript{9}337 U. s. 153 (1949).
\textsuperscript{11} See Rosenberg, The casual connection in Mass Exposure Cases: A Public Law Vision of the Tort System, 97 Harv. L. REV. 851, 851-59 (1984), the later problem is addressed infra text accompanying notes 34-49.
\textsuperscript{12} Borel v Fibreboard Paper Prods., Corp, 493 F.2d 1076 (5th Cir. 1973) cert. denied, 419 U. S. 869 (1974).
\textsuperscript{13} See, e.g., GAO, REPORT TO THE CHAIRMAN, SUBCOMMITTEE ON LABOR STANDARDS, COMMITTEE ON EDUCATION AND LABOR, HOUSE OF REPRESENTATIVES, ASBESTOS: GROWTH OF FEDERAL CLAIMS, COURT CASES AND LITIGATION COSTS 20 (1988); R. Klein, Year End Report on the 1986 Asbestos Litigation in Philadelphia County (undated), reprinted in Asbestos litigation Rep. (Andrews) 14,299; 14,299 (March 6, 1987); see also Bruce, The Armies of Asbestos, AM. Law., Nov. 1979, at 19; Chen, Asbestos Litigation is a Growth Industry, ATLANTIC, July 1984, at 24; Pa Supreme Court is asked to void Emergency Trial Rules in Philadelphia, Asbestos Litigation Rep. (Andrews) 15,716, 15,717 (Sept. 18, 1987) (more asbestos cases were filed in one month than were terminated the previous year and the backlog at current rates of processing cases is 21 years)
Again BabaraWrubel\(^\text{15}\) a breach of contract of employment of legal duty to act with reasonable care may invoke the full panoply of product liability litigation\(^\text{16}\).

**Further research that may be necessary to answer the questions raised by the results**

Compensation for research subjects of insidious diseases in the mining sector of any legal system has been an old an established practice. Many researchers had written a lot about compensation and legal aspects of insidious diseases in the mining sector. For over 200 years, compensation and the legal rights to file for a claim had been offered to research participants for various reasons like monetary gains so that they would come up with new research topics as regards compensation and the filing of claims in the workplace.

Below is a table showing the eligibility and age differences between workers in Debswana mines as regards rights to claim and compensation.

<table>
<thead>
<tr>
<th>S/N</th>
<th>Number of years worked</th>
<th>Eligibility</th>
<th>Presence of pollutants</th>
<th>Compensation awarded</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Miner 1 age 18-25 years</td>
<td>5 years is experiencing slight chest pains</td>
<td>Yes</td>
<td>Denied rights and compensation</td>
</tr>
<tr>
<td>2</td>
<td>Miner 2 age 26-39 years</td>
<td>19 years affected by silicosis and pneumonco</td>
<td>Yes</td>
<td>Denied legal rights to claim for compensation</td>
</tr>
<tr>
<td>3</td>
<td>Miner 3 age 40-59 years</td>
<td>25 to 30 years experiencing cardio-pulmonary tuberculosis</td>
<td>Yes</td>
<td>Delayed but given and not commensurate to the degree of injury.</td>
</tr>
<tr>
<td>4</td>
<td>Employee’s spouse</td>
<td>Silicosis</td>
<td>Yes</td>
<td>Not attended to</td>
</tr>
<tr>
<td>5</td>
<td>Employee’s family</td>
<td>Silicosis</td>
<td>Yes</td>
<td>Not attended to</td>
</tr>
</tbody>
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**Responses to the questionnaires shared**

A number of miners in Debswana Diamond Jwaneng Mine and top management Officers were served with questionnaires and the outcome of their responses were divergent and controversial responses.

Sixty respondents were served with questionnaires, only about 11 responded amongst the top management officers. Others were about 25 amongst the miners that responded who are directly affected with harmful substances in the mines, the people living around and close to Debswana Diamond mines responded; some of which were family members of the miners and administrative staff of Debswana Diamond Mines in Jwaneng and also are some members of Jwaneng Community.

