

The Development of Gedung - An Information and Data Sharing Repository Platform For Hydraulic Research in Malaysia

Mohd. Fikry Abdullah¹ Juhaimi Jusoh² and Salmah Zakaria³

National Hydraulics Research Institute Malaysia (NAHRIM)

¹Resercher, IT Division NAHRIM

²Director, Water Quality and Environment Research Centre, NAHRIM

³Director General, NAHRIM

Introduction

The National Hydraulic Research Institute of Malaysia (NAHRIM) is a government institute (under the Ministry Of Natural Resources and Environment). NAHRIM engaged itself in research and specialist consultancy in all aspects of water hydraulics and water environment.

As with most research organisation, NAHRIM aspires to become the premier water research institute in Malaysia and also within Southeast Asia and to assume the role as an expert referral centre in the same field. As part of this effort objective, NAHRIM is in the process of establishing a “National Water Information Repository Centre”.

It is a known fact that much of the researcher’s time is spent on finding information. Hence, the project aims to assist researchers in this tedious process by providing a point of access for water related information. The Information Repository is currently being populated and when fully developed, it can then not only serve the staff and management of NAHRIM, but also the various government departments and agencies, academicians, consultants, students and the public.

These users can have access to the information available in the repository to serve their needs which can varies from research, design, planning and implementation, coordination, environmental management, policies and decision support, socioeconomic activities and others.

Background

The basis for any information repository system has to be robust, easily expandable and easily accessible to the many communities requiring the information. The vast availability of ICT networks in Malaysia provides the passage and opportunity to allow for the smooth flow of vast information and data and NAHRIM has taken advantage of the current advancement in ICT to develop the system.

In hydraulic and water environment related researches, many types and format of information are prepared, collected and analyzed. These collections of information will not be fully utilised if it is not manage properly. Many valuable information lay idle and a lot of time can be wasted in searching, collating and integrating of data needed for research where it may already have been gathered by other researchers. There are instances whereby the same information was collected over repeated number, at the expenses of public funds.

In order to avoid this duplication of efforts, an Information Repository centre was developed where all water related information are grouped, categorized and digitized, to assist in all water related research and development (R&D) activities.

One of the most significant aspects of this Water Information Repository is to provide NAHRIM with a single water related information platform. It brings together experimental data from many research projects into one consolidated searchable database. As more research works are being done in NAHRIM, this repository will continue to grow and subsequently become an increasingly significant asset to the country and the international research communities.

Objective and Methodology

The objectives of the project were multiple including the creation of an Information Repository that contains all the water related information available in NAHRIM. Here information are digitize according to the respective R&D activities. The Information Repository will act as an electronic support system within NAHRIM and can serve as the Information Repository for other decision support systems.

The system that was developed also allows archiving of information that may otherwise be scattered or even lost. The system has been designed to provide sufficiently comprehensive and granular information so that they are informative and at the same time easily reused or processed for presentation in various formats to meet the user's requirements which finally will be used to generate a consolidated reports of various resource types.

During its first stage, that is the first six months of the project had been focusing around NAHRIM research activities. However, in the second stage, new methods and tools will be developed to make the information compatible with emerging standards, hence making it easier to be linked and cross analysed with related information from other sources.

Currently, the focus of work covers the collection, compilation and development of the Information Repository for the following divisions in NAHRIM:

- a. Research Center for River Management,
- b. Research Center for Coastal Management,
- c. Research Center for Water Resources Management,
- d. Research Center for Water Quality and Environment, and
- e. Hydraulic and Instrumentation Laboratory

From then, the information as translated into several main subjects including collecting, compiling and developing databases for the following repository:-

1. Coastal Engineering Information Repository
2. River Engineering Information Repository
3. Water Resources Information Repository,
4. Lake inventory,
5. Coastal Resources Risk Index,
6. Laboratory and Instrumentation,
7. Registry of Experts,

8. Waterpedia,
9. Waternews, and
10. NAHRIM Water Information Repository Portal

The next step that was carried out is to provide an information management framework that can be customised to suit the needs of the Information Repository. The framework must include facilities to manage the following types of information:

- a. Documents in proprietary format,
- b. Pictures, images, maps, charts and diagrams,
- c. Records of reports, surveys, modelling outputs, field data, assessments etc.
- d. Unstructured and semi-structured information in HTML and XML format.

The final step is then to store only inputs to and outputs information from modelling and analysis applications for easy reference. It will not include facilities to process unprocessed information as they will require custom built applications for their handling. For example hydraulic engineering applications will include specialised methodology in their processing, analysis and presentation of the outputs.

What has been stored?

