Prescriptive System for Performance Information Management System

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Abstract   Information can be briefly defined as processed data. Information is crucial to the success of any organization because it must be exchanged in one form or the other before activities can be carried out. However, too much information can be overwhelming and lead to poor decision-making. Further, as organizations face an ever-growing wave of digital data, they need to analyze that data and make timely decisions to achieve effective management .Formerly, information was viewed simply as a means of expression, they now serve as the foundation for an organization's effectiveness and efficiency. Additionally, increased pressures to manage information appropriately, communicate it and effectively manage it for increased performance has been the focus of organizations. In today's organizations, information is much more dynamic than even just a few years ago. Data; which is the raw material for producing information volumes are exploding, generating larger and larger databases, just as business activities are demanding faster response times. It is therefore compelling to evolve a means by which these loosely located data can be gathered, processed and communicated quickly to meet the challenges of modern business demand. In this study, a prescriptive system for designing a performance information management system was carried out. The system describes the methodology for designing a system that efficiently gathers, processes and makes information available to every level of management

Keywords   Performance, Information, Management, System, Levels of Management, Data, Information

1. Introduction

Performance information indicates how well an organization be it private or public is meeting its aims and objectives, and which policies and processes are working. Making the best use of available data and knowledge is crucial for improving the execution of government's mandate. Performance information is key to effective management of resources, organising, budgeting, implementation monitoring and reporting. Performance information also facilitates effective accountability, and forms a link between the organization and the public and other interested parties to track progress, identify the scope for improvement and better understand the issues involved.

One of the fundamental problems nowadays organizations are facing is how to centralize the various sources of data for processing in order to take timely and prompt decision for improved service delivery. Information is an invaluable asset which organizations must properly managed for sustainability and increased productivity. It is therefore

important to evolve a system that will enable the performance of information to be managed. The focus of this study is the development of a performance information management.

The study is made up of three distinct words; performance, information and management. Before going into the depth of the research, it is necessary to examine each of the component words of the study.

1.1. Performance

Performance in its simplest form means the accomplishment of a given task measured against pre-set known standards of accuracy, completeness, cost, and speed. In a contrast, performance is deemed to be the fulfilment of an obligation, in a manner that releases the performer from liabilities under the contract. Performance has so many extensions such as performance analysis, performance management, performance standard, performance evaluation and so many others. One unique feature of these extensions is that they all rely on information for their actualization.

1.2. Information

At this level, we shall view information as processed data[1];[3] in other words; information refers to data that has been processed.

1.3. Management

Management can be viewed in two ways; first management is the act of planning, organizing, controlling etc. an organization's resources in order to accomplish a given task. Secondly, management can be defined as a group of persons charged with the responsibility of managing the resources of an organization. The keyword in both definition is resources; which may be tangible or intangible. Information is one of the essential resources of an organization that must be managed in the most efficient manner in order to set standard and accomplish a set standard.

This study consequently is directed towards evolving a system capable of generating information for performance management

2. Objectives of the Study

It is a reality that the modern day business operations indicate that organizations must contend with ever-growing data from ever-expanding sources; Social, location-aware, mobile and device data now have to be merged with client, customer, product and third-party data. But as the data grows, it runs into a basic law of physics – that as objects gain more mass, they slow down. So how can organizations get all of their data to be available quicker and perform faster? That is the question which this study is intended to answer. The primary objective of this study is to develop a prescriptive system that will provide internal and external information needed at every level of management for performance management.

Consequently, the objectives of this study are:

a. Provides internal and external information;the system is aimed at ensuring data quality, timeliness, accessibility (the degree of ease of access to information), metadata, presentation, and other attributes of data quality are made available to every level of management when required.

b. Business operations and management: The system could be used as a platform for developing and deploying applications to support business operations and decisions across the organization.

c. Cost-effective: Users can view information and data via the system rather than maintaining physical documents such as manuals, requisition forms, transaction forms etc.. This can potentially save the organization money on printing, duplicating documents, and the environment as well as document maintenance overhead.

d. Enhance collaboration: Information is easily accessible by all authorised users, which enables teamwork.

e. Integrating and harnessing the organization's information assets: knowledge management is a strategic process to capture the ways an organization integrates its information assets with the processes and policies that govern manipulation of those intellectual assets.

f. Promote the efficient and effective use of resources: Ensuring the efficient and effective use of resources means

that the organization, its customer, and partner resources are used in the most effective and efficient manner possible. Trade-offsare sometimes necessary, and the system must consider the competing needs of customers, capabilities of partners, and availability of resources.

