Assessment of Capacity and Performance of Decentralized EMIS Activities in Developing Countries

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ABSTACT: Education Management Information System means to gather statistics by following people, models, methods, procedures, processes, rules and regulations with the emerging information technology to provide comprehensive, integrated, relevant, reliable, unambiguous and timely data to education leaders, decisions makers, planners and managers, to perform their responsibilities accurately and efficiently. Numbers of countries in the world have decentralized their EMIS systems so as to transfer and manage all EMIS activities from high level to low level in the best interest of the organization. But in various developing countries, it is still poor in terms of collection, analysis and production of data, generating its outputs and dissemination to develop better education policies. Work of one district do not complete without completion of the work of other district, which ultimately results delays in overall EMIS activities. This paper emphasizes on the capacity and performance of the different EMIS activities, necessary and mandatory for any efficient decentralized EMIS system by assessing, examining and identifying the deficiencies in them.

Keywords: Decenteralized EMIS Activities, Data Integration, Data Usabiilty, ICT Infrastructure, Policy & Decision Making

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1. Introduction

Education Management Information System means to gather statistics by following people, models, methods, procedures, processes, rules and regulations with the emerging information technology to provide comprehensive, integrated, relevant, reliable, unambiguous and timely data to education leaders, decisions makers, planners and managers, to perform their responsibilities accurately and efficiently. Numbers of countries in the world have adopted this concept and many of them have already failed because of their limitations in their planning and policy frameworks for the efficient development and maintenance of EMIS systems. Decentralization has become an important way of governance and management in most of the developing countries. Decentralization is the way to share the authority & responsibility, accountability of collection, processing, analysis, publication, distribution, reporting and dissemination of data at all level. Many countries have decentralized their EMIS so as to transfer and manage all EMIS activities from high level to low level in the best interest of the organization. But it is still poor in various developing countries in terms of collection, analysis and production of data, generating its outputs and dissemination

to develop better education policies. Some districts (even provinces) neither have sufficient equipment or qualified manpower capable of doing the required job nor the capacity to develop data capturing and retrieval programs. Work of one district do not complete without completion of work of the other districts, which ultimately results delays in overall EMIS activities. Until the early 1990s, there was no systematic EMIS in Islamic Republic of Pakistan. Education statistics were compiled manually, which resulted unreliable and inconsistent data. Data were released two to three years after collection. These technical inconsistencies and the lack of guarantee of data quality consequently weaken effective planning and other related activities of the EMIS. With the establishment of Federal level EMIS, all four provinces (Balochistan, North West Frontier Province (NWFP), Punjab, Sindh) also set up their individual provincial EMIS in early 1990 funded by different developmental agencies. All the Provinces EMIS units are now decentralized to district, tehsil or circle level. The significance of this study was to put a sight in the management of EMIS processes with the key factors (timely and reliable productivity of data, data integration & data sharing and efficient utilization of data) required for the successful development and working of Education Management Information System at all levels. The objective of this study was to observe and examine the trends in utilizing the power of information technology and skilled human resource in the management of EMIS processes / activities (integration, timeliness and reliability of data etc) after devolution of power. In the light of the objectives, it was hypothesized that when EMIS got decentralized, its functionality and services got more suffered in terms of shortage of skilled and technical staff, lack of timely and reliable production and dissemination of data in the best interest of the users/stakeholders. Structure of the paper is formed as that in section II Literature Review is provided in detail. Section III consists of methodology while in section IV results are analyzed and discussed. Section V elaborates the major challenges, section VI describes conclusion and in the last section VII, the recommendations are given to resolve the issues.

