



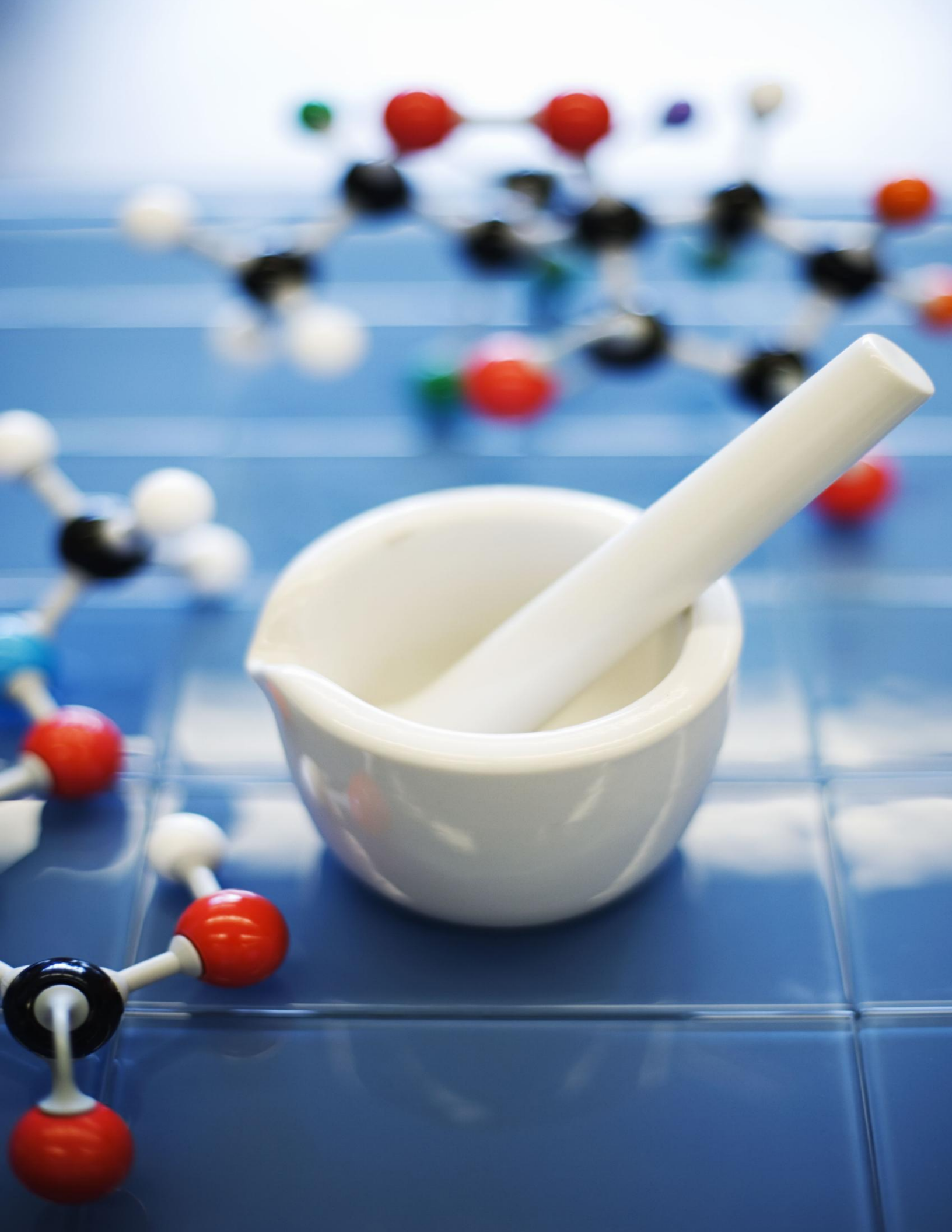
He@lth 2015

Seamless Continuity of Care

Ministry of Health and Quality of Life

Government of the Republic of Mauritius





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1. The eHealth Context

Healthcare is the world's most information intensive industry. Every day the industry produces massive volumes of data which, properly used, can improve clinical practice and outcomes, guide planning and resource allocation, and enhance accountability. There will be no quantum leap forward in health care quality and efficiency without high quality, user-friendly health information compiled and delivered electronically.

The eHealth revolution is also the key to enhanced protection of privacy. Only in an electronic world is it possible to ensure that identifiable patient records are accessible to providers on a need-to-know basis. Access to all or parts of an Electronic Health Record (EHR) can be protected, and the identities of those who have looked at an EHR are known. Such protection is impossible with paper records, particularly in hospitals and other institutions.

Electronic health information is fundamental to better health services delivery, planning and protection of privacy, otherwise impossible with paper-based records.

1.1 The Health Sector in Mauritius

The general state of health in Mauritius is good- people live longer and fewer children die in their infancy; life expectancy, in the last 30 years, has increased from 63 years to 71 years and first year infant mortality is 14 deaths for every 1000 live births. These indicators are better than those for developing countries. The rate of population growth is also low owing to sustained governmental efforts and general access to educational and employment opportunities.

Mauritius is now aiming at attaining indicators that are on par with the developed world.

OVERVIEW OF CURRENT HEALTH SERVICES

With 856 doctors, 3,000 nurses, about 56 dentists and 22 pharmacists, health services in Mauritius are provided free

of cost throughout the country at the point of use to all its people.

At primary care level, the state health services have 135 facilities (Including Area Health Centres, Medi-clinics, a Community Hospital and Community Health Centres) which provide medical, nursing, dispensary and support services at local level. In addition, there are 5 regional hospitals and 2 district hospitals with over 2500 beds. Separate specialist hospitals include a mental hospital with 811 beds, and an Eye hospital, an Ear, Nose and Throat hospital, a Cardiac Centre and a Chest hospital which together have over 200 beds.

The regional hospitals and primary care centres or facilities benefit from a wide range of clinical and non-clinical support services including pathology

The general state of health is good and Mauritius is now aiming at attaining health indicator levels that can be matched only by developing countries.

Health services in Mauritius are provided free of cost at the point of use to all Mauritians.

laboratories, X-Ray, CT scan and MRI, pharmacy, blood collection and transfusion, public health and hygiene, medical records and information services, catering, laundry, transport and cleaning.

PRIVATE SECTOR IN HEALTH

The private sector absorbs over 30% of the total expenditure on health and employs over 544 doctors and provides primary and secondary services with 14 private clinics, nearly 600 beds, 31 private medical laboratories and 291 private pharmacists. In a year, the private sector has about 77,000 admissions for in-patient treatment, undertakes about 30,000 surgical operations and delivers over 2,500 babies

THE MINISTRY OF HEALTH AND QUALITY OF LIFE

The Ministry of Health and Quality of Life (MoHQL) is the agency responsible for health status of the population. It operates under the portfolio of the Minister of Health and Quality of Life. The aim of the Ministry is to improve the quality of healthcare delivery with a view to increasing patient's satisfaction and enhancing social equity through the provision of a wider range of health services to the whole

population. It also ensures that the health sector is consolidated and that the health services remains accessible to every citizen.

NON-COMMUNICABLE DISEASES

Although in recent years, the infectious diseases of the past have been largely eliminated, Mauritius now faces growing problems of non-communicable diseases including heart disease, diabetes, stroke, cancer, tobacco and alcohol related diseases and mental illness. The aim is to eradicate the diseases or to contain them at their present low level.

In adults aged thirty and over, 20 per cent have diabetes, 30 percent have hypertension, and 40 percent are overweight. 42 percent of men are smokers and 16 percent of adults are heavy drinkers. The typical diet in Mauritius is high on salt and fat and low on vegetables, fruits and fibre. This pattern of health risks gives rise to an increasing level of NCDs and a growing avoidable burden on the health services.

CURATIVE SERVICES

Greater emphasis than ever before has been laid on curative services in the past two years to bring Mauritius up-

The public healthcare services delivery includes 135 facilities at primary level and 5 regional hospitals and 2 district hospitals that can accommodate over 2500 in-patients. There are several specialist hospitals in addition.

The private sector accounts for over 30% of the expenditure on health and employs over 540 doctors.

A high intake of salt and fat coupled with a low input of vegetables, fruits and fibre has given rise to an increasing level of Non-Communicable Diseases.