3. Methodology

In developing a prescriptive system for performance information management, it is imperative to firstconsider the levels of management in an organization and highlight the type of information required by each level.

3.1. Levels of Management and Information Required

The performance of corporate daily responsibilities depends to a very large extent on information because information must be exchanged in anyofits form and across levels before official transactions can be established. However, the typeof information being exchanged and required further depends on the level of management. Basically there are three levels of management; top, middle and low as shown below.
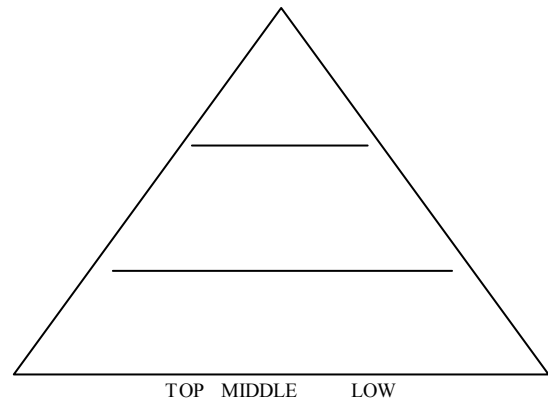

Figure 1. Levels of Management

3.1.1. Top Management

Top management, because of the sensitivity of their strategic responsibilities in any organization requires strategic information. A strategy is a general statement of long term objectives and goals and the ways by which these will be achieved. A strategy is needed where the decision concerned have a major impact on the long term future of an organization. Therefore, top level management requires strategic information in order to effectively discharge their responsibilities. Strategic information covers overall profitability, capital equipment needs, achievement comparison, budget, manpower planning, policies, trend of cash flow etc. Therefore, they are obtained within and outside the organization. Strategic information is used to take strategic decisions and it is not communicated too often.

3.1.2. Middle Level Management

Middle level management are charged with the responsibility of taking short term decisions. At this level,

tactical information is required to transform plans into reality. Tactical information is used in short term planning i.e. plans that will last for months rather than years and is more of interest at departmental level. It is normally prepared regularly; weekly or monthly and such information include analysis, returns, forecast, operating expenses among others.

3.1.3. Low Level Management

This level of management requires operational information because they are concerned with the day to day perhaps daily running of a department. It is usually of direct interest to a fewer number of people than tactical.

Though the type of information required may be different, Information is central to all organizations activities irrespective of levels of management and type of organization,this is because without information nothing can take place; information is needed to set standard, analysis it, evaluate it and must be appropriately communicated before any task can be accomplished. Even in the barter system, there was still exchange of information before barter could take place.[2][6] identified three forms of information; text, audio and video. Information as used in this study combines the three forms.

As earlier defined, information is data that has been processed. Data means the basic fact about a given situation, an entity, personality, etc. Computer processes such raw fact to produce useful information. However for information to be usable in an organization it must meet certain characteristics and these are examined hereafter.

3.2. Characteristics of Information

Information is required at every stage of decision making process therefore information to be used for such purpose must possess the following qualities;

a. **Relevancy**: For any information to be useful for a specific purpose, such information must be relevant to such purpose.

b. **Accuracy:** Information should be accurate to meet the demand of the purpose it is required to take.

c. **Timeliness:** It must be presented within its useful lifetime otherwise it will be adead information.

d. **Target**: It must be directed to the appropriate recipient.

e. **Format**: It must be presented in a clear, attractive and flexible way.

f. **Consistent**: Information must be consistent. It must have unchanged value irrespective of where, when and what was used for its processing.

g. **Integrity**: The information must possess integrity.

