

Toward Sustainable Healthcare by Management Commitment, Education, and Training: Application of Proposed Guidelines in Dinas Kesehatan at the South Sulawesi Provinces in Indonesia

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Abstract

The need and demand for sustainable healthcare are rapidly increasing in almost every nation. In today's world of information technology, one can no longer rely on paper or file-based manual systems. This is because all processes associated with areas like healthcare must be performed with a considerable amount of effort to keep up with the growing demands of society and the rapid increase in technology. It has become more and more necessary for every healthcare staff in a hospital to use computerized information systems for most of their daily work. Employing Nolan's Stage Model, the present review paper tries to give suggestions to the healthcare facility at the provincial level on how to apply management commitment, education, and training.



Keywords: Health Information Systems, Management Information Systems, Indonesia, Indonesia's Ministry of Health, Indonesia's Health Facility, Nolan's Stage Model

INTRODUCTION

Due to these circumstances, HIS is expected to provide the staff with various, worldwide platforms for better decision-making and communication environments that can be used just on the terminals for day to day's work. This viewpoint aims to describe the current healthcare and information technology situation in Indonesia to determine where Indonesia stands in the future for the sake of sustainability when it comes to utilizing Health Information Systems (HIS) in the public health sector by using a management perspective. The need and demand for sustainable healthcare facilities around the world are rapidly increasing. In almost every nation, the growth of both needs and demand for healthcare is faster than the rate of increase in resources available for providing it. There are four reasons for this:

1. **Increase in the number of elderly:** An increase in the number of elderly people leads to an increase in the need for healthcare.
2. **Rapid Development of Technology:** New technology will continue to be developed by industry and research workers within health services and related disciplines.
3. **Patient expectations:** Patient expectations of health are rising, reflecting societal changes in attitude towards the provision of goods and services. In most of the developed countries, this trend includes rising expectations of accessibility and quality of services and the accountability of service.
4. **Professional expectations:** Professional expectations and attitudes are influenced by developments in technology in that any new developments in technology serve as an incentive to increase expectations.

This paper is concerned with the implementation of the guidelines in the Indonesian environment to show how the guidelines may be used for the successful development of MIS in a non-profit making organization, the Ministry of Health in Indonesia in particular the healthcare facility located at the Indonesian provincial level. This paper outlines the current MIS situation in Indonesia and then how the guidelines could be applied in that context. Figure 1 shows how the Ministry of Health is responsible for the implementation of the MIS guidelines.





Figure 1: Ministry of Health Responsibilities

Definition Of Health Information Systems

Understanding what the term Health Information System (HIS) means is essential. Before we define the term HIS it is equally vital to comprehend the meaning of Management Information Systems (MIS) as all Health Information Systems (HIS) are derived from Management Information Systems (MIS). According to Al-Alawi (1991), "MIS

