

# An Investigation into Data Management as an Information Tool and its Importance With in the Durban University of Technology

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**ABSTRACT:** *This purpose of this case study was to investigate data management as an information tool and its importance within the Durban University of Technology. The problem revolved around, inter alia, data management and data accuracy as structured interventions impacting on monitoring, analysis and decision making.*

*The research design adopted a quantitative methodological approach that used precoded self administered questionnaire for collecting data. The empirical component involved a survey method as this was an in-house investigation with a target population equating to only 174 respondents. A significant response rate of 74% was obtained using the personal method for the data collection. Several hypotheses were formulated relating to data quality initiatives, data owners and their responsibility and frequency of data analysis in order to determine accuracy. These were tested using the Pearson chi-square test as well as data that was analyzed to determine frequencies and percentages of responses. The data was analyzed using the computerized Statistical Package for Social Sciences (SPSS) program. A highly significant finding was that 95.31% of the respondents strongly agreed that data management and integrity is of utmost importance at the Durban University of Technology.*

*One of the recommendations suggest that an imperative for the Durban University of Technology to manage its data as an asset, a policy on data integrity and integration policy should be developed and implemented. Another recommendation highlighted and staff should strive to attain proper classification on the database, considering that this directly impacts on the accuracy of the HEMIS submissions to the Ministry of Education for the state allocated subsidy. The study concludes with directions for further research as well.*

**Keywords:** Data, Data Integrity, Data Ownership, Data Management, Data Governance

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## 1. Introduction

Data management refers to techniques used to organize, structure, and manage data including database management and data administration [1]. This definition is comparatively broad and encompasses a number of topics namely; data governance, data integrity, data architecture, analysis and design, data security, data quality management. The focus of this study is based on data integrity as an essential component in relation to data management. Reference [2] stated that data integrity is the prevention or correction of possible errors in data transmission.

Data integrity is a necessity at the Durban University of Technology (DUT), especially in relation to the mandatory data submissions for a specific reporting year to the Department of Higher Education and Training (DHET) from which the institution's subsidy is derived. The institution's subsidy is also known as Government appropriations. Reference [3] provides the definition as *"the fund to which are assigned the amounts received from the central government under the universities' subsidy formula (for both current and fixed asset expenditure). The central government's share of the interest and principal due on long term loans e.g. for buildings or major capital equipment which is also assigned to this fund"*.

Reference [4] explains how the newly elected government was faced with the challenge of nurturing democracy from the apartheid regime. Thus, in the past 10 years there has been a significant change in the higher education funding environment. Consequently, the Department of Higher Education and Training (DHET) requires a high level of data integrity from a management information reporting perspective.

One of the most significant challenges faced at the Durban University of Technology is maintaining data integrity throughout the institution. Reference [5] stated that *"effective information management must begin by thinking about how people use information and not how people use machines"*. There is and must be only one main purpose towards improving data management which is to improve customer and stakeholder satisfaction by increasing the efficiency and effectiveness of business processes in an institution.

### **1.1 The Problem Statement**

There are many common challenges regarding data management at the Durban University of Technology. These mainly comprise a lack of adherence to policies and procedures, lack or the absence of verification of data following capture, as well as staff who have a limited knowledge relating to the impact of incorrect data. This may negatively compromise data integrity and data accuracy. The absence or lack of data management could possibly result in substantial financial loss which can be catastrophic to the institution. Therefore, this study looks at data management as a strategic tool and its importance to the Durban University of Technology. Reference [6] states that *"Management Information Systems may be defined as an integrated, man/machine system for providing information to support operations, management and decision making functions in an organization"*. This system often utilizes computer hardware, software, manual procedures, management decision models and the database. With data management in place at the Durban University of Technology, the management information that is provided is relevant, accurate and current for different activities within the university.

The primary aim of the study is to investigate data management as a strategic information tool and its importance at the Durban University of Technology (DUT). The objectives of the study are:

- To improve awareness of data management within the Durban University of Technology and help stakeholders investigate the state of data management.
- To provide stakeholders with relevant information regarding data management and effectively apply this information in order to improve data integrity.
- To effectively utilize data management as a strategic information tool in order to provide all levels of management and stakeholders with management information to support strategic decision making, planning, policy development and quality processes.
- To explore the feasibility and effectiveness of data management using Higher Education Management Information System (HEMIS) to the DHET.
- To determine what processes exist for data verification.