There are 9 repositories were developed to realize the need of researchers. The information stored from various resources was mapped and group according to issue that related to NAHRIM core R&D activities.

Information has been stored in each repositories specifically can help researchers in planning and strategies their R&D. These are the information that are collated and stored in the respected areas:

i) Coastal Engineering Information Repository

Research Center for Coastal Management will own and manage Coastal Engineering Information Repository. The types of information that are stored includes Project Information, Environmental Data, Physical Data, Engineering Data, Structure Data, Coastal Development, Management Data, Biological Information, Socio-Economics, Findings and Recommendations

ii) River Engineering Information Repository

For River Management information currently partly handled will include Project Information, Physical Data, Biological Data, Human Activities, Key Issues and Option and Integrated River Basin Management

iii) Water Resources Information Repository

Within the Water Resources Information Repository, the following feature were incorporated which includes Project Information, Environment, Socio-Economics, Water Availability and Environment, Water Use, Simulation, Water Resources Development and Water Resources Management

iv) Lake inventory

Lake Inventory module is to be owned by the Research Center for Water Quality and Environment. This module will store information about lakes in Malaysia. Types of information stored include Physiographic Data, Lake Water Quality, Socio Economic Data, Lake Utilization, Deterioration of Lakes Environments and Hazards, Developments, Legislative and Institutional Measures for Upgrading Lake Environment and Monitoring Stations

v) Coastal Resources Risk Index

Besides Lake Inventory, Research Center for Water Quality and Environment will also manage Coastal Resources Risk Index. Information stored in this module which include information such as Project Information, Coastal Classification Schemes, Coastal Vulnerability, Methodology, Water Quality, Biological Resources, Fisheries Socio Economics, Recommendations, Guidelines and Proposal

vi) Laboratory and Instrumentation

Objective of Laboratory and Instrument Information Repository is as follows:

- (a) Inventory Listing for various equipments and instruments managed by the division.
- (b) The inventory list of the instruments in the custody of the other division can also be managed if required.
- (c) Specifications and usage records of the Physical Modeling Facilities available in the Laboratory such as Tidal River basin facility, 2D flume, Coastal Wave Basin Facility, Tilting Flume and Port and Harbor Deep Basin Facility.
- (d) Physical Modeling Report
- (e) Research Project Information

Type of information available in this module is about Equipment available at NAHRIM. This module is manage by Hydraulic and Instrumentation Laboratory

vii) Registry of Experts

As for Registry of Experts, this module will store information about experts in water related. The objectives of this module are:

- (a) To maintain a repository water related experts in Malaysia. These experts may be from NAHRIM or other organizations.
- (b) To facilitate the process of identifying the right experts through profile searching facility.
- (c) To provide a resume bank of staff in NAHRIM.

Types of information stored in this module are List Resources Persons, Themes and Sections, GWP IWRM Tools, Field of Study, Country of Study, Age Groups and Current Status

viii) Waterpedia

Waterpedia module is a module that can be called as water dictionary or water encyclopedia where it store general information about water. The objectives of Waterpedia Information Repository are as follows:

- (a) To maintain a glossary of water related terminology, facilities, instruments and equipments, software, organizations, people, law and information about major projects in the Malaysian context.
- (b) To provide Gazetteer facility for users to search for geographics names or places and associates them with geographics locations and other descriptive information. This includes the register of rivers, the river basin management unit and shore reaches.
- (c) To provide facilities for the administrator to add, edit and delete all various static and dynamic resources.
- (d) To provide a suggestion form to add new subject matters and technical terms.

Types of information available under this module include:

- Technical Terms, Acronyms and Abbreviations, Gazetteer
- Facilities, Instruments and Equipments, Software and Databases
- Organizations and Distinguish Personalities
- Legislation
- Major Projects
- Water Bodies
- Publications, Journals, Guidelines and Technical Specification

ix) Waternews

Waternews is a repository of news related to water issues in Malaysia and the region. It is a compilation of news items from various news sources. Similar news is grouped together into customizable news categories, events and issues which are of interest to water community.