3.3. Methods/Techniques of Data Processing

There are three techniques of data processing that any organization can use to process data into information and these aremanual, mechanical and automatic.

3.3.1. Manual Data Processing

Manual method of data processing involves using traditional systems of counting and processing data without the aid of any device, it involves the use of pens, pencils, worksheet, journals and files. These devices or tools facilitate recording, classifying, calculating, sorting and presenting data in a summary either in diagrams, statistical tables or in prose writing. Manual data processing operations entails considerable mental efforts. The method is characterized by the following features:

i. It is not reliable

ii. It is not always accurate

iii. It is cumbersome

iv. It involves a lot of paper work

v. It is subject to errors.

The advantages associated with this method are:

a. It is cost effective

b. It does not require any maintenance

3.3.2. Mechanical Data Processing

This technique makes use of mechanical devices like manual typewriter, cash register, adding machine, etc to process data. The advantages of this method over manual data processing are:

a. It is faster

b. it is more accurate.

Its shortcomings are:

a. It is noisy and clumsy

b. Because it involves repetition, an operator can key in wrong data/information

c. It is impossible to carry out any processing without human intervention

d. Data cannot be processed continuously without human assistance

e. It is a difficult to produce large quantity of information on a regular and timely basis.

3.3.3. Automatic Data Processing

This method is carried out with the aid of electronic digital systems i.e. makes use of electronic digital system to process data. Computer is one of the electronic devices. Unlike the manual and mechanical systems, this method is accurate, not cumbersome, realistic, not noisy and can work without human intervention. The main feature of this technique is that data can be processed when the computer is instructed on what to do and how to do it. It has a memory for storage, retrieval and transmission of information. Any errors can be neatly and early corrected.

Advantages:

a. It is fast

b. Accurate

c. Error free and

d. Not noisyDisadvantages

e. It requires expert to operate

f. It is expensive to procure and

g. It is expensive to maintain.

3.3.3.1. Components of Automatic Technique of Data Processing

Automatic technique integrates many components to process and communicate informationTheseequipment include computer resources and communication facilities[14][15]. A computer cansimply be described as a powerful electronics device which has the capability ofaccepting dataas (input) in aprescribed format, apply a series of arithmetic and logical operation on the data(processing) andproduce the result of these operations as an (output) in a specified format at a veryfast speed underthe control of a logical sequence of instruction called "PROGRAM"

From the description above, a computer can be described as an input-process-output (IPO) system; pictorially represented in the figure below
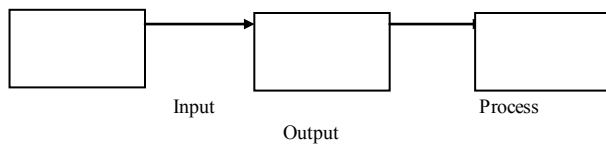

Input

Output

Process

Figure 2. IPO System

Computer is used to process data because of its attributes which include but not limited to the following:

a. Computer is versatile: Its versatility has made it look like a wizard and it can do a lot of things with or without human intervention.

b. Accuracy: It is accurate in its processing ability. The accuracy however depends on GIGO – garbage in garbage out i.e. it is what is sent to the computer as an input that the computer will process to produce output.

c. Reliability: The output of computer is very reliable and is consistent, when a program is run on a particular computer, if it is taken to a similar computer in another country at any time, it will still produce similar information.

d. Fastness: The speed of computer is high. It is one of the fastest devices man has ever manufactured.

e. The volume of data: It can process is high

Each level of management can use any of the three methods to process their data but the automatic

technique is most preffered because of its advantages over other methods. However the decision as

to which of the methods to use depends on:

i. the size of a business;

ii. the volume of data to be processed;

iii. the geographical spread of operating units and

iv. the information needs of the various functional units and departments of the business.

4. Design

It is necessary at this point to establish a system where information can be effectively managed for optimal performance. In order to do this, the three components of PIM are needed to be connected together and the best way to do this is by adding S; System to PIM to become PIMS i.e. Performance Information Management System.