2. Literature Review

Decentralization refers to the process through which administrative and decision making responsibilities are transferred from high level to low level authority [1, 2]. Decentralization has become an important and efficient way of governance in most of developing countries and reformers have also turned to decentralized their organizational structures to as to induce broader participation in governance [3, 4, 5, 6, 7, 8]. But the countries, likely to decentralize their organizational structures, also tend to be relatively wealthy and have high income [9]. Various developing countries have decentralized their EMIS systems down to Province/district level with a provision to provide access to timely, reliable, relevant and economical information to planners, researchers and to all concerned users for good governance, management and reliable decision making in the best interest of education system [10]. But besides, ensuring access to quality & timely data and also choices about ICT infrastructure, it is equally important to give sufficient attention to institutional building of human resource to ensure appropriate skills to operate and maintain EMIS activities at all levels [11]. Research reveals that many developing countries (e.g. Mozambique, Nigeria), are still showing poor performance in terms of managing collection, analysis & production of data, generating their outputs and dissemination to users even with decentralized EMIS. Some developing countries have also developed expansion plans to take all the EMIS activities online (electronically link all level local databases e.g. Ghana, Bangladesh etc) but still suffering from some serious and major capacities constraints i.e. lack of budget, lack of computer equipments and lack of technical staff & their understandings about their functions etc [12, 13, 14, 15]. Ministry of Rwanda developed an online EMIS system to keep track of digital information, but due to non-adoptability and accessibility of internet in numbers of districts offices / schools, users used to bring data to district centers or to cybercafé to upload onto online system for the compilation at the main office [16]. In Pakistan, until the early 1990s, due to non availability of systematic EMIS, education statistics were compiled manually by the Ministry of Education. The data were released two to three years after its collection which ultimately resulted delays and also weakened effective planning and other EMIS activities. Later on MOE developed four EMIS units in the four Provinces of Pakistan with the assistance of Donors. With the provision and objectives to provide timely and accurate date to stake holders, it was decided to decentralize each Provincial EMIS Unit down to district level under the devolution of power by the Government of Pakistan [17,18]. In this regard, a project was also initiated in July 2003 to support institutional development and data generation capabilities of the staff to support Provincial EMIS units in better planning and decision making [19, 20, 21, 22]. In the year 2008, AEPAM (Academy for Education Planning and Management) with the assistance of ED-Links and the USAID, arranged EMIS working Sessions from 24th to 27th November at Karachi wherein international and local consultants were also invited to perform rapid internal assessment of the existing EMIS infrastructure in Pakistan and emphasized on the growth and development of Internet Communication System among all the districts to provide timely availability and usability of data. But, despite all, district EMIS units are still suffering from serious capacity constraints regarding budget, computer equipments and staff job descriptions & their understanding about their functions [23]. District EMIS cells are also have no proper network and computing infrastructure, sufficient capacity of servers, backups and security facilities along with appropriate and regular maintenance of the equipment, which are also one of the major issues relating to make EMIS more functional at all levels [24, 25].

3. Methodology

This research study is based on descriptive research methodology, which proceeds with the key EMIS measures to analyze capacity and performance of decentralized EMIS activities to find challenges regarding human resource, data integration, timeliness and reliability of data and finally come up with few recommendations to overcome the deficiencies. In this research study, data is collected through questionnaire, personnel interviews and discussions. This explains the stimulus response of the district EMIS cells regarding key issues of EMIS without being using the laboratory techniques. It is not done experimentally at all. District survey was the key mean to collect correct and accurate data from twelve (12) of the twenty four (24) district EMIS cells of the Province. Somewhere personnel interviews and discussions were also conducted with Provincial and District EMIS staff, which really provided us great support with much of information with real facts and figures about each surveyed district EMIS cells of the Province. Data gathered through questionnaire was being tabularized and analyzed in Microsoft Excel, 2010. The data analysis expressed in frequencies, percentage somewhere in table and figures for further interpretation in simple form where required. Data analysis consisted of examining the surveys for correctness and completeness, coding and keying data and performing an analysis of descriptive responses according to frequencies and percentages and is expressed in charts, tables and figures.