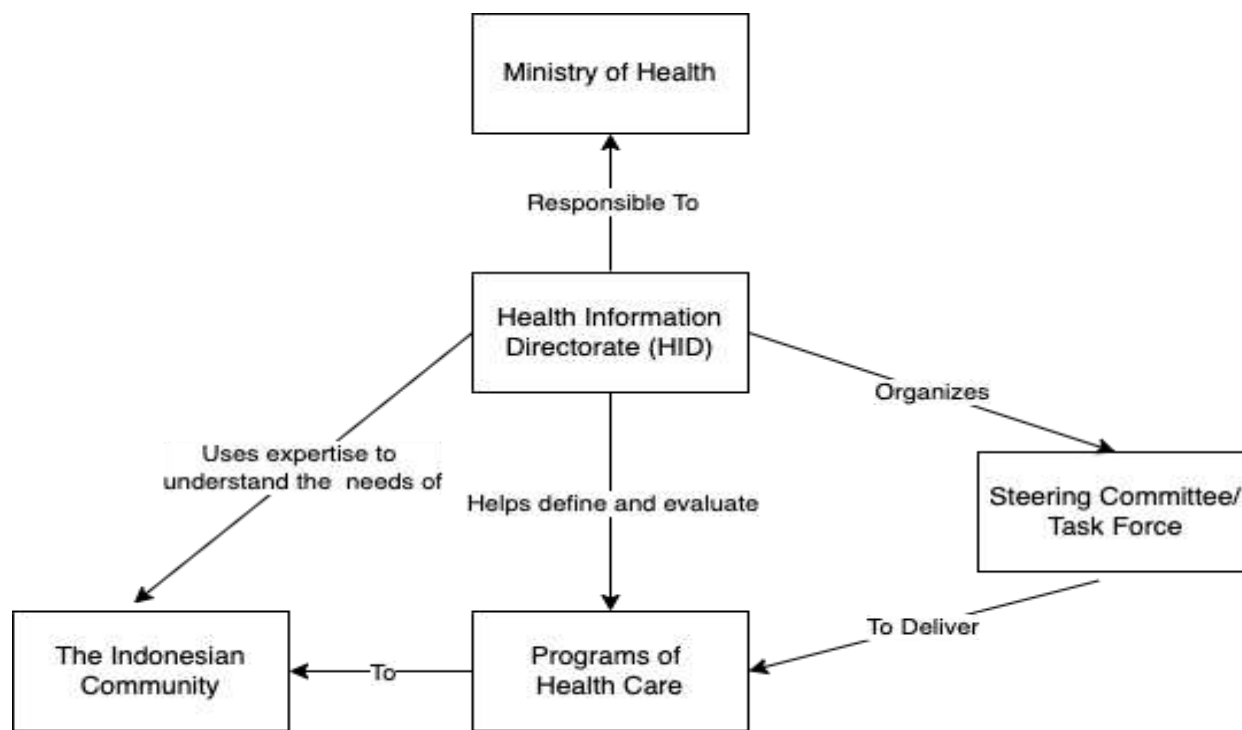
is a system, which provides historical, present and predictive information derived from both the internal operation of the organization and the external environment. MIS supplies accurate, selective, and timely information and supports the information needs of management at all levels of management activity to assist in decision-making.”

It can therefore be said that Hospital Information Systems, Health Information Systems (HIS), and Medical Information Systems (MIS) the Management Information Systems, to some degree for healthcare facilities. Health Information Systems (HIS) could be seen as integrated order entry systems, an administrative system, and departmental subsystems within the health sector that combined both the non-medical needs of one health centre with their medical needs. HIS on the other hand (medical perspectives) could also be separated into Electronic Medical Records (EMR) and Personal Health Systems (PHS). EMR is an inter-connected information systems platform with other medical and non-medical platforms. EMR then is the same as MIS thus the ideology, method, principles, tools, and techniques for developing and implementing HIS and MIS are the same.

The Current Situation Of The Health Information Systems In Indonesia

The Ministry of Health (MoH) has established the Health Information Directorate (HID), which is responsible for the implementation and monitoring of Information Technology Services. Figure 2 shows the role that the Health Information Directorate plays.



**Figure 2: Role of the Health Information Directorate**

The Health Information Directorate has played a major role in implementing appropriate information technology services to improve healthcare outcomes through leadership, a qualified team, and commitment. Various services such as software, infrastructure, and communication have been implemented and managed successfully to deliver the maximum possible information that can facilitate and enable the MoH business. Several conceptual frameworks stand out in the MIS area, the best-known most widely cited model of evolution related to organizational information systems being the one developed by Nolan. The model started as a tentative hypothesis (Nolan 1973) and has since become regarded as an empirically grounded theory (see Nolan 1979) and an accepted description of how organization information systems develop over time. In Nolan (1973) the core concept behind the model was presented as a “hypothesis grounded” in observation and discussion with managers in three organizations. Richard Nolan and Chuck Gibson published a paper “Managing the Four Stages of EDP Growth” (1974). The four stages are “Initiation”, “Contagion”, “Control”, and “Integration”. The four stages

model developed by Gibson and Nolan (1974) has been further modified by adding two more stages “Data Administration” and “Maturity” (Nolan 1979).