The objectives of Waternews Information Repository are as follows:

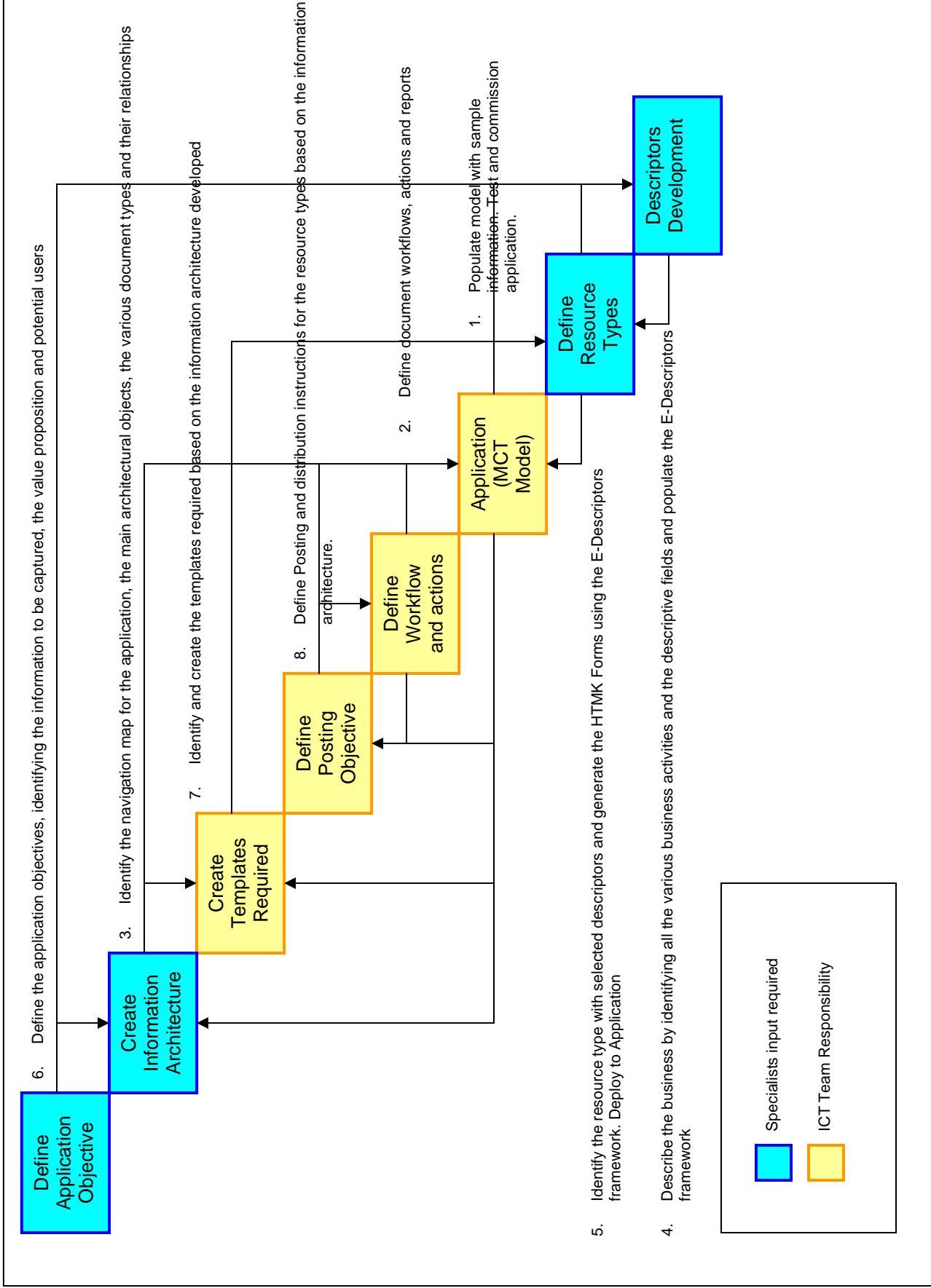
- (d) To provide a repository news resources related to water in Malaysia and the region. The news item will be grouped into customizable news categories. The news can be further grouped into secondary groups such as issues, locations, organizations and personalities.
- (e) To provide facilities for the administrator to add, edit, delete and organize news.
- (f) To display current news at the front page with the facility to expire the news item after specified time frame.

- (g) To enable users to search for archived news with various options.
- (h) To complement the news clipping related activities in NAHRIM.

Types of news collected are :

- Climate Change, Environment, River Engineering, Water Policy, Water Quality, Flash Flood and Natural Disasters
- x) NAHRIM Water Information Repository Portal

This portal will act as the gateway to the Repository and the sub-repositories. The applications for the various divisions are designed as the work space for the divisions. The portal will allow users to view and search the information across divisional boundaries.



Application Development Methodology

Special Features of the repository

NAHRIM Water Information Repository Centre shall be based on an information management framework. The final framework when ready shall have the following features:

i) Document management

The information source for the repository is most likely to be in the form of documents in various formats. It is therefore crucial for the repository to be able to store and manage these documents in their native format. Users should be able to browse and search for the documents available using metadata. It should also provide support for hyperlinks and the definitions of these links in the other documents in the repository. The repository should also be able to maintain different filing structure of each division as it depends on their needs and current practices.

ii) Information architecture and structure management

The application to be developed for the various divisions in NAHRIM will require customised information architectures to suit their diverse needs. Information architecture is defined as the structural design of shared information environments. It is the practice of structuring information for a purpose.