The Department of Higher Education and Training (DHET) has drastically changed the way in which higher education institutions are reporting their data. The unit record collections for students, staff and space replaced the collection of data in the form of SAPSE tables. On 19 March 1999, all higher education institutions (HEI's) were informed about the main features of the new system through the document entitled *"A New Higher Education Statistical Reporting System for Students and Staff – A Concept Paper"*. The Department of Higher Education and Training (DHET) then provided all institutions with the Valpac software in order to make the HEMIS submission. The first data set was in respect of 1999 student data and 2000 staff data. Thus, a good management information tool/system has become indispensable for sound strategic planning, management and operation control at the Durban University of Technology.

Reference [7] explained how the integrity of data and data management affects the quality of decisions taken. Protecting the integrity of data can be difficult and becomes more strenuous as the size and complexity of business and its systems increase.

## **2. Reporting Systems**

The Department of Education's New Higher Education Statistical Reporting System for Students and Staff – A Concept Paper [8] reiterates that the implementation of the policy framework for the transformation of the higher education system will be information intensive requiring the development of quantitative and qualitative analytical skills and capacities that translate into reliable, high quality data. Further, this concept paper [8] outlines that there is a need for timely, comprehensive, good quality statistical data. This data will be required as an information base that is of fundamental importance in the development of plans and strategies, the evaluation of achievement of goals and targets, and the development of policy mandates for Government and institutions.

Reference [9] state that there are costs relating to a lack of data integrity and data management, namely, that in some extreme cases where reporting is flawed or data lost then there could be some loss in financial data. These costs are difficult to measure but can be catastrophic. When it comes to corporate credibility, the lack of data integrity and ineffective data management can have a negative impact on corporate image and sound decision making.

## **3. Management Information**

Reference [10] define management information systems as the function that plans, develops, implements and maintains information technology hardware, software and applications that people use to support the goals of an organization. Reference [10], management information systems involve collecting, recording, storing and basic processing of information including:

- Accounting records, financial statements, management reports; and
- Operation records, inventory, equipment repair and maintenance.

Management information systems use the above tools to implement, control and monitor plans. Reference [11] states that the idea of providing executive management with pertinent information directly from information technology based systems is not new. It was one of the objectives of the management information systems era, but an objective that was rarely achieved. There are two main reasons for this shortcoming [11]:

- Defining what is pertinent to executive management is very difficult and subject to rapid change; and
- The need for external information about the business environment to be included with internal information.

The following are a few objectives, as asserted by [12], for an effective management information system:

- To help facilitate the decision-making process by providing information in the proper time frame; and
- To provide information to each level of management to effectively carry out their functions.

Reference [12] also discusses the limitations in management information when he warns that information cannot be provided in information packages to analyse the available information before making decisions. When it comes to data integrity and data management in management information, it is essential to highlight the quality of input and processes [12].

It is contended that adequate attention is not given to the quality control aspects of the inputs. The process and the outputs leading to insufficient checks and controls in management information may thus compromise the accuracy of data capturing and result in huge financial losses.

Reference [13] stressed that many managers have an increased appreciation for the role of data in meeting the challenges of today's business environment. Accessing data from various organizational subsystems is often required to respond to the demands of an increasingly competitive global market place. Many large organizations are finding that even if they can access data from multiple functions, the lack of logical data integration across information systems makes it difficult or impossible to answer cross-functional or cross-divisional questions as espoused by [13].

Reference [14] focus on the purpose of management information systems which is a concise, explicit statement of the role

assigned to a particular information system in the organization. The roles have been identified by [14] as:

- A decision and planning tool.
- An analogue or model of the organization.
- An information bank.
- A problem finding and solving aid.

There is overlap between the above four roles and any management information system may contain elements of each of them.

Reference [15] describes a management information system as an interconnected set of procedures and mechanisms for data accumulation, storage, and retrieval which is designed to convert organizational data into information appropriate for managerial decision making. Management information systems generally summarize data produced by transaction based systems which is stored in organizational databases for analysis.

#### **4. Data Management**

Reference [16] highlighted that data management should be a regular part of daily work. In order to eliminate problems at the source, identify problems that need correction and be driven by opportunities to do better. Further, [16] advises on the following advantages:

- Enhancing value to the customer through new and improved products and services.
- Improving productivity and operational performance through better work processes and reductions in errors, defects and waste.
- Improving flexibility and responsiveness.
- Improving organizational management processes through learning.

By associating data management with quality systems, [16] identified three important benefits, namely:

- Effective data management reduces the direct costs associated with poor quality.
- Improvements in data management tend to lead to increase in productivity.
- Improvements in quality and productivity lead to increase in profits.

Reference [16] further emphasis process management which can be aligned to data management. It involves design, control and improvement of these activities needed to achieve a high level of performance. This helps to prevent defects and errors, eliminate redundancy and leads to better quality and improved organizational performance.