When this study was initially conducted Nolan’s “Six Stages of Growth Model” was used to explain how the MoH has passed through the Nolan stages. The expansion of the stage’s theory has continued. Mustaers et al (1997) in Figure-3 have described the S-curves model as three eras of IT growth and maturity, the Data Processing (DP) era, the Information Technology (IT) era, and the Network (NW) era as shown in figure three. Rather than evolution, business transformation through creative destruction will occur. Each era is characterized by a period of evolution, followed by a period of stability, ending with a period of discontinuity and revolution, before the start of the next era. An explanation of each stage is provided below.

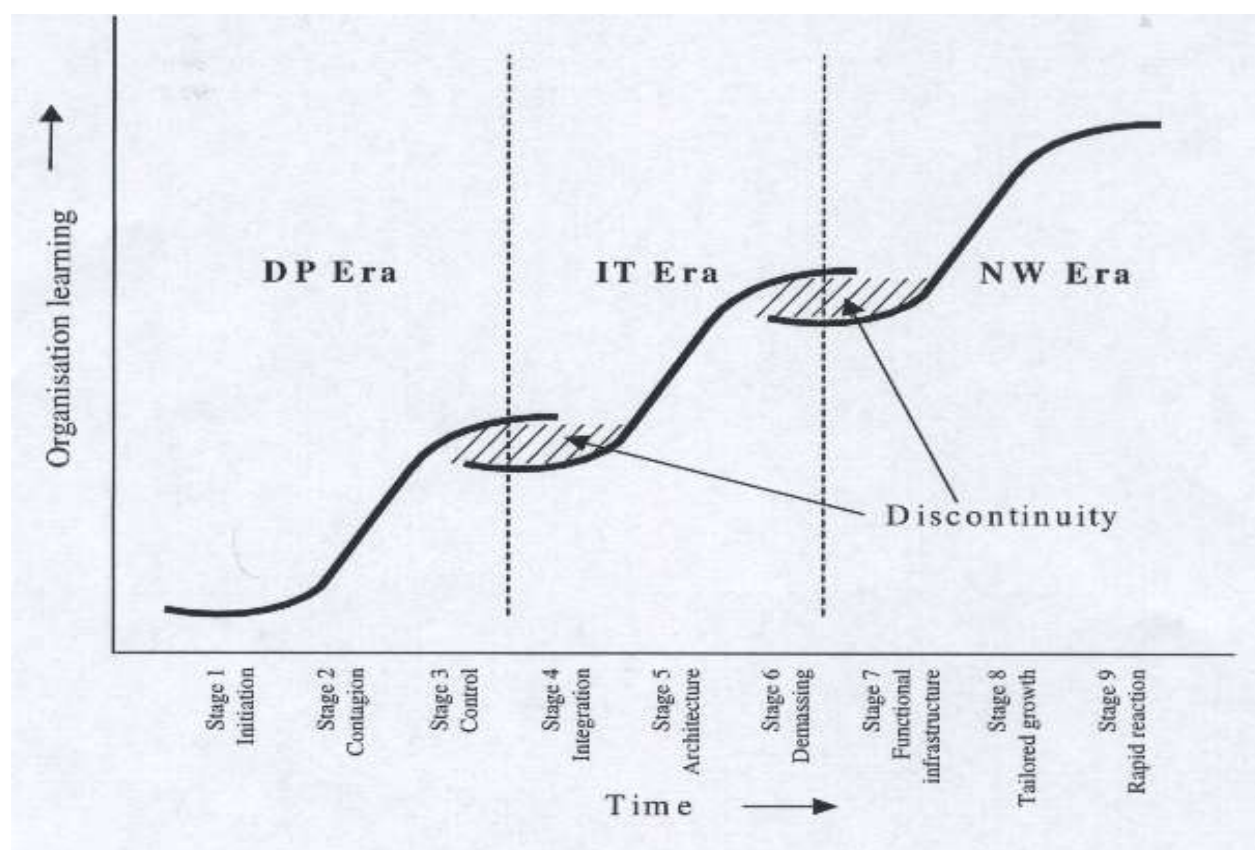


Figure-3: “Three eras of IT growth (Mustaers et al 1997)”