4. Results and Discussion

Figure 1 shows that out of total 12 district EMIS cells, 06 of them have shared office space in district building, 03 of them have separate office in district building while 01 have shared office space in school building. Only 01 of 12 district EMIS cell have keeps its own building as its office space while 01 of 12 district EMIS cell have given no response to the question. In discussion with the Provincial EMIS staff, it has also been revealed that most of the EMIS offices are damaged; roofs are leaked, and are often flood affected.



Figure 1. Type of Office Space

Table 1 shows that there are total "60" number of sanctioned posts in district EMIS cell surveyed, in which 12 posts are of Assistant Programmer (01 each) and the rest are of KPOs/Compter Operators (04 each). However only 30 posts are filled up till now. Usually, all the employee used to perform data entry and statistical analysis seeing that there is no post sanctioned for statistical officer yet. Results shows that 12 (100%) of 12 districts EMIS cells have requested / demanded training in Database Administration and Network administration while 8 (67%) desired training in Hardware Maintenance. This reveals their deep interest in mentioned areas for to be an expert to make District EMIS Cell more efficient in function.

The software resources necessary to all districts EMIS cells include MS Access software for EMIS database (build in MS Access), other MS Office softwares and utility softwares such as backup software, virus protection software etc. Table.II shows that EMIS database is developed in MS Access software and is deployed to all district EMIS either by the Provincial EMIS office or the Donors. Each district EMIS cell performs its data entry in their individual databases at local level. Almost all the District

Human Resource & Training Analysis								
	Total Post			Persons	Who	Who Dorforms	Areas where expertise required?	
	AP	DEO/ KPO	CO	Perform Data Entry?	Performs Data Entry	Data Analysis	Database & Network Administration	Hardware Maintenance
Battagram	1		4	3	СО	CO	Yes	Yes
Buner	1		4	2	AP & CO	AP	Yes	
Charsadda	1	4		1	DEO	Nill	Yes	Yes
Kohistan	1		4	4	СО	EMIS	Yes	Yes
Malakand	1	4		3	KPO	AP	Yes	Yes
Mansehra	1	4		4	KPO	AP	Yes	
Mardan	1	4		1	KPO	Nill	Yes	Yes
Nowshera	1		4	1	AP	Nill	Yes	Yes
Peshawar	1		4	4	CO & AP	AP	Yes	
Shangla	1	4		1	KPO	KPO	Yes	Yes
Swabi	1		4	4	CO & AP	AP	Yes	
Swat	1	4		2	KPO	KPO	Yes	Yes
Total	12	24	24	30			12	0
Grand Total: 60		30						

Table 1. Human Resource Analysis and Training Required

Software Resources in District EMIS Cells				
	Frequency	Percentange		
Type of Data Software in MS Access	12	100%		
Database Provided by Provincial Office	11	92%		
Database Provided by Donors	1	8%		
MS Office Availabilty	11	92%		
Acrobat Reader Availabilty?	9	75%		
Backup Software Availabilty?	0	0%		
Malwares Availability?	1	8%		
Antivirus Availability?	8	67%		
Burning Software Availabilty?	5	42%		
No Response	1	8%		
Individual database Environment?	12	100%		

Table 2. Software Resource Analysis

EMIS cells have MS Office software installed for documenting reports, maintaining accounts to handle budgeting (as the custom written software are minimal at the district level) and for making presentations and for running access database. But only 5 (42%) of 12 district EMIS cells have burning softwares to burn reports/database on CD/DVD for the purpose of backing up of data on regular basis. None of district EMIS cell reported the use of backup software to take data backup automatically. It has also been revealed in the discussion that most of the softwares are unlicensed because of their budgetary constraints.

Table 3 shows that in only 5 (42%) District EMIS cells data is protected from unauthorized users while in 7 (58%) DEMIS unit

data is not protected from unauthorized users. It is also analyzed that in 6 (50%) of 12 district EMIS cells computers are also not protected by secure password. All the district EMIS cells used to take backup of data on regular basis, for the purpose 9 (75%) of the 12 District EMIS cells use to take backup on USB drives while 3 (25%) of 12 district EMIS use optical drives and external hard disks to take data backup.