THE ISLAND OF RODRIGUES

The population of 35,000 of Rodrigues has access to hospital and community health services. Recent improvements in facilities include the introduction of the NCD mobile screening services, an Intensive Care unit for the Queen Elizabeth hospital, haemodialysis services, a physiotherapy unit and a new incinerator for the hospital. The incentives to attract staff to work in Rodrigues have been improved and specialist services expanded with plastic surgery being provided in Rodrigues for the first time this year.

to-date in medical technology for diagnosis and treatment of disease. The principal major projects in progress are the reconstruction of the Dr Jeetoo hospital, new outpatients and treatment services at Victoria Hospital, new national centre for mental health and regional mental health services, extension of the cardiac unit at Victoria Hospital, reconstruction of Souillac hospital, renovation of health centres, and improvements to catering departments.

CT scan, MRI and nuclear medicine services have been introduced to aid accurate diagnosis of a variety of disabling and life threatening conditions. High technology treatment has been expanded to meet growing needs including a major expansion in heart surgery at the Cardiac Centre, haemodialysis in four regions, transplant surgery, lithotripsy for eradicating kidney stones, cobalt radiotherapy for cancers and more up-to-date equipment for theatres and intensive care units.

1.2 MAURITIUS HEALTHCARE DELIVERY FRAMEWORK

The Healthcare delivery framework can be considered at three levels

- Primary
- Secondary
- Tertiary

PRIMARY HEALTHCARE PROVIDERS

The primary healthcare providers are usually the first points of contact for

The management of Accident and Emergency Services has been reformed to reduce waiting time and increase the effectiveness of services using a triage system of assessment with a fast track for urgent cases, elderly and children. Catering, reception, cleaning and complaints procedures have been improved too.

HEALTH SECTOR MANAGEMENT

The health services in Mauritius operate through five regions and with separate arrangements for Rodrigues. Each region has its own Health Advisory Board to advise on the health needs of the region, effectiveness and efficiency of services and consumer matters. The management of the regions is the responsibility of regional health directors. The Ministry of Health and Quality of Life (MOHQL) is responsible for overall policy, planning and management, resource allocation and regulation, together with parliamentary and international matters.

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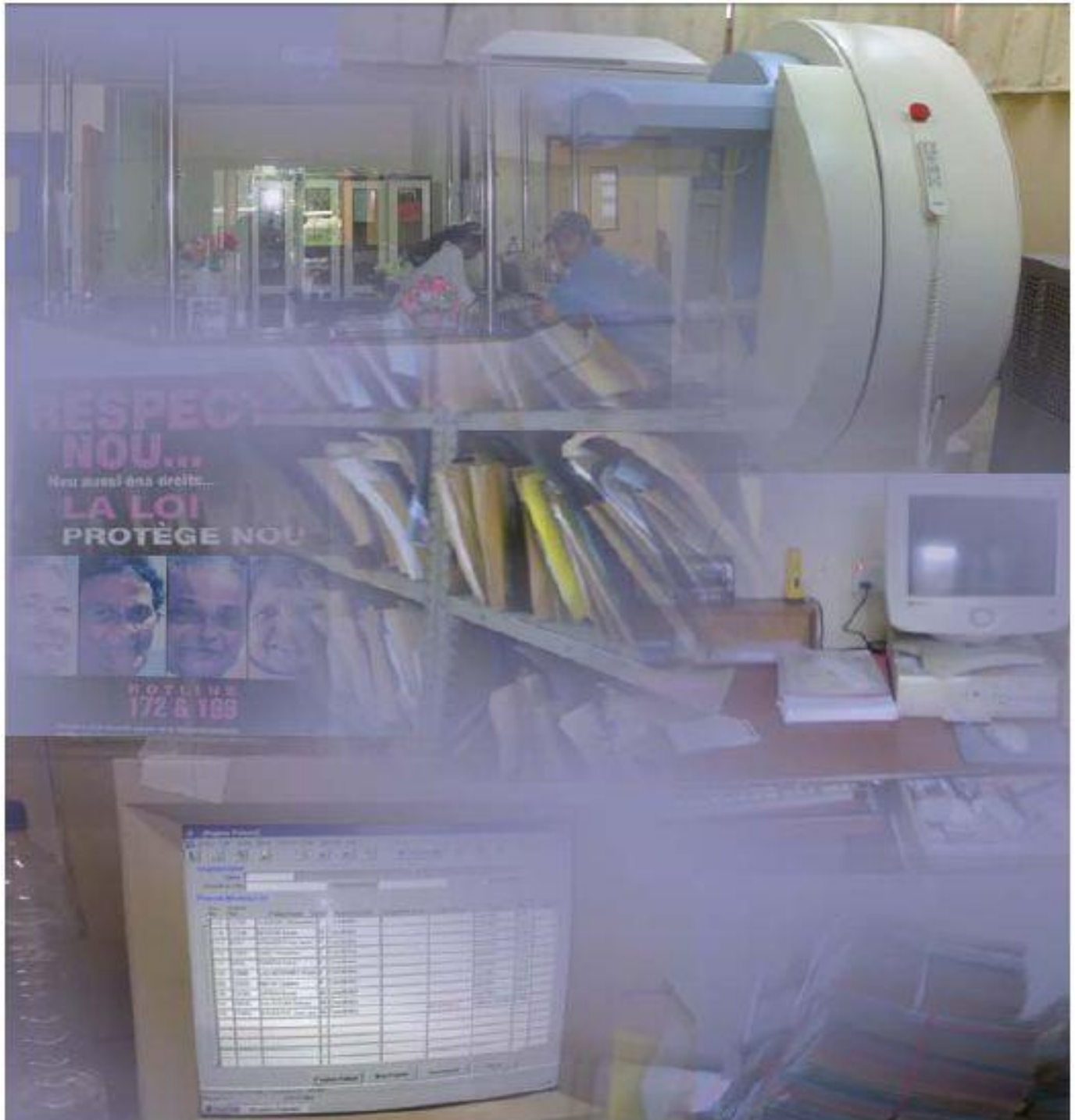
Mauritius has a 3-tier healthcare services delivery comprising Primary (Area Health Centre, Medi-Clinics, Community Health Centres, Community Hospitals and Family Health Clinics), Secondary (Regional and District Hospitals) and Tertiary (Specialized Hospitals)

SECONDARY HEALTHCARE PROVIDERS

The secondary healthcare providers are usually the first referred points of contact for patients. However, in case of emergency direct access could also be provided. They comprise the following the District Hospitals and the Regional Hospitals

TERTIARY HEALTHCARE PROVIDERS

The tertiary healthcare providers are usually the second referred points of contact for patients. However, in case of emergency direct access could also be provided. They comprise the Specialised Hospitals in Mauritius



