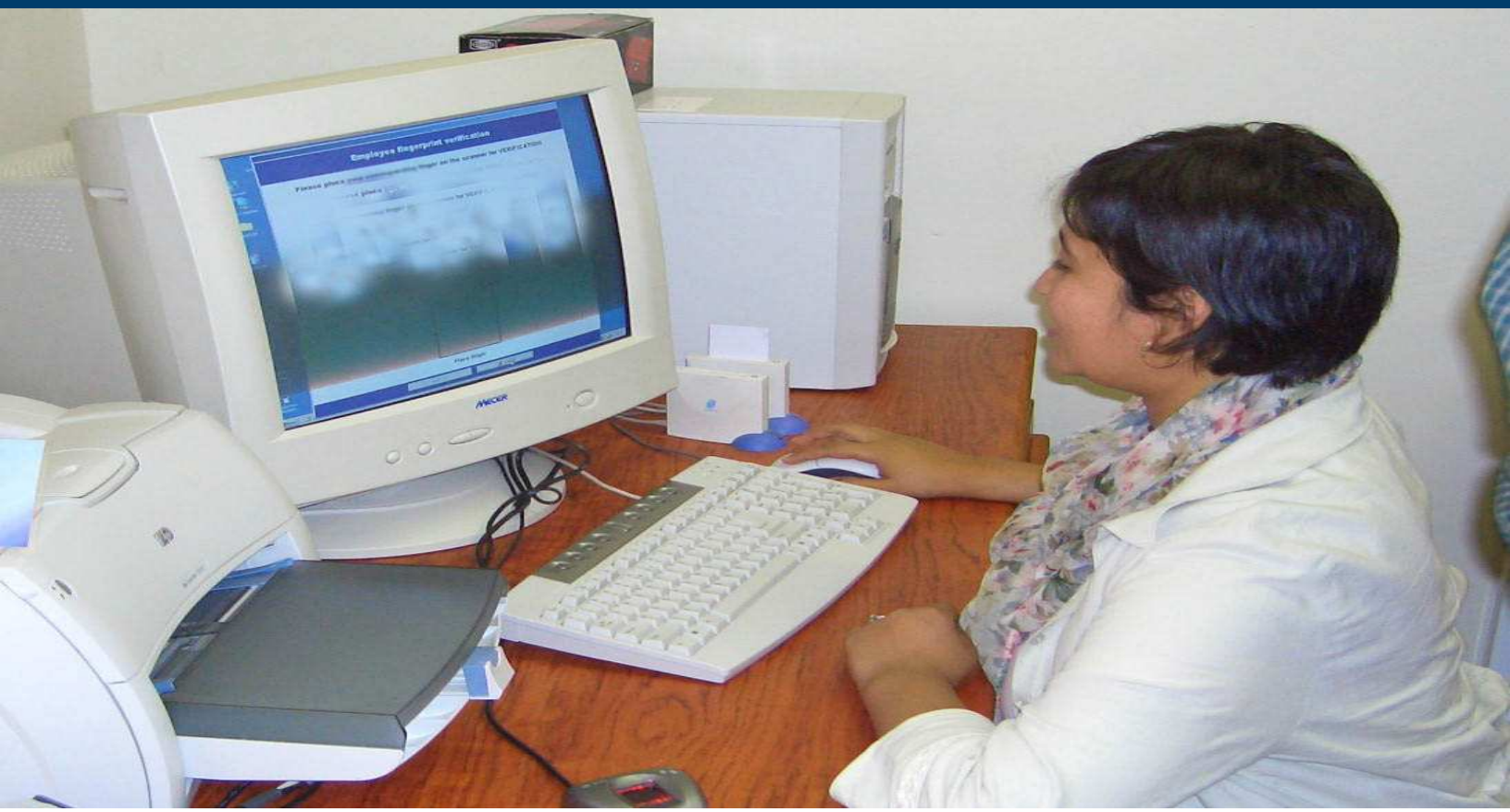
USAID | DELIVER PROJECT

COMPUTERIZING LOGISTICS MANAGEMENT INFORMATION SYSTEMS FOR HIV TESTS, LABORATORY SUPPLIES, AND ARV DRUGS

LESSONS LEARNED FROM KENYA AND UGANDA



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ACRONYMS

AIDS	acquired immunodeficiency syndrome
AMC	average monthly consumption
ART	antiretroviral therapy
ARV	antiretroviral drug
CMS	central medical stores
FEFO	first expiry, first out
HIV	human immunodeficiency virus
ICS	inventory control system
IT	information technology
JSI	John Snow, Inc.
KEMSA	Kenya Medical Supplies Agency
LMIS	logistics management information system
LMU	logistics management unit
MOH	ministry of health
MOS	months of stock
NMS	National Medical Stores
NPHLS	National Public Health Laboratory Services
PMTCT	prevention of mother-to-child transmission
SCM	Supply Chain Manager
SDLC	software development life cycle
SDP	service delivery point
SKU	stock keeping unit
SOH	stock on hand
SP	software programmer
US	United States of America
USAID	U.S. Agency for International Development
VCT	voluntary counseling and testing