Reference [17] mentioned the following potential problems with respect to data management:

- Most internal data is captured by human sources and that in it self can be a very complex problem.
- Transmitting data from where it originates to the place where it is required for processing and decision making is very important for controlling and coordinating the operations of organizations.
- All staff needed to agree on common definitions of data entities and attributes.

Reference [18] refers to data management as “*natural as the air we breathe and as a result data management should represent a valuable additional technique for the executive management to adopt when his/her judgment dictates*”. When faced with any incomprehensible set of data, the first task would be to determine some sort of pattern to bring some order out of the complexities of data. Reference [19] argued that data management should aim for the following:

- Provide data to fulfill the information requests by a variety of users.
- Maintaining the integrity of data by restricting unauthorized access. However users have to be able to update incorrect data if necessary.
- Have the ability to evolve and develop as the organization expands.

Reference [19] also highlights some of the advantages of data management as:

- Reduction in data redundancy. Data is stored once and accessed in many forms.
- Data integrity. By avoiding data redundancy, data integrity is accomplished to a certain extent.

## 5. Data Integrity and Validation

Reference [20] comment on high level principles for data integrity and validation as being able to assess the predictability of risk estimates. The above type of validation is the most difficult validation because it involves the transfer to the operational risk arena. The predictability of a 99.9% confidence level estimate cannot be tested directly against real loss outcomes.

Reference [21] makes reference to the term data synchronization. It is contended that one of the reasons why organizations incur large costs for having bad data in various sections in the organization is that their data is '*out-of-sync*'. This means that pieces of information related to the same things differ between the source and what is on the system. It is therefore not uncommon for the organizations to have processes that are hampered by the lack of consistent good data. The solution provided by [21] is data synchronization which means achieving consistent information between the source and what is on the organization's operating system.

Reference [22] highlights how the easiest problem to fathom is the inaccuracy of data. Inaccuracy of data differs from organization to organization. An estimated 10 to 25% of data records contain errors or have missing data. Even a simple decision needs many data records and it could mean that a very inaccurate decision can be made on the corrupted data.

Reference [23], data integrity is vital to quality and customer satisfaction but fundamental to sound management decisions. Poor data integrity adversely affects organizational operations. Reference [24] argued that with inconsistent representation of data across organizational sections, as well as limited resources for data quality, this will inadvertently lead to data integrity problems.

Reference [25] discusses how in a competitive business climate, dismissing the importance of data integrity is unacceptable. HEI's must ensure that the focus is on maintaining data quality. In order to achieve this, it is essential to effectively educate the team on the importance of data integrity while providing information on how this can be achieved.

## 6. Decision Making Level and Quality of Information

The skill of decision makers' levels and the type of decisions to be made determines the quality of information. Information provided for the strategic manager would be predictive in nature. However, this level of manager will not be concerned with timeliness or accuracy. They would prefer information to determine trends. Operational managers would need more accurate and timely information considering frequent decisions need to be taken in a timely manner [26].

Reference [16] stated that data that can be used on a fact-driven basis for decisions to allow managers to deal with disparity in a logical fashion. The potential offered by knowledge based systems to process raw data based on experience has made management information systems more practical. The following goals as listed by [26] help to eliminate redundancy of data:

- Ensure input validity.
- Ensure input completeness.
- Ensure input accuracy.
- Ensure update completeness.
- Ensure update accuracy.

## 7. Efficiency at Higher Education Institutions

Efficiency as suggested by [27], the National Commission on Higher Education Report, 1996 and the 1997 White Paper on Higher Education Transformation began with equity as the first transformation principle. The Council on Higher Education Report of 2000 started with effectiveness and efficiency challenges and then highlights the imperative of equity initiatives. Most recently,

the National Plan for Higher Education [28] highlights the challenges facing higher education with human resource development. In simple words efficiency refers to cost while – effectiveness is doing the same with fewer resources or doing more with the same resources.

### 8. Measuring Instrument

Reference [29] explained that the quality of information depends considerably on the measurement procedures used in the gathering of data. The research instrument to be used in the collection of data would be the survey questionnaire. In addition, a letter of informed consent was obtained from the Research Director prior to conducting the empirical investigation at the Durban University of Technology.