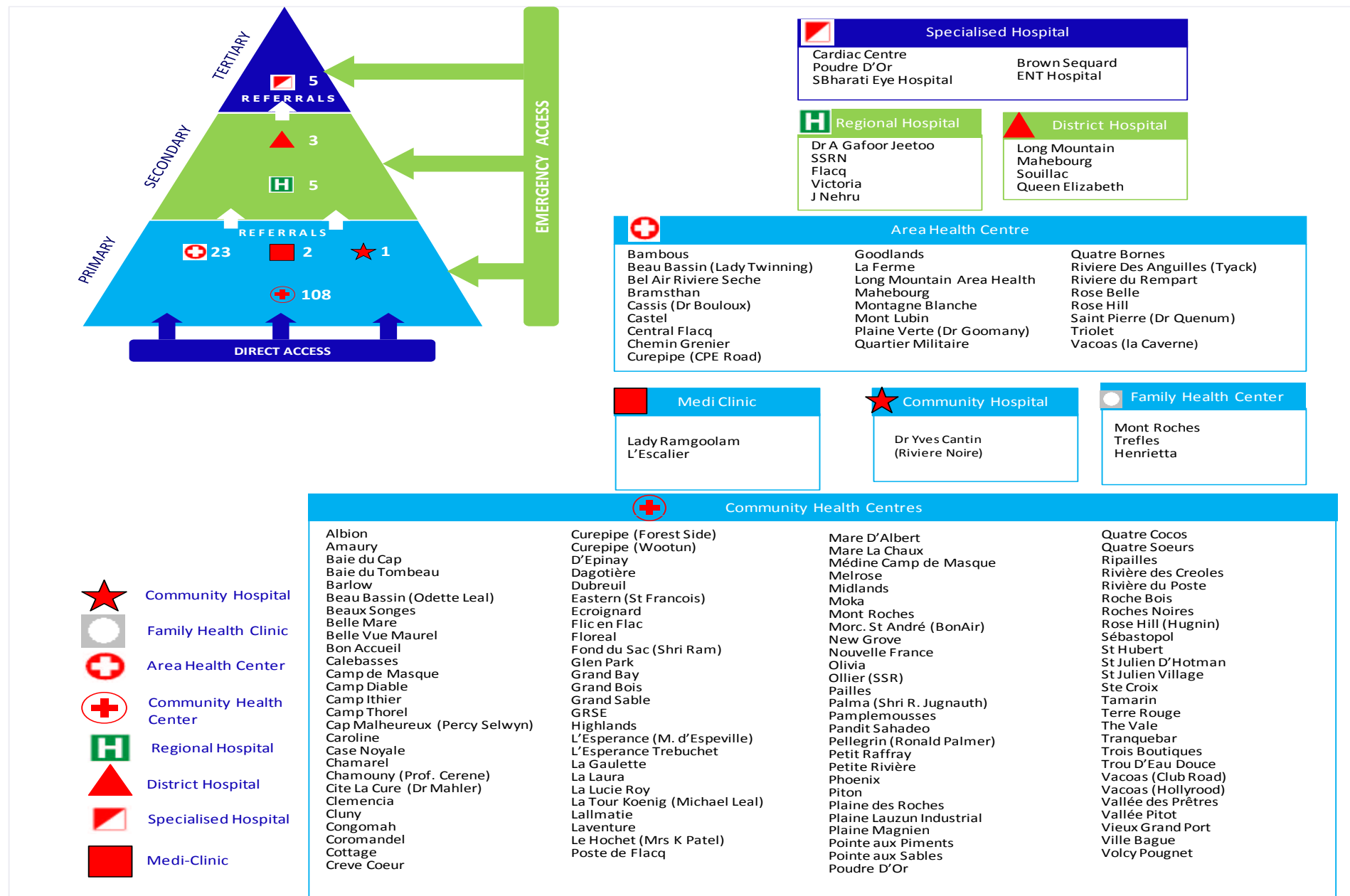


Figure 11.2 MAURITIUS HEALTHCARE DELIVERY FRAMEWORK



2. The Current State of ICT in Health in Mauritius

EXISTING INFRASTRUCTURE AND COMMUNICATION -MOH INFORMATION PLAN

In 1990, an information plan in three phases was prepared by the State Informatics Limited (SIL) to computerise all the healthcare units. The project was scheduled to be completed in 1998.

The scope of the project was to provide a scenario for the future integration in a National Health Network System. The objectives were to improve the quality and effectiveness of the Health services and to provide timely information to the decision makers to give them the tools for informed decision to be made.

Computerisation of MoHQL was a priority for the government in the 1990's. The objectives were to improve

the quality and effectiveness of the Health services and to provide timely information to the decision makers.

Table 1 shows the current status of the projects implemented so far.

INFORMATION PLAN PHASES

The projects were scheduled to be implemented in five phases. A Management Advisory Committee and a Project Steering Committee were set up to manage the projects till completion. The implementation tasks were planned for a period of 5 years starting in 1992 and ending in 1998 as shown in Figure 2.

INTEGRATED HOSPITAL MANAGEMENT AND PATIENT CARE SYSTEM (IHMPCS)

The IHMPCS was developed on a pilot basis by State Informatics Limited.

Efforts to computerize healthcare units began way back in 1990 when an information plan was formulated that aimed at computerizing all healthcare units by 1998 with projects to be implemented in 5 phases.

Modules	Description	Current Status
Patient Medical Records	Functions as the Patient's physical medical folder. It contains information on the patient and his health / medical history.	The system is operational since 1995 and contains loopholes which need to be addressed.
Catering Services	Hospitals provide catering services for in patients. The module will handle the operations management of the caterer and the quality of products - services supplied to the patients.	The catering service module is not operational and has never been used.
Laboratory	Implies computerisation of all the sections of the Central Health Laboratory . This includes recording of requests as well as results of tests	The laboratory software has been completed but is not deployed / used because staff resources is

Modules	Description	Current Status
		not available
Blood Bank	Computerisation of blood transfusion services at Victoria Hospital and the four Blood Collection Centres at Jeetoo, Nehru , SSRN and Flacq Hospitals	The module is operational since 1996 however a manual system is used in parallel causing duplication of work.
Drug Store Inventory – Main store	Computerisation of the pharmacy store	The module is not used at full capacity. Some activities are performed manually and the system is still under parallel run.
Pharmacy dispensing	Computerisation of the internal pharmacy. It handles the prescription from the doctor to the delivery of the medicine to the patient	The pharmacy system is operating since 1996. New features are required
X-Ray	Computerisation of the X Ray department.	The system is operational since 2001 and is still under parallel run.

Table 1 Main ICT Projects Undertaken and their Status

STATUS OF THE IMPLEMENTATION

The computerisation of the Ministry of health is still underway since inception in 1990. These systems are not fully used and part of the operations is still manual. Moreover the deployment of the systems at other regional and district hospitals has not been completed. A wide area network planned to be implemented at the Ministry of Health and Quality of life and the MIS to be implemented at the headquarters is still outstanding.

ADMINISTRATION AND REGISTRY

The operations of the administration section of the Ministry of health are partly manual. The registry department has been computerised and the hardware infrastructure deployed. The system is not used at

its full capacity. Most of the staff trained on the registry system has been transferred to other departments of the ministry and the new joiners have not been trained. The result is that part of the data is on Excel and the other part on the registry system resulting in a non homogeneous system.

CENTRAL SUPPLIES DIVISION – STOCK MONITORING SYSTEM

The system has been developed and installed since 1996. It is planned that the system will be upgraded shortly. The hardware has been purchased and is being deployed.

DECISION SUPPORT SYSTEMS

The decision support systems consist of a database which would allow members of the public and of the health sector to access relevant data concerning the

Most systems developed in the 1990s suffer from a lack of sustained use owing to an indifferent deployment. Training efforts undertaken have not been followed through and staff has relapsed into manual ways.

health sector. The setting up of this database was included in the information plan and its development is outstanding to date.

SYSTEM AT CENTRAL LABORATORY

An Integrated system is being used at the Central Laboratory since 1995. This system is partly manual and it was found that it contains many weaknesses. The Central Laboratory has since renewed their hardware equipment and are planning to upgrade / change their application. They are considering a system which is being used in other laboratories worldwide.

CARDIAC CENTRE

A new system has been installed at the Cardiac centre by an Indian Firm Sobha Renaissance, on a pilot basis. The development and deployment of the system has been completed and the system is now under production.

FINANCE DEPARTMENT SOFTWARE

The finance departments of the MOHQL like the other Ministries' finance department are using the Treasury

Accounting System (TAS). The system is accessed through an Intranet. The ministry is in the process of updating the system to cater for programme based budgeting.

TRANSPORT DEPARTMENT

The Transport Department is still working on a manual system, the transport monitoring and workshop management scheduled to be installed there has not been developed.

INVESTMENT IN ICT

Since 1990, the Ministry of Health has invested more than Rs 65 Million for capital expenditure and Rs 50M for recurring expenditure on IT.

INFRASTRUCTURE

The hardware infrastructure in the different entities of the Ministry of Health and Quality of Life was purchased in the early or mid 1990's. In some department of the Ministry the hardware was not renewed and these PCs are either out of date or not supported or not being used.

Since 1990 the Ministry has spent more than Rs 65 million on both capital and recurring expenditure towards IT systems in the health sector.

However, save a few places, hardware has mostly turned obsolete and manual systems continue to be used.