Stage One: Early Successes (Initiation)

This is the first stage where the use of new technology is introduced. The computer is introduced within the organization to meet its basic needs. Users are encouraged to use the system but there is slow growth in use due to unfamiliarity and the few applications which have been developed. Users are not yet ready to request further applications due to a lack of computer appreciation. The developed applications are simple and typical of an accounting-oriented system. The MIS organization in this stage is often centralized because both the organization and the users must learn the new centralized technology. Control in this stage is loose and planning is almost none existent. There is a chance that some sort of stumbling may occur, however, early success can lead to increase interest in exploring new technology. The initiation stage in the Ministry of Health in Indonesia was the first computer equipment (IBM 4381) installed for the Ministry of Health in the Government Computer Centre together with a communication network based on telephone lines with 9600 BPS speed utilizing IBM 3714 and IBM 3274 remote controllers. The first applications were finance and payroll, this latter system being established by the Government Computing Directorate for all the Ministries in Indonesia.

Stage Two: Contagion

This stage is based on early successes, there is a rapid increase in interest as new products and/or services that are based on technology arrive in the marketplace. These new products and/or services are applied to a wide variety of applications. Growth is uncontrolled and therefore it increases rapidly. In this stage, excessive usage of computerized systems is due to top management's commitment to exploiting computing potential plus high expectations among users, and requests for the development of many different applications. Computing expenses are often carried as an overhead during this stage computer services are often free to users and therefore new application development is encouraged. This stage which can also be called the proliferation stage can be described as a "learning period" for the organization. The contagion stage in the Indonesian government organization occurred in mid-1980. During this stage consultation took place with the Government Computing Directorate and decisions were taken to develop customized systems. The Indonesia Health Information Centre (BHIC) now known as the Health Information Directorate (HID) was established in the Ministry of Health. An Admission Transfer and Discharge (ATD) system were developed. A CPR (Central Population Registration) was developed to be used as a Patient Master Index.

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Stage Three: Control

In this stage, it becomes evident that the proliferation must be controlled. The management begins to realize that the costs of using the new technology are very high and there is wastage in using a variety of different applications. Top management becomes concerned about the level of benefits being received from computerization versus the cost of MIS operation. Cost control measures are determined or set by top management and the MIS manager is charged with designing and implementing adequate control systems. Therefore, an attempt is made to try and integrate systems; however, the difficulty is experienced in doing so. According to our perspective, the control stage was entered by the Indonesian Governmental organizations in the mid-1980s. The control stage at the Ministry of Health occurred during 1987-1989 along the following lines.

1. Corporate steering committee for computing established.
2. A team of computer/management consultants travelled abroad to see live systems in some recommended hospitals to purchase off-the-shelf systems.

Stage Four: Integration

During this stage, the technology that is being utilized can be considered to be mature and top management begins to rethink the management of computing in terms of data resources rather than computing resources. This stage is characterized by an attempt to take advantage of new technology, typically a database, by integrating it into existing systems. The computing costs continue to increase rapidly in this stage as well as computer usage. To help to move toward data resource management, database systems are introduced and brought into the organization. The MIS function is set up mainly as a utility service for users. Once this stage is achieved there is a significant transition point in an organization's use of computers. The "dominant design" of the technology has now been mastered making way for new technologies. When this study was initially conducted by us in 2022 at the Ministry of Health in terms of integration some use was being made by the Government Computer Centre of database management systems. At present, the MoH has implemented the McDonnell Douglas Information System (MDIS). The MDIS software is handling basic functions such as Admission - Transfer and Discharge, Financials, Radiology, Lab Appointments, and logistic services. Most of the applications are handling data and are connected via point-to-point so they become inter-connectable and could be accessed easier.