INTRODUCTION

Designing and implementing Logistics Management Information Systems (LMIS) for HIV tests, laboratory supplies and antiretroviral drugs (ARVs) is occurring in increasingly complex environments, with multiple funding and implementing partners. Although managing a logistics system still requires recording, reporting, analysis and use of the three essential data elements (stock on hand, losses and adjustments and rate of consumption), there are a number of additional data elements that are being collected to manage the three commodity categories. Furthermore, although a manual system can still suffice, service providers have an increasing range of responsibilities, and many countries are exploring computerization of LMIS as a way to reduce the burden on service providers at facilities and to provide timely and accurate data for logistics decision-making as well as for advocacy and resource mobilization.

While computerized LMIS can greatly facilitate the work of supply chain managers, the implementation of software packages can be costly and time-consuming, requiring planning and management to achieve optimal outcomes. For countries with scarce resources to invest in public health program management, limited access to skilled workers and extremely dynamic HIV/AIDS programs, it is imperative that such initiatives be well-planned, managed and informed of potential pitfalls along the way, so as to minimize costs and maximize benefits.

John Snow, Inc. (JSI), through the DELIVER project (2000-2007), USAID | DELIVER PROJECT (2006-2011) and other projects, is working with a number of national HIV/AIDS programs that have chosen different strategies and tools for computerizing the LMIS at the central level for HIV tests, laboratory supplies and ARV drugs. Two of the national programs that have experience with LMIS computerization are those of the ministries of health in Kenya and Uganda. Kenya has a custom built Oracle-based software that is housed in the central medical stores, Kenya Medical Supplies Agency (KEMSA), and operated by JSI and KEMSA staff. The tool has two linked modules for LMIS and inventory control and is currently used for the majority of donated commodities. In Uganda, the program has adopted a pre-existing software package, *Supply Chain Manager* (SCM), and has customized the software to manage HIV tests and ARV drugs through the National AIDS Control Program. Both countries use at least one other software package for related functions at different levels in the supply chain to address issues including warehousing, financial and human resource management and ARV drug dispensing.

As countries continue to expand HIV/AIDS programs and the corresponding supply chains that support them, there will be an increased need for user-friendly tools and software packages to support the management of logistics information to provide timely, accurate data that can be used for decision-making. This paper provides insights and lessons learned from JSI's experience in implementing computerized LMIS for two national programs. It identifies some of the considerations and requirements for planning the computerization of LMIS for these commodity categories, ultimately to enhance informed decision-making.

METHODOLOGY

A team, comprised of an information system specialist, two logistics advisors, and an information technology analyst, assessed three aspects of the computerized LMIS's used in Uganda and in Kenya: 1) whether the computerized system met a minimum standard of functionality required to manage HIV tests, laboratory supplies and ARV drugs; 2) whether the process – the development of the computerized system – followed software development standards; and 3) whether the computerized system was ultimately being used by the people for whom the system was built. More detail regarding each of these three areas of assessment follows.

LMIS STANDARDS

The team assessed whether the product – the computerized LMIS – was sound (i.e., could provide the logistics functions expected of any LMIS). The team utilized guidelines developed by USAID | DELIVER PROJECT regarding good logistics management systems and the computerization of LMIS. The team applied these guidelines as criteria to evaluate each system by documenting HIV/AIDS logistics management standards in the form of system "use cases". The use cases are descriptions, by function, of what any computerized LMIS should be able to do (see Appendix 1). These functions were described step-by-step, separating what the user of the system should do from what the computerized LMIS should capture, calculate or display.