2.1 The Principal Pain Areas

Table 2 brings about some principal pain areas in the current state and their possible resolution through an eHealth system

Pain Area	Resolution
Patients wait a long time for their "turn" to come at the hospitals	Scheduling and Appointment systems
No integration of Patient History data	Application software needs to get implemented that is same for all the healthcare facilities with centralized data storage

Pain Area	Resolution
The set of processes that are being followed are not officially recorded anywhere	Processes need to be agreed upon between the different stakeholders and recorded into comprehensive process manual
Data gathered manually collected, stored and retrieved	Data needs to be electronically captured, stored and retrieved through user-friendly application software.
Appointments on paper in a piecemeal way with no automatic notifications	Technology solutions need to be implemented for scheduling, notifying and sending alert messages to all parties of every appointment.
Medical Record leads to high volume of paper and lot of time is wasted in retrieval of patient's file; there are cases of patient's medical record getting lost	Electronic Medical Record system will be able to solve most of these issues. Also, there needs to be proper data backup and archiving schedules that should form a part of the delivered applications.
No integration of laboratory with the hospital which lead huge waiting time for test results to reach doctors	Integration of hospitals and laboratory through eHealth system will save lot time in the generation and transfer of test report.
Tracking of inventory of drugs in the pharmacy and other unit is difficult	Better inventory management of the drugs at the pharmacy and assessment of the inventory level of the pharmacy in different hospital and distribution of drugs in case of crisis in other institutions.
Drug abusers falsely generate medical records by changing their identity to sell or consume drugs prescribed by the doctor.	Linking each and every patient with one unique identifier (for e.g. National Identity no.)

Table 2 The Principal Pain Area

2.2 The Way Forward for eHealth in Mauritius

In consultation with stakeholders the Ministry has worked out the complete strategic framework for the adoption of eHealth in the country (He@lth 2015). In doing that it has used the famed Logical Framework Approach following the hierarchy **Vision→Objectives→Outputs→Activities→Resources** ensuring that every stage in this chain was linked to the one preceding it.

2.2.1 eHealth Vision

To exploit ICT to extend seamless continuity of care through affordable, high-quality, user-centric service to all healthcare stakeholders in Mauritius and to promote knowledge networking among them



2.2.2 eHealth Objectives

The following are conceived to be the objectives for eHealth towards realization of the above Country eHealth Vision:

- MoHQL a single integrated source of information and a focal point of reference on all matters related to health;
- improve clinical outcomes through better client-centric service delivery & high levels of internal efficiency and effectiveness;
- guide resource planning, allocation, monitoring and evaluation through use of appropriate technology;
- improve health awareness levels in citizens and residents of key issues in personal/public health & use of technology;
- enhance competency levels of health care staff at all levels and across organization types towards ICT to deliver better healthcare; and
- to improve levels of collaboration between the sector stakeholders with interoperability, standardization and cooperative knowledge exchange.

Figure 2 brings out the complete Strategic framework to be adopted for the comprehensive adoption and use of ICT in the health sector in Mauritius.



2.2.3 The eHealth Complete Strategic Framework

VISION	OBJECTIVES	OUTCOMES	ACTIVITIES	RESOURCES
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">To exploit ICT to extend seamless continuity of care through affordable, high quality, user-centric service to all healthcare stakeholders in Mauritius and to promote knowledge networking among them</p>	to make MoHQL a single integrated source of information & focal point of reference on matters on health in Mauritius	<ul style="list-style-type: none"> • A Web Portal for Health sector in Mauritius that provides information in an integrated way on all matters related to health in a user-centric manner 	<ul style="list-style-type: none"> • Determine information with MoHQL & agencies • eHealth portal best practices • Define Portal Requirements • Operationalise Portal 	<ul style="list-style-type: none"> • Detailed technology requirement specifications. and RFPs/ tech infrastructure • Availability of staff with appropriate skills • Availability of portal vendor • Skilled Programme Mgrs
	to improve clinical outcomes through better client-centric service delivery through high levels of internal efficiencies and effectiveness	<ul style="list-style-type: none"> • Comprehensive set of services supported by information systems for the associated stakeholders using effective and workable technology solutions 	<ul style="list-style-type: none"> • Identify and prioritize services and systems for eHealth • Prepare technology specifications for the above • Engage technology vendor 	<ul style="list-style-type: none"> • Detailed technology reqmt specs. and RFPs/ tech infrastructure • Availability of staff with appropriate skills • Availability of solution vendor • Skilled Programme Mgrs
	to guide resource planning, allocation, monitoring and evaluation through use of appropriate technology	<ul style="list-style-type: none"> • Executive information systems for policy makers • Citizens and other stakeholders' feedback counters on services/issues • International networking 	<ul style="list-style-type: none"> • Identify information needs for decision-making for policy and programme formulation • Prepare typical technology specs for the above • Engage technology vendor 	<ul style="list-style-type: none"> • Detailed decision-support reqmt specs. • Digitized cartographic systems • Availability of senior staff with appropriate skills • Availability of solution vendor • Skilled Programme Mgrs
	to improve health awareness in citizens and residents of key issues in personal/public health and use of technology for same	<ul style="list-style-type: none"> • Well-developed technology-enabled thematic forums for citizens and stakeholders • Health awareness raising events and literature for dissemination 	<ul style="list-style-type: none"> • Gauge current health sensitivity levels in the country • Identify ways and means to spread awareness • Disseminate information • Address competency gaps operationalise solutions 	<ul style="list-style-type: none"> • Information dissemination materials • Annual eHealth Conferences • Availability of staff with appropriate skills • International and national linkages • National eHealth Status Report. Newsletters etc
	to enhance competency levels of healthcare staff at all levels and across organization types towards using ICT for better care	<ul style="list-style-type: none"> • A complete set of eHealth team and resources to implement initiatives • Well-agreed capacity building plans for technology adoption and usage 	<ul style="list-style-type: none"> • Assess skillset availability • Determine skill gaps and training requirements • Design eHealth Org Structure • Realize Org Structure 	<ul style="list-style-type: none"> • Availability of appropriate staff with identified skill requirements • Realizing the Organisation Design/Recruitment • Communication of Org Design to staff
	to improve collaboration between stakeholders with interoperability, standardization and knowledge exchange	<ul style="list-style-type: none"> • Collaborative technology-enabled knowledge exchange platforms • Collectively agreed interoperability, security and privacy standards 	<ul style="list-style-type: none"> • Determine knowledge exchange requirements • Develop indicative KM specs for databases, e-libraries, e-forums etc • Operationalise solutions 	<ul style="list-style-type: none"> • Collaboration-oriented staff in MoHQL and agencies • Availability of technology vendor or internal development sources • Skilled Programme Managers

Figure 2 eHealth Complete Strategic Framework



3. Principal Intervention Areas

He@lth 2015 recommends interventions in the two large areas of Technology and People with the former including the complete suite of solutions required to operationalise computerized delivery of health services in Mauritius and the latter including not just capacity building of MoHQL officials and staff but also a complete institutional framework required for eHealth on a sustained basis.