MoH has implemented many Local Area Networks (LAN) & Wide Area Networks (WAN) infrastructure projects. All buildings within the Medical Complex are interconnected through a fibre optic network underground. This has minimized communication costs and provides fast and reliable access to network resources. In addition, all departments are connected to and managed from one central location through a 100Mbps Ethernet network.

Different data types are accessed through the network for example Clinical Data (Radiology, Pathology, Medical Records, etc), Administrative Data (Financial, Personnel, Materials Management, Drug Control, etc.), Other services (Internet, Email, etc). The MoH is still in the integration stage because the implementation of information technology is still under process as not all public hospitals and health centres have been automated. Secondly, McDonnell Douglas Information System (MDIS) vendor has abandoned the support of the application. The lack of application support from the vendor is driving MoH to find a replacement platform for this technology. The Health Information Directorate has developed a future application architecture, which consists of forty-four functional application modules that would be deployed across the MoH over the next five years. As the Ministry of Health (MoH) is still in the integration stage a very brief explanation is provided of the remaining stages of the Three Eras of IT Growth (Mustars et al 1997).

Stage Five: Architecture

Information dispersed. Management of data is vital. New systems focus on strategic business objectives. There is a rapid increase in the participation of top management.

Stage Six: Outsourcing

Termination of information technology centralization takes place. The business unit has responsibility for the deployment of IT. Outsourcing processing becomes a commodity. There is a clear trend toward the maintenance of legacy systems.

Stage Seven: Functional Infrastructure

There is a transformation of business architecture into a new additional layer of functional infrastructure. IT staff get accustomed to powerful tools. The focus is to develop applications according to quality standards, at high speed, and low cost. The focus will move from system integration to flexible module integration. There will be a continuous



shift towards a client-server environment and attempts at truly integrated office automation.

Stage Eight: Tailored growth

Expansion of the functional support for users by adding top-layer applications that use the functionality provided by the functional infrastructure. Vast amounts of external servers are available and accessible via public networks.

Stage Nine: Rapid reaction

Adaptation of functionality with dynamic business team changes occurs. Many required adaptations are performed by the users by simply changing the parameters. All development of new applications will have the character of pragmatic engineering with high efficiency.

According to Davis and Olson (1985), the Nolan Model is a useful conceptual model for understanding the general direction of change. At a conceptual level, it aids the planning process by providing a framework for understanding change. The diagnostic measurements and prescriptive elements of the model should be viewed as general guidelines for information system planning.

Application Of Proposed Guidelines In The Dinas Kesehatan At The South Sulawesi Provinces In Indonesia

A survey was conducted which indicated that the Ministry of Health has implemented a Health Information System however the Ministry of Health does not completely meet the author's working definition of HIS stated earlier in this paper. The remainder of this paper proposes certain guidelines which will enable the Dinas Kesehatan particularly in South Sulawesi Provinces in the City of Makassar to successfully meet the definition of HIS.

Management Commitment:

The survey which was conducted recognized the significant importance of management commitment in Indonesia. From the survey, it was concluded that although appropriate information technology services have been implemented in the Ministry of Health lack of management commitment exists among the managers of the organization's hierarchy. Reasons for lack of commitment may include fear of information technology,



lack of education, inappropriate training facilities, etc. The following issues must be addressed to ensure the Indonesian manager's commitment.

- Establish a free flow of effective communication between the managers and systems builders. From the survey conducted it was revealed that a lack of communication existed which was hindering management commitment. In part, the structure already described will provide a framework for effective communication.
- Create a program of MIS education and training which then must be provided for managers.
- Assure managers the MIS established will improve the total organization and management decision-making without threatening any manager's authority.
- Managers will make the decisions; the MIS will provide them with information to assist them in their decision-making.