In the Information Repository, the information architecture will be used as the navigation structure for users to browse, explore, group and filter the repository. It will also be used as a place holder for the resources to be captured.

iii) Document-centric computing

All information stored in the Information Repository will be in the form of documents. The information type identified will be entered using HTML forms where these HTML forms will have to be designed to meet the requirements of the different resource types over their business processes. These forms may require to be revised from time to time to meet new requirements.

To ensure productivity and reduce errors in the information capture, these HTML forms must incorporate various constraints and validation rules; provide pick-lists based on the information captured in the Information Repository. Information from existing documents may also need to be transferred to the forms during data entry to reduce inputs and typing errors.

iv) Water related descriptors

A key to the success of the Water Information Repository is for similar information to be described in a similar manner. This will help reduce redundancies and ensure that the collected information can be easily compared or consolidated. This requires the use of water related descriptors.

Descriptors are not to be confused with the term *specification* that engineers and researchers are more familiar with. *Specification* specifies what is required whereas *descriptors* describe what is already there. The *descriptors* list shall contain the descriptive fields for all the technical information handled by the division. The *descriptors* shall be arranged into sections in line with the current practices of the division.

Where the *descriptors* are for quantitative information, a description of how the quantitative information is to be determined must be provided together with the recommended units of measurement.

Some descriptive fields may require a controlled vocabulary or qualitative scales and these must be provided by the specialists together with descriptions of the vocabulary used.

The highly discriminative *descriptors* must be identified so that when the *descriptors* are used, they are mandatory.

v) Ease and efficiency in populating the Information Repository

The Information Repository is generally found to be easy to be populated either using a desktop application or a web browser. The desktop application provides native access to all the information in the Information Repository with extensive searching, navigating, filtering, export and import capabilities which may not be available on the web-based applications.

vi) Flexible querying and reporting abilities

The Water Information Repository collects all related information throughout NAHRIM. It organises the information for study and make it completely flexible for intensive reporting and analysis. In order to do so, a searching facility needs to be provided for the user, for example searching information by full text or by common sets search.

The information can also be grouped under multiple categories and can be related to any other information based on its relationship. This can be use to

describe, summarise and compare data, hence providing a more meaningful report generation.

vii) Spaces and Security Policies

Each division in NAHRIM is given the privilege customized application for their business processes and needs. Some work-in-progress information may also be stored to serve the division needs and should not be exposed to users outside the division. In other words, the divisions would like to work in their own spaces.

Management, on the other hand is more interested in the final information and the status of the projects in progress. They need to look at the information across all the divisions. Typically the information may need to be grouped into geographical units, resource types and time frame. Management may also require consolidated reports across the various divisions. As such, the management space is different from the division spaces. Collaborators and other users will also require their own space.

The information stored in the data repository will require information in different subject areas to be stored in different models. The security policies will need to be defined at model, folders, document types and resource type's levels. Security policies can also be defined for the various actions that can be used for work-flow and documents updates.

Challenges

Among the issues and challenges faced in developing Information Repository are:

- (a) Content development must be based on industry practice and usage. This includes descriptors categories in each information repositories.
- (b) Active participation from various divisions to process the reports and to populate the repository and to take the ownership of the repository.
- (c) To ensure desk officers and support staffs are familiar with the information architecture of their respective application and the various functionalities provided.
- (d) Acquiring more reports and information in digital format to be used for populating the repository.
- (e) Creating a critical mass of information in the repository so that it will become the primary reference for water related technical information by the researchers.
- (f) Enforcing quality control measures to ensure the accuracy of the information in the repository. This will determine the success of this project where the success is measure through quality, usefulness and also quantity of information available in the information repository.

Development Progress

To date the development progress of the system is 80% completed and over 12,344 reports and document have been processed. The system is currently available for the use of researchers in NAHRIM.

For Waterpedia and WaterNews repository, these 2 modules are ready to be used. However, from time to time refinement will be done to enhance repository.

Conclusion

Capacity building can be in varied form and one of them is through the provide access to information. NAHRIM repository is aimed at that objective and hopefully will reduce the amount of time taken to produce research findings. Once fully populated it is hope to be a useful referral platform not only to NAHRIM officers but to those who are involved in all aspects of water related research.

References

NAHRIM, (2008) : National Hydraulic Data Repository Centre Inception Report, March 2008.

NAHRIM, (2008) : National Hydraulic Data Repository Centre Progress Report 1 2008.