3.1 TECHNOLOGY MEASURES

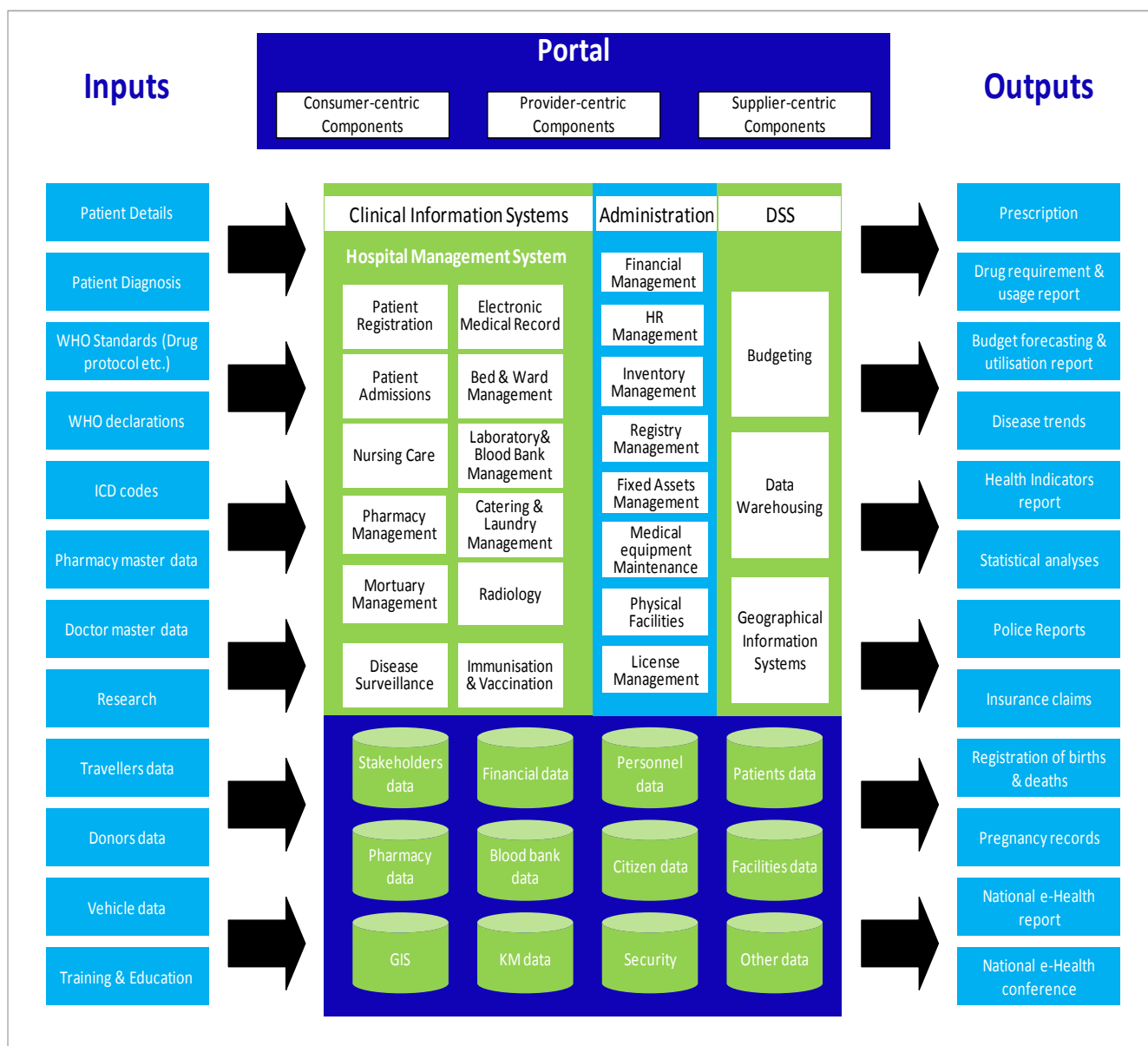


Figure 3 Technology component of eHealth Landscape

Figure 3 brings out the technology components of eHealth Landscape. It outlines the inputs and outputs of the various eHealth Information Systems and the databases used by various modules that fall under the four broad categories of eHealth Information systems namely:

- Clinical Information Systems
- Administration Information Systems
- Management Information Systems
- Portal Information System



3.1.1 eHealth Information System



Figure 4 eHealth Information System

3.2 PROCESS MEASURES

This eBusiness plan looks at the development of eHealth in healthcare sector in a holistic fashion. The solution framework would consider the People, Process and Technology measures to achieve the eHealth objectives. If a task is being executed on a repetitive basis then there must exist a standard process for doing it.

This process needs to be captured and documented so as to move towards a process driven approach. Once the process is formalized then comes in the technology to facilitate the process. In this age of services oriented architecture (SOA)

technology should be determined by the services and hence services provided by a stakeholder of healthcare sector in Mauritius should be at the core of entire technology solutions.

Documented standard operating procedures are required for process driven clinical systems and on the technology front the various systems required for clinical management need to seamlessly integrate with each other so as to maintain a smooth information flow amongst various departments and divisions

Documented standard operating procedures are required for process driven clinical systems. On the technology front the systems required for clinical management need to seamlessly integrate to maintain a smooth information flow amongst various departments and divisions.

3.3 PEOPLE

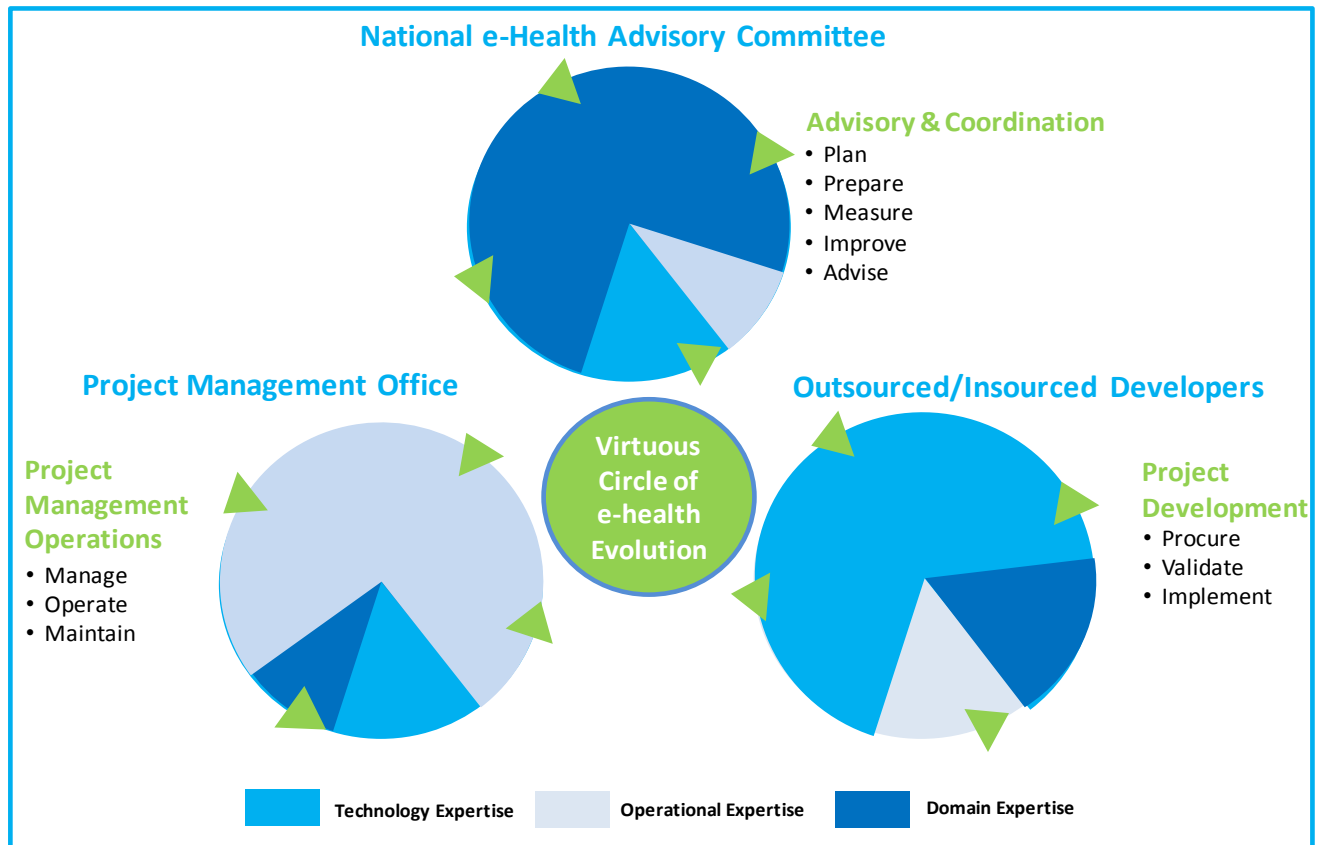


Figure 5 eHealth- Institutional Structure for Implementation

Figure 5 brings out the organizational triad for eHealth development which comprises the following broad functions.

ADVISORY AND COORDINATION, which is ideally done by an apex level multi-stakeholder body that performs the functions of planning, advising, monitoring and coordinating the activities of the multiple stakeholders that constitute/ represent the health sector. This body also ensures that there is a buy-in of the initiatives being pursued among the policy makers too.

PROJECT MANAGEMENT, which is actually a middle-level group of professionals that is entrusted with the day-to-day project management of the initiatives being undertaken. This group also doubles up as the “always available” bridge between

the eHealth project owners and the top-level body. The project management group performs the day-to-day project management and monitoring and coordination of the activities being undertaken. Wherever required and when competencies exist, this group must also advise the stakeholders on the initiatives being undertaken.