Management commitment will provide the following benefits to Indonesia:

- Management acceptance of responsibility for the management of information resources,
- The development of an MIS directed to meeting the real needs of managers.

User attitudes and Expectations:

Resistance to change by those affected by the introduction of a new system is often a serious problem for organizations. Although the survey showed Indonesian managers not to be afraid of computers, there is some empirical evidence, noted earlier, to suggest that they are afraid to admit to their fear of technology. To overcome the problems associated with user attitudes and expectations in Indonesia, appropriate education and training of users are essential. This education and training will give the users a better appreciation of the role of MIS in the Ministry of Health. An extensive process of informal and formal user discussions and open meetings should improve user attitudes and expectations about MIS in the Ministry of Health.

User Involvement:

User involvement in the development of MIS is advocated for Indonesia in order both to increase participation and to ensure accurate specification of user requirements. It is clear from the general case presented that the more active the users are in determining their requirements; the more likely they are to accept the system and utilize



it appropriately. It has also been shown that user involvement in the development of MIS can subsequently increase their satisfaction with the system.

Performance Measurement:

The Health Information Directorate (HID) monitors the performance of the current HIS which is the McDonnell Douglas Information System (MDIS) regularly. End users are required to provide feedback about the operation of the system including issuing any complaints about the working of the system. However, performance measurement is monitored and evaluated only by the HID, however, one point needs to be raised here he must be evaluated by an external entity (people not employed by the Ministry of Health). It is therefore recommended that External Information System Auditors be hired from a well-known audit institution to conduct an audit on the HIS to give an opinion about its performance that is true and fair and free from any bias.

Measurement Techniques:

It is suggested that the most appropriate measurement technique of the HIS is the SWOT analysis. SWOT represents the first letter as in:

- S = Strength
- W = Weakness
- O = Opportunities
- T = Threats

Thompson and Strickland (2003) suggest a SWOT analysis provides an overview of an organization's situation and is a vital element of crafting a strategy firmly matched to an organization's situation.

“Strengths” to look for in the HIS would be the following:

- Powerful strategy
- Strong financial condition
- Proprietary technology

“Weakness” to look for in the HIS would be the following:

- No clear strategic direction
- Obsolete facilities
- Internal operating problems

“Opportunities” to look for in the HIS would be the following:

- Openings to exploit new technologies



“Threats” to look for in the HIS would be the following:

- Vendor abandoning the support of the application being used.

If the Health Information Directorate (HID) had used SWOT analysis as a measurement technique of their current HIS which is the McDonnell Douglas Information System (MDIS) they would be able to realize that the greatest threat to using this system was the vendor abandoning the support of the system and the greatest weakness was the HID not having a technical team possessing enough knowledge to support the MDIS had the vendor decide to abandon it. Using the SWOT analysis would have saved the MoH a considerable number of financial resources as they would have opted for a system towards which weaknesses and threats were minimized.

Education and Training:

Reference has been made earlier in this paper to the need for education and training. Following problems then particularly occurred locally in Indonesia such as a shortage of trained personnel in the MIS field, a lack of managers trained in MIS, and a general lack of MIS literacy. However today in Indonesia this is not the case. Indonesia today has qualified people in the MIS field but unfortunately, their talents are not being utilized by the Ministry of Health when it comes to planning and implementing successful Hospital Information Systems.

Indonesia has many schools and IT graduates could now be found easier. The Ministry of Health is advised to employ these graduates in the planning, development, and implementation of the HIS. Fresh graduates are young and they have a better understanding of information technology as they have grown up with Information Technology playing an active role in their lives. Employing fresh graduates would not be a very costly issue for the Ministry of Health as these graduates are looking for jobs and will take up any opportunity to display their talents and skills in IT.

Fear of an unknown complex system is one of the major obstacles to MIS use, and by employing fresh IT graduates this fear can be overcome as these graduates will help other users by helping them involve themselves in the system development process. The MIS users must be informed as to how the new job is going to be performed and the user must be educated about the tangible and intangible benefits for the organization as well as for the individual user.