The questions that were asked in the questionnaires are questions that relates to working conditions, insidious diseases in the workplace and whether there seem to be some kind of redress or rights; even the rights to file a claim or the right to compensations.

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\(^{15}\) Liability Insurance for Insidious Disease Who picks up the tab? 48 Fordham L. Rev. 657 (1980).

\(^{16}\) In 1916 Judge Cardozo announced the doctrinal basis of product liability law. If a nature of a thing is such that it is reasonably certain to place life and limb in peril when negligently made, then it is a thing of danger. Its nature gives warning of the consequences to be expected. Also is the case of manifestation theory that is somehow similar to liability insurance. Manifestation theory refers to a legal theory recognizing an injury as an insurable loss when injury is manifested to an injured. Manifestation theory is also an insurance doctrine stating that an injury or disease is covered under the policy, on a first appearance of symptoms of the covered injury or disease. Manifestation theory is also known as exposure theory, actual-injury trigger, or triple trigger.

However, some injuries do not manifest themselves immediately between the occurrence of the event and time when the injury becomes apparent. The consequences are referred to as delayed manifestation injuries. A delayed manifestation injury is not recognized under manifestation theory and hence coverage cannot be provided under insurance policy.

The following is an example of a case law defining manifestation theory. Manifestation theory states that an insurance coverage applies under a policy if the property damage manifests during the policy period, regardless of when the act from which it resulted occurred. [Audubon Trace Condo. Ass’n v. Brignac-Derbes, Inc., 924 So. 2d 1131 (La.App. 5 Cir. Feb. 27, 2006)].
The top management officers in Debswana Jwaneng Diamond mines seem not to agree with the presence or likely hoo of an occurrence of an insidious disease because of the health policies they have put in place. When asked if they had followed the laid down rules and principles in the International Labour Organisation; they seem not to strongly ascent to have strictly followed the principles laid down by the International Labour Organisation as complying with the principle as regards the rights and compensation of an employee. Some of the top management officers said that if the miners are affected and are suffering from insidious diseases it was because they brought it from their former place of work in South Africa where they were mining before they came back to work in Debswana Jwaneng Mine in Botswana and that there are likelihood of the miners that came from South Africa to had been exposed to insidious diseases before they started working in Debswana Jwaneng Mines in Botswana.

When asked whether their miners have some sort of rights to file a claim and also the rights to compensations, they said yes, but their statements and policies seem to be only on paper and not operational as it were. The Debswana Jwaneng Diamond miners are not even aware of certain rights accrue to them when it comes to filing for a claim and compensations for the insidious diseases they suffer as a result of exposure to dust air pollutants of silica and asbestos the inhale while blasting the earth crust just to reach the diamond they are looking for.

The Debswana Jwaneng Diamond miners affirmed to the question in the questionnaire as to whether there are dust substances containing silica and asbestos in the Debswana Jwaneng Mines; their workplace. More than twenty three affirmed to the presence of dust substances of silica and asbestos in large quantity. They also strongly agreed; agreeing to the question put forth in the questionnaire as to whether any of them, as Debswana Jwaneng Diamond miner had fallen sick of insidious diseases as a result of working in Debswana Jwaneng Diamond Mine. Almost all of them said the Diamond seats on asbestos.

Botswana has not really legislated and implemented the principles of International Labour Organisation into their laws and so the enforcement of these rights is weak. Furthermore, the miners are ignorant of the rights available to them and would rather suffer.

Family members too said there are large deposits of asbestos and this also had affected them in some way or the other. More than four family members ranging from their spouses to their kids, also affirm of being affected by frequent chest pains and inhalation of dust blown towards their dwelling place by the wind and this had caused them a lot to treat and managed.

**Conclusion**

In conclusion the tables below indicates and shows the different ages filing for a compensation as a result of exposure to silica dust, asbestosis and their company’s response.
References

[1]. Bruck, the Armies of Asbestosis Am.Law.org.
[7]. Pollock and Maitland, History of English Law 81 (2nd ed. 1898).
[13]. Sohn, the Institute of Roman law 318-22 (3rd ed. 1907).

Cases


Internet sources

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