OUTSOURCED/ INSOURCED PROJECT DEVELOPERS, which comprises the people who are in charge of the development of the eHealth systems proposed, their implementation, operationalisation and maintenance. Typically, this group would be working through two wings- one, who are the actual system developers, packaged or custom-built, and two, those who take over for the operationalisation, support and maintenance of the systems that have

The institutional framework recommended for He@lth 2015 is a three-tier one comprising the three large functional areas of Advisory and Coordination, Project Management and Outsourced/Insourced System Development efforts.

These functions will be performed respectively, by the National eHealth Committee, the Project Management Office and individual Committees and/or taskforces acting in unison with eHealth system developers.

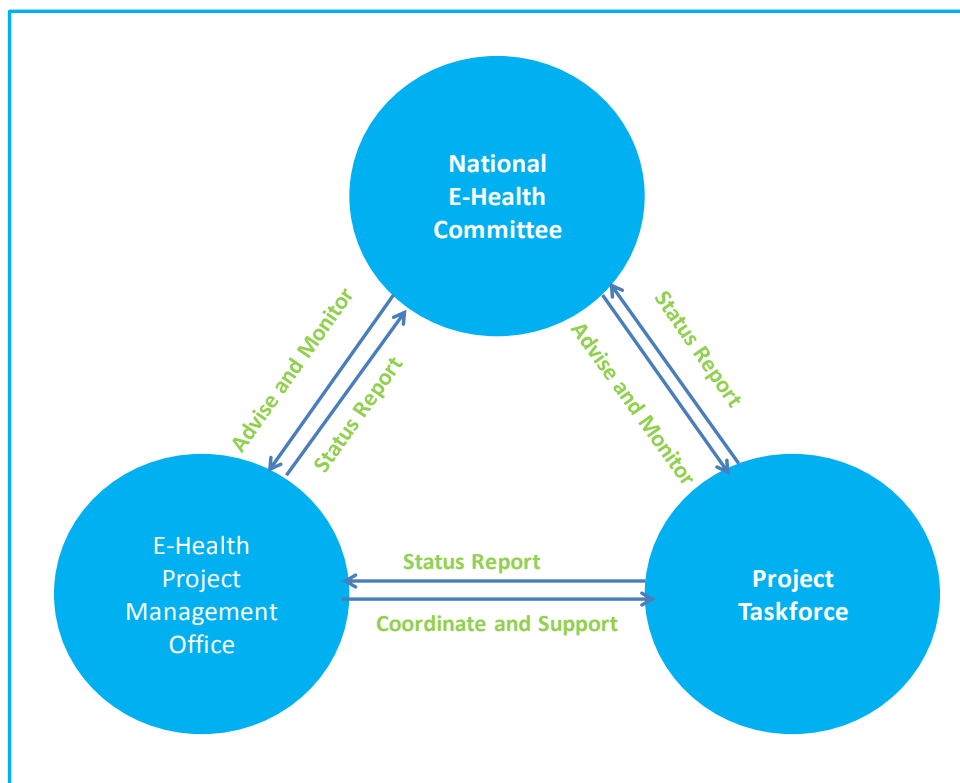


Figure 6 Institutional Framework

been developed. Whereas, usually the first one is outsourced, the second one could also be done by the healthcare bodies themselves, once the necessary handholding has been provided and knowledge transferred. This will not only cut down on costs, but it will also increase ownership and address any domain competencies required at the same time.

COMPETENCIES REQUIRED

Three kinds of competencies are required to perform the functions described above.

1. **DOMAIN EXPERTISE**, or the awareness and the functional knowledge of the health sector and

its activities. This would also cover knowledge of any emerging developments in the sphere of eHealth elsewhere.

2. **TECHNOLOGY EXPERTISE** or the competency required to address all the requirements from a technology perspective, including within its scope, hardware, software, networking and the like.

3. **OPERATIONAL EXPERTISE**, or the competencies required to manage the day to day activities of the national eHealth system with multiple stakeholders, resource constraints, budgetary limitations, and handling the non-technology risks that emerge along the way.

3.3.1 INSTITUTIONAL FRAMEWORK FOR EHEALTH IMPLEMENTATION

Figure 6 brings out the main elements of the institutional framework required for the implementation of the eHealth strategy.

The **National eHealth Committee** be the body responsible for the “Advisory and Coordination” functions.

For project management functions, a **Project Management Office** would be formed to be a dedicated team responsible for the implementation of the eHealth initiatives.

For operational functions, all projects identified as part of this strategy will have **committees and taskforces** responsible for its implementation. These will be or represent the actual organisation where the actual eHealth solution is being

implemented. For example, if a solution needs to be implemented at the Transport Division, then the project taskforce/committee will comprise representatives from the division while the ProMO will oversee the implementation.

The ProMO will be responsible for getting eHealth solutions developed by outsourced contractor. The ProMO will be responsible for all support and maintenance activities on eHealth.

Therefore, while the ProMO will take charge of all development and implementation activities, the committees/taskforces will be responsible for operationalising the solutions in the user departments.

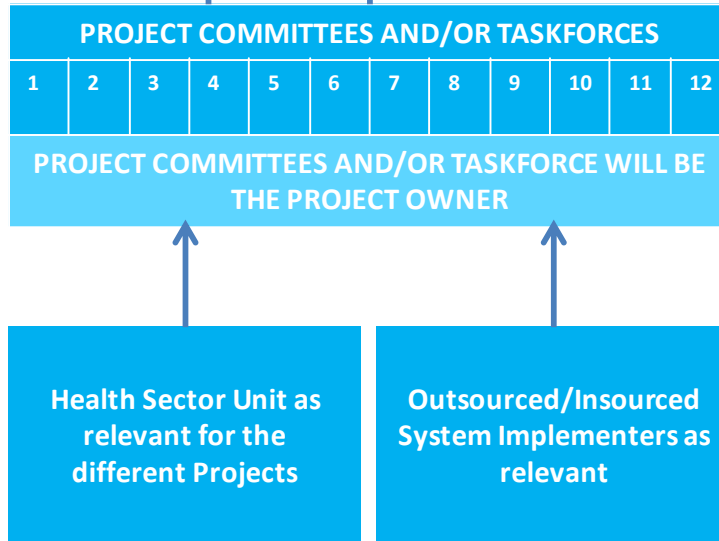
Figure 7 represents the complete institutional constitution.

Three large competency areas for operationalisation of He@lth 2015 are (a) Domain Expertise, or knowledge of the health sector activities, (b) Technology Expertise, or knowledge of the technologies deployed for eHealth, and (c) Operational Expertise, or the day-to-day project management required to ensure sustained adoption and use of eHealth by stakeholders.

NATIONAL E-HEALTH COMMITTEE



- Constitution of the ProMo will take some time, the Independent Programme Managers (IPM) have been suggested as a stop-gap arrangement to ensure that delay in implementation is minimised.
- IPM to undertake necessary handholding arrangements to ensure smooth transition to ProMo
- Project Committees and Task forces to take overall responsibility of projects and constituted by the NeHC as one of the first things in its implementation agenda
- Work on the portal development will most likely need to get outsourced to portal development specialists, however, operating the portal on a continual basis could be taken up internally since this will necessarily involve substantial and continual consultations with stakeholders.
- At the time of constitution of the Project Committees and taskforces, it should be borne in mind that representation from the IPM/ProMo be necessarily included into it, though the task force/committee would best be chaired by a representative from a health sector organisation.



Independent Programme Managers are a method being used to ensure that project management activities do not suffer for want of a ready group of people within the sector to facilitate the implementation process. They would also bring in the required levels of expertise, independence and neutrality into the vendor selection process.

Figure 7 The Complete eHealth Institutional Framework

4. Recommended Technology Systems

Technology systems recommended fall in four broad areas

- Clinical Information Systems;
- Administrative Information Systems;
- Portal Information Systems; and
- Management Information Systems.

4.1 Clinical Information Systems

Systems for better clinical management systems are essentially those that bring about seamless continuity of care to patients among different healthcare facility. These systems are strongly clinical in their content and revolve around the patients' record, and are supported by such other systems like the pharmacy, disease surveillance, radiotherapy and appointments and scheduling. The following modules are proposed.