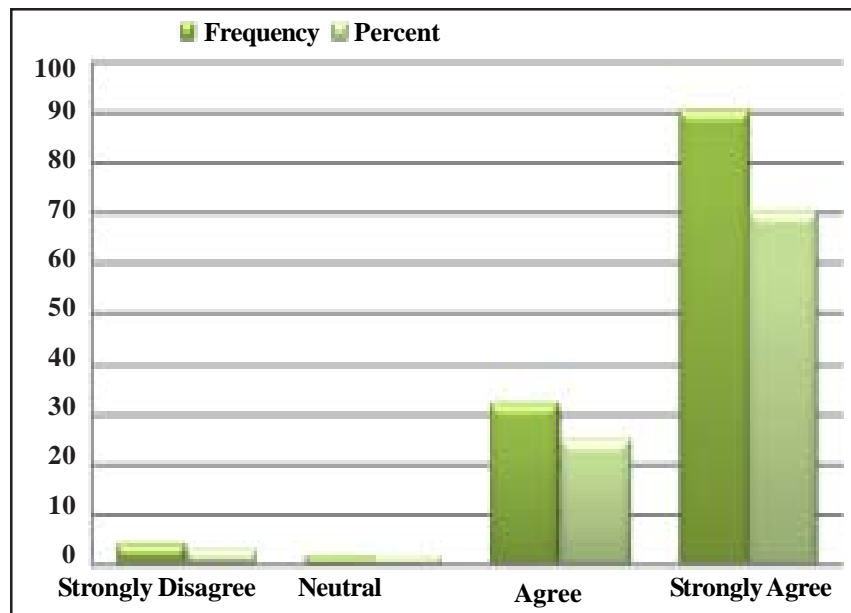
### 9. Target Population

This study is an in-house investigation and thus the target population comprised of all Executive Deans, Heads of Departments, Information and Communication Technology staff, Management Information staff and all Faculty officers as well as the staff within the faculty office. The total number of target respondents was obtained from the institutional ITS database was 174.

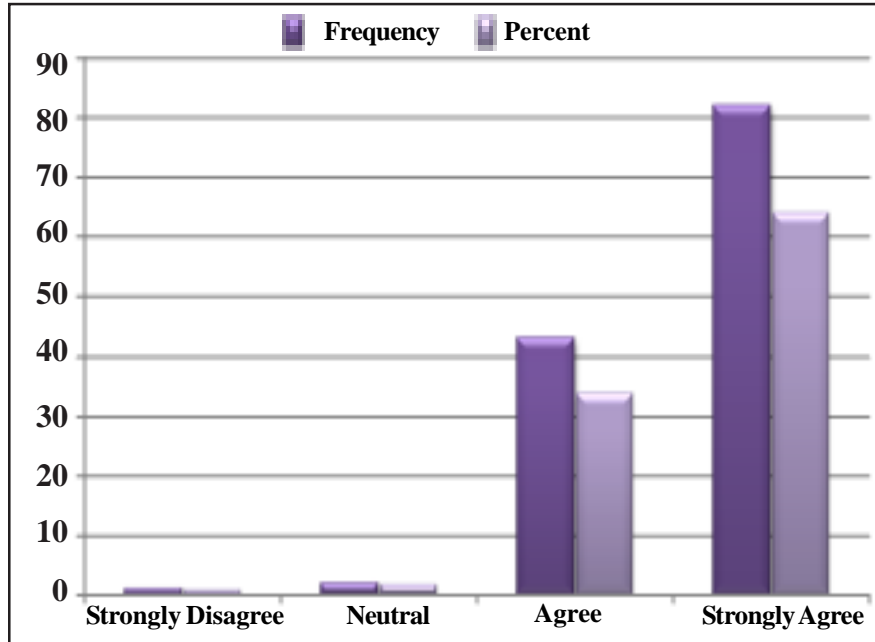
### 10. Analysis of Results and Discussion of Findings

This chapter presents the analysis of the results and discusses the findings. The data collected from the responses was analysed with Predictive Analytic Software (PASW) version 18.0 and SPSS (Statistical Package for the Social Sciences) version 16 for windows. The initial results were presented in the form of graphs and cross tabulations. A total of 174 questionnaires were distributed to the target respondents. The number of returned questionnaires totaled 128 which represented a high response rate of 74%. The data was captured by the researcher from the pre-coded questionnaires returned.

As illustrated in Figure 4.7, 70% of the respondents strongly agreed while 25% respondents agreed that data management and integrity is of utmost importance. In total 95% of the respondents either agree or strongly agree that data management and integrity were important. There were merely 4 respondents (3%) who strongly disagreed that data management and integrity was of any importance. A neutral response was reported by 2% of respondents in Figure 4.7. It would appear therefore that the majority of the respondents for this study consider data management and integrity as being of utmost importance. Reference [30] stated that data integrity is an important feature of nearly every computer system. It is important to guard against threats that impact on data integrity in order to ensure that data can be deemed to be accurate solely on its presence in a system.