USB Drives are looking the most popular way of having database backup on regular basis unlike optical drives and external hard disk drives. It can been that virus protection software have been deployed to all the District EMIS cells by the Provincial EMIS cell but allthe virus protection softwares have now got unlicensed and outdated and do not provide high level protection due to none updating from the internet when required.

Data Security Analysis in District EMIS Units				
Data Security Analysis in District EMIS Units Frequency % ag				
Is Computer Protected by	Yes	6	50%	
Security Password	No	6	50%	
Is Computer accessible to	Yes	7	58%	
unauthorised personnel?	No	5	42%	
Is EMIS data backup on regular basis?	Yes	12	100%	
	Optical	3	25%	
Specify methods to adopt to take	External	2	17%	
backup	USB Flash	9	75%	
Is any licensed Virus protection	Exists	12	100%	
software available?	Unlicensed	12	100%	

IT Facilty Analysis in 12 districts EMIS Units of NWFP					
			Frequency	Percentage	
Available Functional Equipments	Total No of C	omputers	28	93%	
	Total No of La	aptops	1	8%	
	No of Printers	Laser Printer	8	750/	
		Inkjet Printer	1	7.5%	
	Scanners		6	50%	
	CD/DVD Wri	ters	12	100%	
	Multimedia P	rojectors	1	8%	
	USB Flash D	Prives	4	33%	
	Availablity of	Training room	No		
	Seperate Com	puter room	No		
Local Area	Available		3	25%	
Network	Not Available		9	75%	
Internet Access	Available	Dial up	2	590/	
		DSL	5	38%	
	Not Available		5	42%	

Table 3. Data Security Analysis

Table 4. IT Facilty Analysis

Table 4 shows that there are total 28 computers in the 12 district EMIS cells surveyed and each computer employee is facilitated with one computer in all district EMIS cell. 9 of 12 district EMIS cells have reported the availability of printer in their offices. Only one district cell is using laptop and multimedia projector for providing trainings to his employees or presenting data to stake-holders but none of the district have separate computer room or even training room to conduct such kind of activities. In many districts EMIS cells, USB Flash Drive is used as a most popular resource for having data back up, but only 04 districts EMIS cells

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have reported its availability. Only 3 (25%) out of 12 district EMIS cells have developed Local Area Network (LAN) while 9 (75%) of 12 district EMIS cells have reported non availability of LAN. In the discussion with Provincial EMIS staff it has been revealed that the local area network has been developed in a workgroup environment in the mentioned 3 district EMIS cells but only resource sharing i.e. printer. Table.IV reveals that internet has not been adopted widely as a primary mode of communication among all the district EMIS cells. Results reveal that internet service is available in 7(58%) of 12 District EMIS cells wherein 5 of them district EMIS cells are using broadband DSL internet service and 2 district EMIS cells are using dial up service to connect to the internet. But only 01 district EMIS cell is using internet as a primary mode of communication to send and receive emails to and from the Provincial EMIS office.

Figure 2 shows 7 out of 12 district EMIS Cells have forms in the range of 1000 to 2000 while 5 out of 12 district EMIS Cells have the range below than 1000 forms. But Figure 3 shows that the weeks taken to distribute and collect the forms in above mentioned ranged EMIS Cells are not the same e.g. the forms distribution and collection process in each district Buner, district Battagram and district Malakand completes in 4 weeks but in District Shangla and district Nowshera form distribution and collection process completes in more than 4 weeks as these two districts have form also in the same range i.e. below 1000 forms. It can be also seen that district Peshawar and swat having 1400 1580 forms respectively for distribution, also takes 4 weeks for forms distribution and collection. It demands that there should be a mechanism through which this gaps can be removed and make this process time saving. Data entry is the responsibility of the district EMIS Cells. Figure 4 shows the number of weeks it takes the different district EMIS Cells to enter the data into the EMIS database. Data entry typically starts from the moment when the first form returns and get continued until the last form received. It can be much analyzed that time taken to distribute and collect forms should be more or less equal to time taken to enter the data. It can be seen that district Swat have just 1 desktop computer available and they distribute and collect 1580 forms in 4 weeks but enter the data in just 1 week which is just amazing and surprising as compared to others which comes in the same range.