PATIENT REGISTRATION

This is the first point of contact of the patients with the healthcare unit. The patient or an accompanying person registers the patient by providing the particulars of the patient.

ELECTRONIC MEDICAL RECORD

Based on the information provided at the Patient Registration, an Electronic Medical Record is generated which is a single file that moves with the patient within and outside the healthcare unit (if required). This medical record is appended to

whenever a diagnosis is made or follow up done or the patient gets treated.

SCHEDULING & APPOINTMENT

Based on the details of discomfort provided by the patient at Patients Registration, he / she is scheduled or allotted an appointment with concerned medical practitioner. Scheduling is done in such a manner so as to reduce the practitioners' idle time in the healthcare unit.

PATIENT ADMISSION, BED AND WARD MANAGEMENT

An inpatient is required to be admitted in the healthcare unit. Bed and Ward Management is the allocation and provision of wards and beds in a hospital where beds in specialist wards are a scarce resource. It is done in a manner to ensure maximum bed / ward occupancy rates.

NURSING CARE

Once an inpatient is admitted, \ medical care is ensured by nursing officer by recording vitals and ensuring the timely



medication of the patient as prescribed by the medical practitioner.

LABORATORY & BLOOD BANK MANAGEMENT

A patient needs to undergo various tests in a pathology lab as prescribed by the medical practitioner. Once the patient has undergone these tests reports pertaining to these tests is sent by the pathology laboratory to the medical practitioner. The Blood bank is linked to the Laboratory and its services are availed if blood is required by a patient. On the other hand a donor can register him / her and donate blood to the blood bank.

PHARMACY MANAGEMENT

The medicines that are prescribed by a medical practitioner are supplied by the Pharmacy in the healthcare unit. This Pharmacy has a direct link to the Central Supply Division (Administration) as well which replenishes the stock at the Pharmacy.

MORTUARY MANAGEMENT

If an inpatient passes away or a person is brought dead then he / she is sent to the mortuary in the healthcare unit. This mortuary unit has linkages with Ministry of Social Security (for e.g. pension related), Local government (for e.g. cremation), Ministry of Interior (for e.g. police cases) and Ministry of Civil Status (for e.g. death registration).

CATERING & LAUNDRY MANAGEMENT

Catering and Laundry forms an integral part of Clinical Systems as the diet and hygiene of a patient are controlled as per the prescription of the medical practitioner. This system is directly linked to Bed & Ward Management.

TRANSPORTATION SERVICES

In case of emergency or some other acute cases, Ambulance services are provided by healthcare unit. This service needs to be centralised to ensure maximum occupancy and minimum idle time of Ambulances and drivers.

HEALTH & DISEASE SURVEILLANCE

This module is meant track the visitors to Mauritius for the diseases with which they visit Mauritius and whether the required processes have been followed as recommended.

IMMUNIZATION & VACCINATION

This module manages the administration of immunisation and vaccination to the citizens of Mauritius.

RADIOLOGY MANAGEMENT

Radiology is the specialty directing medical imaging technologies to diagnose and sometimes treat diseases. It has direct links to Bed & Ward Management and also with the Laboratory & Blood Bank Management.



4.2 Administrative Information Systems

All administrative processes including financial should be integrated using technology in such a manner so that they communicate not only amongst themselves

but also with other clinical information systems. Typically these systems will be those that are not clinical in their content like file tracking systems in the ministry,

license management systems, asset management systems, equipment management systems, personnel information systems and financial management systems.

FINANCIAL MANAGEMENT SYSTEM

This module would cater to the complete requirements related to the financial information needs of the MoHQL, including the budgetary allocation, the expenditure made, the bills processed and the like.

HUMAN RESOURCES MANAGEMENT

This module takes care of information related to complete human resources in MoHQL, which would cover the skillsets available in the ministry, the capability building requirements for the same, their compensation structure, remuneration processing and the like.

INVENTORY MANAGEMENT

This module would involve management of the information related to inventory in MoHQL, that is, the movable assets other than those of drugs and medicines.

REGISTRY MANAGEMENT SYSTEM

This would be largely based on document management system that will help track

the movement of files and other communication received in the ministry.

FIXED ASSET MANAGEMENT SYSTEM

This module would involve management of the information related to inventory in MoHQL, that is, the fixed assets that are present and are owned by the MoHQL.

MEDICAL EQUIPMENT MAINTENANCE MANAGEMENT

This module would capture all details related to the maintenance of medical equipment in the MoHQL.

PHYSICAL FACILITIES MANAGEMENT

This module would cater to the management of physical facilities present and owned by the MoHQL and would include such assets as buildings etc.

LICENSE MANAGEMENT SYSTEM

Selling of food items in Mauritius requires acquiring a license from the MoHQL under which to undertake such activities in Mauritius. This module would take care of all the informational requirements pertaining to the same.



4.3 Portal Information Systems

User centricity of information dissemination in healthcare sector is of utmost importance. The information provided to the various stakeholders through information dissemination needs to be latest and up-to-date and at the same time in-sync with other clinical and

administrative information systems. As such, there also needs to be a single-point reference for all healthcare related information in Mauritius. The national eHealth portal is expected to fulfill this requirement.



HEALTHCARE PROVIDER CENTRIC INFORMATION AND SERVICES

This comprises information and services typically required and used by healthcare providers including doctors, nurses, paramedical staff and the like.

HEALTHCARE SUPPLIER CENTRIC INFORMATION AND SERVICES

This includes information and services typically required by healthcare suppliers including medical supply-oriented business

units, pharmacies and other drugs and equipments suppliers; at a generic level this would also include other suppliers of non-medical equipments.

HEALTHCARE USER AND CONSUMER CENTRIC INFORMATION AND SERVICES

This consists of information and services typically required by healthcare users and consumers like patients, buyers, government bodies and the like

4.4 Management Information Systems

Once all the systems for clinical, administration and information dissemination are in place and there is a smooth flow of information amongst these systems, the management decision making would be made easy. Specialised decision-support systems capable of inferring trends and doing such other statistical analyses as may required for policy formulation is conceptualized for the purpose.

BUDGETING

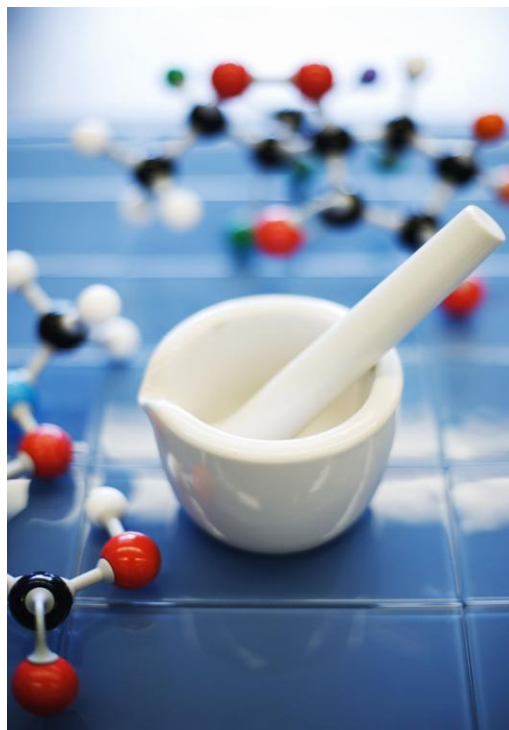
This includes the set of information and services that are related to decision-making on budgetary requisitions, allocations, expenditure, monitoring and evaluation of the same and informing future decision-making based on past trends.

GEOGRAPHICAL INFORMATION SYSTEMS

This consists of the set of information systems that work as a significant aid to decision-making as described above, that will work as a visualizing and query tool towards facilitating multi-dimensional decision-making as described above.

DATA WAREHOUSE SYSTEMS

This comprises the set of information and services that are related to decision-support where many variables need to be taken into account towards deriving trends and other statistical analyses aimed at facilitating decision-making at the MoHQL..



4.5 Prioritisation Among Interventions

eHealth implementation is recommended to be taken up in phases (or stages) described here as “Phases”. Phase One and Phase Two from Jan 2011 to 2015 will constitute the complete implementation spectrum for eHealth systems in Mauritius.