According to the COBIT (Control Objectives for Information and related Technology) Steering Committee and the IT Governance Institute (2000) educating and training users “ensures that users are making effective use of technology and are aware

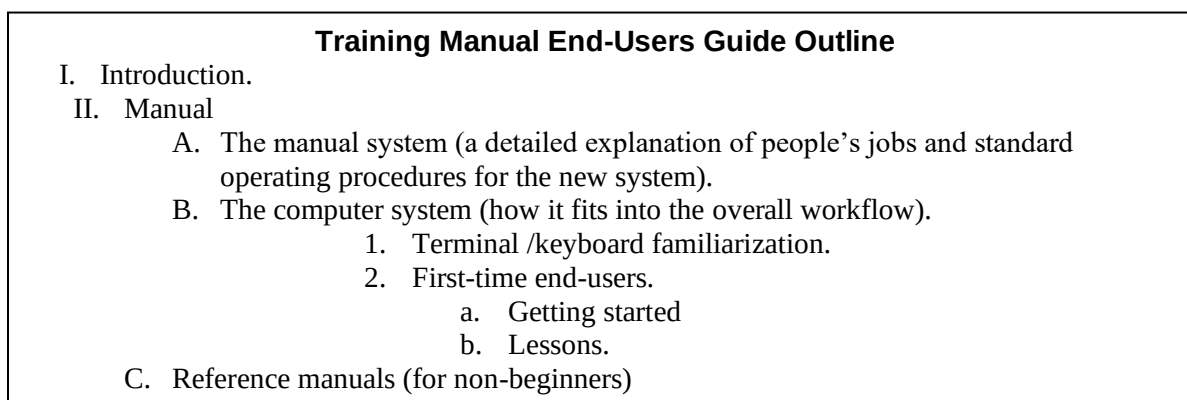
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of the risks and responsibilities involved". Such an objective can be achieved by a comprehensive training and development plan that considers the following factors.

- Training curriculum
- Skills inventory
- Awareness campaign
- Awareness techniques
- Use of new training technologies and methods
- Personnel productivity
- Development of knowledge base.

The Ministry of Health is advised to ask Hasanuddin University's College of Information Technology which is well-equipped with qualified to conduct training courses or seminars for all its employees who have little or no knowledge of MIS to address the issues mentioned above. To obtain user support it would be necessary to provide training and education on computerized management information systems by introducing related computer MIS courses with hands-on exercises. Training and education are very important factors in increasing the level of computer literacy among the "older generation" currently employed and providing users with MIS appreciation. Figure 4 shows an outline of a training manual that can be used when training end-users (Whitten, Bentley, and Dittman 2001).



Source: "System Analysis and Design Methods", Whitten, Bentley and Dittman, McGraw Hill, 2001

Figure-4 An Outline for a Training Manual



The Ministry of Health should also consider sending managers with good communication and teaching skills outside Indonesia to countries currently using Hospital Information Systems (HIS) so they can exposure to how a HIS functions in a hospital. The managers can then effectively communicate their experience to their colleagues and increase their motivation for learning and actively participating in the new MIS. In general studies (see, for example, Reznikoff, Legler, and Clark 1979, County, Kjerulff, Salloway, and Campbell 1983) report that educational level and period of employment at the organization being computerized are positively correlated with attitudes towards computers.

CONCLUSION

The Nolan concept was used to investigate and explain the state of the Ministry of Health in Indonesia, in particular, to set the scene for the application of the guidelines. The Ministry of Health has significantly improved its Healthcare Information System situation in comparison with the previous situation when this study was first conducted. However, certain drawbacks exist in management commitment, education, and training. It is also suggested that the Ministry of Health carefully evaluate all the strengths, weaknesses, opportunities, and threats associated with the implementation of the future application architecture of the HIS as completely aborting the use of an information system and switching over to a new information system is very costly and very time-consuming in terms of implementation, training, and education, etc.

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