Graph 1. Importance of Data management and integrity (n = 128)



Graph 2. Proper data management will help improve strategic decision making ( $n = 128$ )

	Value	df	Asymp. Sig. (2-sided)
<b>Pearson Chi-Square</b>	61.612 <sup>a</sup>	40	0.016
<b>Likelihood Ratio</b>	57.949	40	0.033
<b>Linear-by-Linear Association</b>	.903	1	0.342
<b>No. of Valid Cases</b>	128		

\*Pearson Chi-square = 61.612, df = 40, Significance  $p < 0.016$

Table 1. Frequency of data owners and responsibility for accuracy ( $n = 128$ )

The responses to the statement that proper data management will help improve strategic decision making at the Durban University of Technology is presented in Figure 4.10. Eighty two respondents (64.1%) and 43 respondents (33.6%) comprised a total of 97% of the respondents that strongly agreed and agreed respectively to the statement that proper data management will help improve strategic decision making. The number of respondents that disagreed was a meagre 1 (0.8%). Two respondents (1.6%) remained neutral. The majority of the respondents agreed that proper data management will help improve strategic decision making at the Durban University of Technology. Reference [31] concurs that if management cannot trust the reliability and integrity of the data, it may be more detrimental to the organization especially in the decision making process.

H1 There is a significant correlation between data owners and the responsibility for data management and integrity.

Table 4.5 revealed that the Chi-square test result showed that the p value is 0.016, which is less than 0.05. This result indicates that there is a statistically significant correlation between the data owners and the responsibility for data management/integrity. Reference [32] highlighted how data defects easily creep into systems. Thus, maintaining data quality at acceptable levels takes considerable effort and coordination throughout the organization. Reference [33] affirms that data owners (researchers) are ultimately responsible for the integrity of data. Reference [34] argued that data management is a major initiative for large organizations as they strive for greater integrity and consistency across the organization. Organizations should therefore understand the role of data management in relation to their overall business performance and decisive decision making.

## 11. Conclusion

The main reason for this study was to investigate data management as a strategic information tool and its importance at the

Durban University of Technology. What was revealing was that staff are generally aware of the significance of the data that they dealt with from the time as they received it until it gets captured and verified. Data management and data integrity may be distinct yet have overlapping fields. Each has its own focus and each discipline fulfills different purposes within an organization. However, it is becoming more evident that the coordination of data management and data integrity can increase an organization's efficiency and effectiveness. Arising from the empirical analysis of the data the following recommendations are suggested.

## **12. Recommendations**

### **12.1 Knowledge Transfer**

It is recommended that staff in the faculty office should be given on the job training by their Faculty Officer who have extensive knowledge. Similarly, [35] asserts that the importance of developing employee knowledge beyond basic understanding of job requirements is not required and is largely an activity that should be separate from work itself. Reference [36] contended that the ease with which individuals are able to transfer their explicit components of their knowledge to their work situation is expected to transfer more than verbal or face-to-face communication.

### **12.2 Verification Process**

It is critical that verification process should be done immediately after the data is captured in order to reduce the errors. Reference [32] emphasizes that validation routines cannot catch typographical errors where the data represents a valid value. While [31] contends that when it comes to an on-line system, it permits remote entry of data and also allows for concurrent processing of data. It is imperative that there should be transaction authenticity as well as accuracy and completeness of the data management. Reference [38] also argued that users at the Durban University of Technology sometime captured only fields that they were using and did not capture required fields by the institution. He also stated that data was sometime not verified against source documents. Hence, the verification of data should be expedited immediately for its accuracy and integrity.

### **12.3 Procedures and Processes for Data Management**

The effective implementation of procedures and processes is critical at the Durban University of Technology and should be crucial for decision making. Reference [31] states that in order for controls to be effective for data management, those that exercise control must be capable of doing so and honest enough to do so consistently. This in itself has a high degree of risk and control awareness in order to ensure that procedures and processes function accordingly.

### **12.4 Assigning Accountability for Data Management**

Reference [37] state that there must be accountability in order to achieve the results and realizing the value for the organization. Similarly, at the Durban University of Technology there should be accountability especially at the level of capturing. Reference [38] contended that in order to ensure accuracy of data at the Durban University of Technology, Executive Deans, the Registrar, Directors and Heads of Departments should take ownership of the data by being accountable and responsible for the integrity of the data.

### **12.5 Establishment of Data Integrity and Intergration Policy**

In order for the Durban University of Technology to manage its data as an asset, a policy on data integrity and integration policy should be developed and implemented. Similarly, [39] at the University of Nevada highlighted that one out of a number of Universities have found a better method to drive data integrity throughout the entire University community.

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