Figure 2. Forms Distribute in the Last Year



Figure 3.Weekends taken to Distribute and collect



Figure 4. Weeks taken to enter data

Table 5 shows that optical media such as CD/DVDs are in frequent use in (6) 50% to (7) 58% district EMIS cells as a medium of transmission to Provincial EMIS cells. While on the other hand Provincial EMIS cell disseminate compiled reports and database to (2) 17% to (6) 50% district EMIS cells for their use on CD/DVDs. Only 8% (1) district EMIS cell used to send reports via email while 17% (2) district EMIS cells sent reports to Provincial EMIS cell in hard form. Besides sending compiled districts databases and reports in CD/DVDs, the Provincial EMIS cell also send hardcopy reports to 42% district EMIS cells for their use by the Provincial EMIS cell.

5. Major challenges

5.1 Adequate No of Experienced, Technical & Skilled Staff

As a result of devolution, the responsibilities of Provincial EMIS Unit become more on providing adequate and skilled staff with technical and analytical support to produce consolidated data rather than being a data entry house at all levels. Most of the EMIS staffs at district level are KPOs/Computer Operators with one Assistant Programmer each, having limited functions and responsibilities. The shortage of staff along with weak capabilities in technical and analytical skills is the main issues in many of the district EMIS cells.

5.2 No Use of Statistical Analysis Application Package for Research Oriented Activities

As research and analysis are the integral parts of generating statistics but there is no evidence of the use of statistical analysis application packages as well as research oriented activities to produce the policy oriented analysis even at the Provincial level. This also reveals shortage of statisticians to conduct analytical work and to convert the educational data into such indicators essential for planning, monitoring and evaluation of education system.

5.3 Financial Support

Availability of equipments and technical infrastructure at district level even at Provincial level varies and is much dependent upon the donors support and / or external funding. Only the very basic IT facilities are provided to the district EMIS cells by the Provincial EMIS Office (i.e. Computers and related accessories).

5.4 Absence of Advance computer Training

The absence of advance training in database administration even other computer skills (i.e. hardware maintenance, network administration etc) are impossible for the district level staff in order to efficiently exploit the database and data entry process.

5.5 Poor LAN Enviroment Where Available

In such District EMIS cells, where Local Area Networks are installed but servers used for networking are outdated and causing many problems in sharing of printers and other resources.

5.6 Non Adoptability of ICTInfrastructure

Due to non adaptability of ICT (internet) as a primary mode of communication, local databases are neither linked with the

provincial databases nor with other related Federal Ministries. So the information is collected at the districts, verified and transmitted to the province on cds/dvds to pass through data cleaning and data validation process to produce annual statistical reports for dissemination to the district offices. But in very few cases, the corrected and validated information makes its way back to the district offices.

Majority of the Districts EMIS cells have internet availability and accessibility but only one district is using internet as a medium of communication to send reports/database via email to Provincial EMIS cell for compilation.

Method of Transmission to and from PEMIS Units in NWFP			
	Frequency	Percentage	
Transmission of Data from DEMIS to PEMIS Compilation			
Reports via Email	1	8%	
Reports via CD/DVD	6	50%	
Hard Copy Reports	2	17%	
Database via CD/DVD	7	58%	
Not Responded	1	8%	
Dessimination of Data from DEMIS to PEMIS Compilation			
Reports via Email	1	8%	
Reports via CD/DVD	2	17%	
Hard Copy Reports	5	42%	
Database via CD/DVD	6	50%	
Not Responded	1	8%	
Internet Usability as a Medium of Communication	1	8%	