The Performance Information Management System (PIMS) is a system that is capable of ensuring that existing and future performance based, function-related data are available to help a specific Department staff and administrator, among others, improve and strengthen policy making, planning, and management through the use of data. The actions that are taken to create an information system that solves an organizational problem are called system development[12]. These include system analysis, system design, programming/implementation, testing, conversion, production and finally maintenance. These actions usually take place in that specified order but some may need to repeat or be accomplished concurrently. However, the design of this system will defer a little from this prescription because Management information systems are distinct from other information systems in that they are used to analyse operational activities in the organization[5] and[11]

4.1. Key Considerations in PIMS Development

There are some key factors that must be considered in the course of the design of PIMS. The organization must take into account and address these issues in order to develop efficient system.

These are:

4.1.1. Connectivity

Connectivity in its simplest form used to mean communication, In other words it establishes connection between two or more systems. There must be connectivity among various devices within the organization that are responsible for capturing data and sending it to the back-end system. However the present day communication systemand advancements in mobile communications have now made communication two-way with many devices including mobile devices. Provisions must be made for the connection of these devices. Connectivity is very important for exchange of information among systems and devices[13]

4.1.2. Identity

This allows organizations to collect and deliver the right data in the right context to the right person or device, making the organization more effective and improving service delivery. But managing identity becomes more complex as inputs increase across users, devices and discrete subsystems. Therefore, measures must be inbuilt into the system that will maintain identity integrity.

4.1.3. Security

Seurity generally are perceived to be simpler when systems or devices had well-defined boundaries, so the number of entry points to a system could be tightly controlled. However since PIMS is an open and connected systems, there must be adequate security measures to secure data being processed and the entire system. It should be noted that the more devices connecting to a system, the more vulnerable that system becomes because each type of device

has a different way it connects and has different security capabilities.

4.1.4. Manageability

Specifically the ability to manage and update devices and systems from designated points will increase the efficiency and performance of the system and devices will no longer be "passive"; only capturing data to send to the back end[8],[9] and[10]. Instead, devices will be able to be updated, managed and even reprogrammed remotely from any of the locations, ensuring continuous safety and security, and enabling customization to the organization's requirements and individual users' preferences.

Analytics is the ultimate goal of any system, since it can provide better business intelligence from the expanded data captured by the system. Organizations will need to consider a strategy for their analytics, stretching beyond the information they historically have analysed. With this system in place, organizations can create strategies for storing and analysing vast amounts of new data directly from many devices; making decisions and acting on them in real time.

The first step to develop a performance management system is to access, review and determine information flow in the organization; both inter and intra information flow are analysed. While doing this, the pattern of information flow and the following points must be considered:

1. Identification and evaluation of current data and information requirements of every Department/units and their activities.

2. Coordination of other components to ensure that the Department's data definition, collection and maintenance procedures conform to information management requirements.

3. Assessment of the performance and capability of the Department's/unit's current processes and information systems, focusing first on the efficient collection, effective analysis and assessment, and timely communication.

4. Review of departmental/unit electronic data collections and data analysis software

5. Identification of inadequacies in the current data and information planning systems.

6. Rationalizes the data requirements to the department, focusing first on consolidating and simplifying all data collection processes and eliminating duplicate or unnecessary data requirements and collection processes.

7. Identifies the future information requirements of the Department and its principal offices and programs and develops plans for the collections, analysis, and communication of such data.

Work Flow Patterns:. Patterns that are related to business-process development that illustrate a collection of architectural and workflow patterns are gathered and among them are:

1. Basic workflow patterns—Control-flow, resource, data,

and exception-handling–related patterns.

2. Advanced workflow patterns—Wizard-based tools that drive contract-first development, inclusion of transparent processes or intermediaries, context-based process selection, enabling mutual interactions, and externalization of business rules. Some of these patterns are not formalized elsewhere.

3. Workflow-hosting patterns—A flexible hosting platform exposing workflows as Web services, locating and selecting business processes from a repository based on context, scalable process execution environment, and pluggable workflow runtimes.

4. Business-activity monitoring—Monitoring the current state of a business activity.

These patterns are used to build service compositions with the flexibility to dynamically change the activities through an appropriate service implementation based on business rules.