This approach will yield the following benefits

- not all ICT initiatives that have been identified are equally important; taking them up in phases will ensure that the ones that are most important are taken up first, benefits and gains from them are visible faster which, in turn, will impart added impetus to the subsequent stages of implementation that are more complex.
- with manpower resources and budgetary allocations being limited the phased approach will ensure that not only is the manpower suitably focused to concentrate smaller chunks of work, but also that the limited budgetary allocations are better utilized.
- Doing the implementation in stages will also mean that if some mistakes become apparent in the early stages of implementation, these can not only be corrected but also that subsequent initiatives in later stages of the implementation stand to gain from these early mistakes. Doing everything all at once will deny agencies this advantage.
- a staged implementation ensures that parts of the implementation are taken, and successfully accomplished before moving on to the next stages. As such, stakeholders do not have to wait for a long time to see the “low hanging fruits” or the early successes. In an all-at-once

approach success necessarily comes much later.

PHASE I CLINICAL & ADMINISTRATIVE SYSTEM IMPLEMENTATION

Implementation plan for clinical system & administrative module which will include:

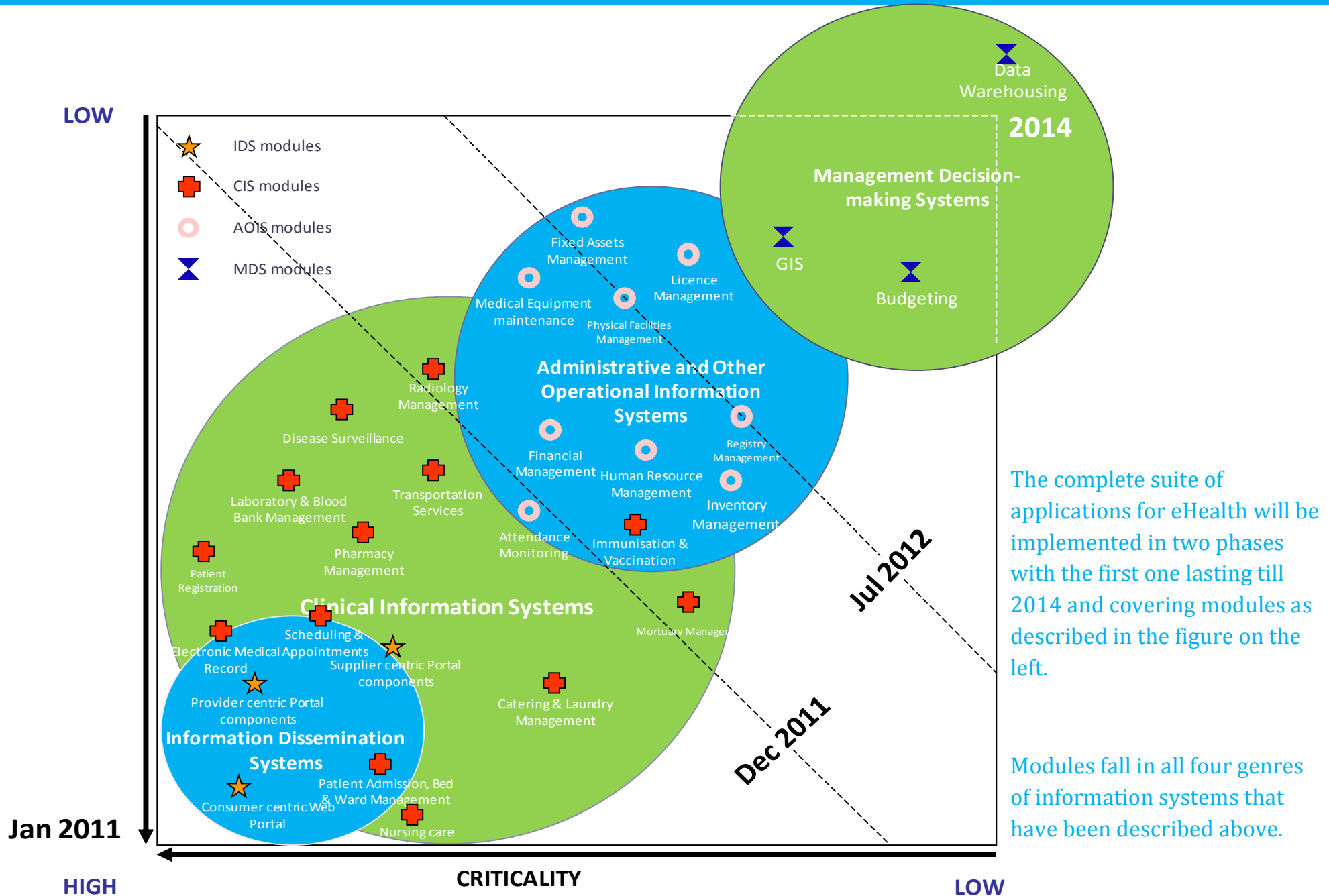
- Patient Registration
- Electronic Medical Record
- Patient Administration, Bed & Ward Management
- Scheduling and Appointment
- Nursing care
- Disease Surveillance
- Laboratory and Blood Bank Management
- Pharmacy Management
- Attendance Monitoring
- Transport Information Network
- Catering & Laundry

PHASE II CLINICAL & ADMINISTRATIVE SYSTEM IMPLEMENTATION

Implementation plan for clinical and administrative system which will include:

- Mortuary Management
- Immunization & Vaccination
- Radiology Management
- Fixed Assets Management
- Medical Equipment Maintenance
- Data Warehousing





5. The eHealth Action Plan

Table 3 eHealth Action Plan

NAME OF THE INITIATIVE	2011				2012				2013			2014				
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Constitution of the National eHealth Committee	█															
Constitution of the eHAP Project Management Office	█															
Finalisation of the First Year Action Plan for the eHAP	█															
(PROJECT ONE) Independent Programme Managers for eHealth Implementation	█	█	█	█	█	█	█	█								
(PROJECT TWO) Communication Initiatives of the eHAP	█	█														
(PROJECT THREE) National eHealth Interoperability and Security Framework	█	█														
(PROJECT FOUR) Health Services Comprehensive Process Manual	█															
(PROJECT FIVE) National eHealth Portal			█	█												
(PROJECT SIX) eHealth System Implementation Phase I			█	█												
(PROJECT SEVEN) eHealth System Implementation Phase II					█	█	█	█								
Operationalisation of the eHealth System							█	█	█	█	█	█	█	█	█	█





6. Conclusion

The importance of the National eHealth strategy is enormous. Its successful implementation will decisively influence the uptake and adoption of ICT in the health sector. A failure to implement the same may also do irreparable damage.

Today, as we take stock of the current state realities, it increasingly emerges how ineffective piecemeal efforts can be. Failure to define an overarching national level strategy, in which the different ICT components must belong, robs initiatives any sectoral ownership and leaves them at the hands of individual organisations. This national level eHealth strategy with almost a sector-wide participation and ownership is an effort to fill this gap. Stakeholders stand to benefit through participation in this endeavor through win-win relationships.

At the same time, definition of this strategy has, perhaps for the first time, afforded the opportunity to look at ICT issues in the health sector in their totality. Interventions have been outlined not only in the technology dimensions, but also in other areas including those of processes, organisational and institutional capacity building, and awareness dimensions. The treatment is holistic and the approach step-by-step. Think Big, Start Small and Scale Fast has been the influencing mantra.

For the implementation, though, it must be said that getting the complete and combined buy-in of all participating stakeholders may yet prove difficult to obtain. In light of this, the greatest possible participation needs to be built without unduly compromising the pace of implementation. Successful implementation will automatically co-opt those of them that do not make it in the initial stages. Another temptation that must be resisted at all costs is possibility of the plan being implemented only in parts. Components of the action plan are too tightly knitted together to allow that.

Implementation would also engender its own set of problems and issues, anticipating all of which is difficult at this stage. Implementers will need to be fully prepared for such emerging realities and armed with corrective measures required to address them. The plan, therefore, is evolutionary, as against revolutionary, and necessarily requires that the emerging situation be periodically visited as soon and as frequently as it may be affordable to discover emerging glitches, iron them out and identify new approaches that need to be followed



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