Figure 5. Method of Transmission to and from PEMIS Units

Assessment of the Capacity and Performance of EMIS activities			
	District EMIS Units		
Adequate number of experienced/skilled staff	-		
Technical Support from Provin	+		
Financial Support	+		
Adequate Computer Facilities	++		
Data Entry in a Network Environments	*		
Ease of Data transfer to Provincial EMIS cell	*		
Timeless of Output Producation	-		
Dissemination media and stratergy	+		
Analytical Contents	-		
Adequate Data Availablity	+		
+++Very Good ++ Good +Needs Improvement - Wea	k VeryWeak * Not Applicable		

Figure 6. Assessment of the Capacity and Performance of EMIS activities

5.7 Inadequate Data Availability for Pocily & Decision Making at District Level

If the districts are expected to create their own reports, presentations or to take any decision, do not meet their requirements adequately in the outdated database as well as in the disseminated annual statistical report, which discourages the use of statistical information by the staff and at the same time plans are formulated based on unreliable and non-accurate data.

5.8 Scalability, Security and Robustness of the Database System

All the 24 districts are using access database which falls into desktop category and work best for individuals & workgroups. It supports only megabytes of data and creates big problem to the administrators in system scalability if the data gets large. Access uses file server architecture rather than client server architecture so cannot be used to build stable and efficient system

with many concurrent users if required. MS Access does not support atomic transactions and also do not guarantee about changes within a transaction boundary are committed or rolled back.

5.9 Database Security

The risk of data security is very high in each DEMIS cell as every individual computer is maintaining its own individual database. Analysis shows that the data is not secure from the virus attack; unauthorized personnel have access to data very easily and can change or alter the data because there is no secure password in many of the districts EMIS Cells computers. All districts EMIS Cells also reported that they have unlicensed versions of virus protection softwares available.

5.10 Delay/Slow Data Dissemination Process

Data is disseminated to all the districts in form of hard copy Annual Statistical Reports via physical medium. This process takes a lot of time in distribution of reports to all the districts. Though report gets also available on the EMIS intranet but due to unavailability of internet the districts have no access to it. Integration and processing of data take far too long and as such delay the timely publishing of the annual report which results in delay data dissemination. By the time many of documents are produced, the data is out of date and considered irrelevant.

6. Conclusion

The work can be summarized by assessing & examining the capcity and performance of different EMIS activities, necessary and mandatory for any functional EMIS unit as shown in Table 6.

7. Limitations & Recomendations

Time constraint and accessibility was the major barrier in collecting data from district EMIS offices and arranging interviews / discussions with District / Provincial EMIS staff in their busy schedule. Few recommendations are enlisted below:-

1) The EMIS cell should have its own separate office either in district office or in separate building and should be properly equipped with its own office equipments in order to function properly.

2) An efficient and secure office environment should be provided to each EMIS cell that no unauthorized personnel illegally access the data and equipments for its personal use.

3) There must more posts be sanctioned like Network Administrator, Database Administrator and a Statistician and if employed, they must be taught and trained in their respective fields.

4) Centralized Local Area Network (LAN) with centralized database server in each district EMIS cell should be developed to provide a secure network and database environment wherein only the database administrator should have full right of centralized database and all the users should connect / interact through client with the database for data entry, querying and reporting.

5) The Internet allows the distribution of software, operating system updates, virus definitions for virus protection software and other items necessary to protect the integrity of the systems. Broadband (DSL or cable) Internet access must be provided to those district EMIS cells where facility is available and where, it is not available, others ways should be adopted to connect through internet to other districts and provincial EMIS cell. This internet facility will make EMIS database updates, data dissemination and communication between all districts easy and efficient.

6) Backup software should be provided for the scheduling of backups, cataloguing of media, and reporting on backup activities. Wherein, the daily backup reports could be transmitted automatically to a centralized server which could then notify the relevant technical personnel when problems are persistent.

7) Each computer must have licensed copies of all software and where possible, software should be standardized throughout. Nationally or provincially negotiated license agreements with software providers such as Microsoft, Symantec or Adobe will provide significant savings in licensing and maintenance fees.

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