The second step is to develop a multidimensional data gathering system. Departmental/Units key initiatives and its strategic objectives cannot be achieved without a robust, effective data management system supported by the right policies, processes, and information systems[7]. An essential principle behind this concept is that meaningful performance data will always be available to staff, policy makers, and the public through this system. This data is critical in assessing performance. Therefore, it is imperative to put in place a multidimensional data gathering system. Such system includes the following:

a. An electronic data gathering system that receives data from various sources;this requires an effective communication in each of the department in the organization. In other words, provision is made for a dedicated distributive system/intra network in the organization for effective distribution of information

b. Analytical tools for analysis of submitted data; basically each of the computing facilities in the dedicated network are installed with necessary software that is useful to each of the departments. Above all, analytical tools including software are made available and

c. Reporting tools for Departmental, unit, staff and other users that need to submit data to ensure better use of those data. Each department will be equipped with tools that are required to report data as at when due

The last step is the installation and integration of devices: the various devices that are needed are integrated together. Appropriate software are thereafter installed on each of them are required. The system is then tested and necessary correction effected where necessary. It is then put into use

5. Conclusions

Organization consistently requires adequate information in order to make timely decisions. The prompt availability of information can be guaranteed by putting in place PIMS structure. The design of the system is made up of four simple and flexible steps and these are:

a. Evaluation of key considerations;

b. Determination of work flow pattern;

c. Development of multimedia data gathering system and

d. Integration of the components

The system is capable of meeting information needs of organizations.

REFRENCES

[1] Akinyokun O.C. (1994). Computer and Programming Using Fortran.Second edition. Ondo state New Era Commercial Press, Alagbaka G.R.A., Akure, Ondo State.

[2] Akomolafe et al (2009) "Enhancing road monitoring and safety through the use of geo spatial technology" International Journal of Physical Sciences Vol. 4 (5), pp. 343-348

[3] Akomolafe, D.T. &Eludire A.A. (2009). "The Prospects and Challenges of Web Based Learning" Journal of Institute of Mathematics &Computer Sciences(Computer Sciences Series) Vol. 20, No 1 81-87

[4] Akomolafe, D.T. &Eludire, A.A (2008). "The Role of Information and Communication Technology in National Development" Journal of School of Science, Vol. 1 No.1Pages 102-107

[5] Brien, J (1999). Management Information Systems – Managing Information Technology in the Internetworked Enterprise. Boston: Irwin McGraw-Hill. ISBN0-07-112373-3.

[6] Falaki, S.S., (2002), "Information Technology in Nigeria: Now or Never". (FUTA Inaugural Lecture Series 29). Unix Computer Services Ltd., Akure.

[7] Joseph Heller (2008) "Computer Terms" Dictionary.com

[8] Laudon, C.K. and Laudon, J.P. (1997), "Essentials of Management Information Systems: Organization and Technology". Second Edition, Prentice Hall International, Inc.

[9] Laudon, K.,&Laudon, J. (2010). Management information systems: Managing the digital firm. (11th ed.). Upper Saddle River, NJ: Pearson Prentice Hall.

[10] Laudon, Kenneth C.; Laudon, Jane P. (2009). Management Information Systems: Managing the Digital Firm (11 ed.). Prentice Hall/CourseSmart.p. 164.

[11] Meziani, R., Saleh, I., Towards a collaborative business process management methodology. Proceedings of the International Conference on Multimedia Computing and Systems (ICMCS), 2011

[12] Niehaves, B,MHenser, J., Business Process Management beyond Boundaries? - A Multiple CaseStudy Exploration of Obstacles to Collaborative BPM. Proceedings of the 44th Hawaii International Conference on System Sciences (HICSS), 2011

[13] Schwartz, M (1987), "Telecommunications Network: Protocols, Modelling and Analysis, Reading". Addison Wesly

[14] Solman, J.V. (1987) "Design of a Public Electronic Mail System". IEEE Network Magazine Vol 1 pages 11-15

[15] VomBrocke, J. &Rosemann, M. (2010), Handbook on Business Process Management: Strategic Alignment, Governance, People and Culture (International Handbooks on Information Systems). Berlin: Springer