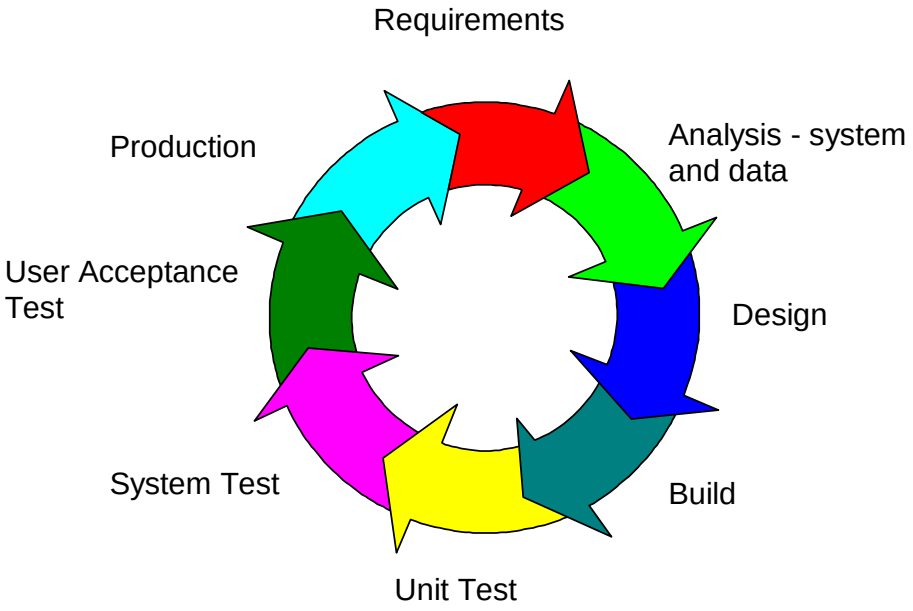
After establishing the criteria by which the systems could be reviewed, the team then compared these standards to the Uganda and Kenya systems and identified any gaps in functionality. After interviewing system managers, the team noted any reasons for the gaps. In this way, the rigorousness of the LMIS as a product was assessed.

SOFTWARE DEVELOPMENT PROCESS

The team reviewed the process that was used to develop the product in order to determine whether an efficient process and quality product had been developed. To do so, they adopted the framework of the software development life cycle (SDLC) as their overarching guide (see Figure 1). This entailed reviewing whether the step-by-step process of developing requirements, conducting the analysis, designing and building the system and quality assurance testing were followed prior to making the system available to users. By following each step of the SDLC, a project developing a computerized system has a greater chance of building an end product that meets the needs of the users, as well as being more efficient in the development itself.

A key component of the SDLC is various levels of testing. During unit testing, the developer usually conducts tests on the new pieces of code to ensure that the required functionality has been properly captured in the new code. During system testing and user acceptance testing, developers and users run through the work that is done on a daily and periodic basis to make sure that the entire system performs and supports their needs. As can be seen below, Figure 1 depicts the software development life cycle as a continuous process; this is true since software must be updated and adapted to environmental changes over time.

Figure 1. Software Development Life Cycle



USERS AND USES

The team also assessed whether the system was being used by the right people given the original intention and system design. They identified who the intended users were, ascertained the information that each group of users needed in order to do their work, determined the availability of that information to users, and interviewed both internal JSI and external, e.g., MOH, users and clients. After learning about the level of utilization of the system by the intended users, the team also explored barriers to increased use.

Thus, this three-pronged methodology aimed to answer the following broad questions:

- Does the computerized LMIS manage HIV/AIDS products well?
- Was the computerized LMIS implemented efficiently?
- Ultimately, is the computerized LMIS useful?

The background from the review and results follow.

BACKGROUND

Given the relative newness of computerization of LMIS for national HIV/AIDS programs, there are few documented lessons for countries undertaking such initiatives to learn from. The experiences from Kenya and Uganda are by no means comprehensive in terms of lessons learned. However, both countries and programs are facing challenges that are common to many resource-limited HIV/AIDS programs, and many of the lessons are pertinent across a variety of settings. Kenya and Uganda were selected because the data and information about experiences were relatively easily obtained and because their significant differences in implementation of both product and process make for very informed learning. The team chose to focus only on JSI software packages, and specifically only on computerized LMIS products (rather than off-the-shelf or other customized software packages used for inventory and warehouse management) since the majority of requests for technical assistance and support received by the USAID | DELIVER PROJECT and other project field offices are concentrated in the area of LMIS computerization. An increasing number of countries in which JSI provides supply chain management support for HIV/AIDS commodities are exploring computerization solutions, and a primary purpose of this review was to inform the support and advice JSI logisticians will provide to country programs facing choices in the computerization of LMIS.

KENYA

In Kenya, the Ministry of Health (MOH) and its partners began to focus on the idea of funding the development of computerized systems for HIV/AIDS commodity management in 2001. The DELIVER project Kenya office was asked to undertake the system design and implementation process and eventually opted for a custom-built Oracle-based computerized inventory control system (ICS) and LMIS. Both modules in the system integrated the management of all supplies at the KEMSA warehouse in a single database. KEMSA is the central medical store for the country and houses the current version of the application.

LOGISTICS SYSTEMS

Table 1 summarizes the three logistics systems that were reviewed in Kenya. In addition to the commodity categories listed below, the computerized LMIS also manages data for reproductive health supplies, contraceptives, tuberculosis drugs and other essential medicines.

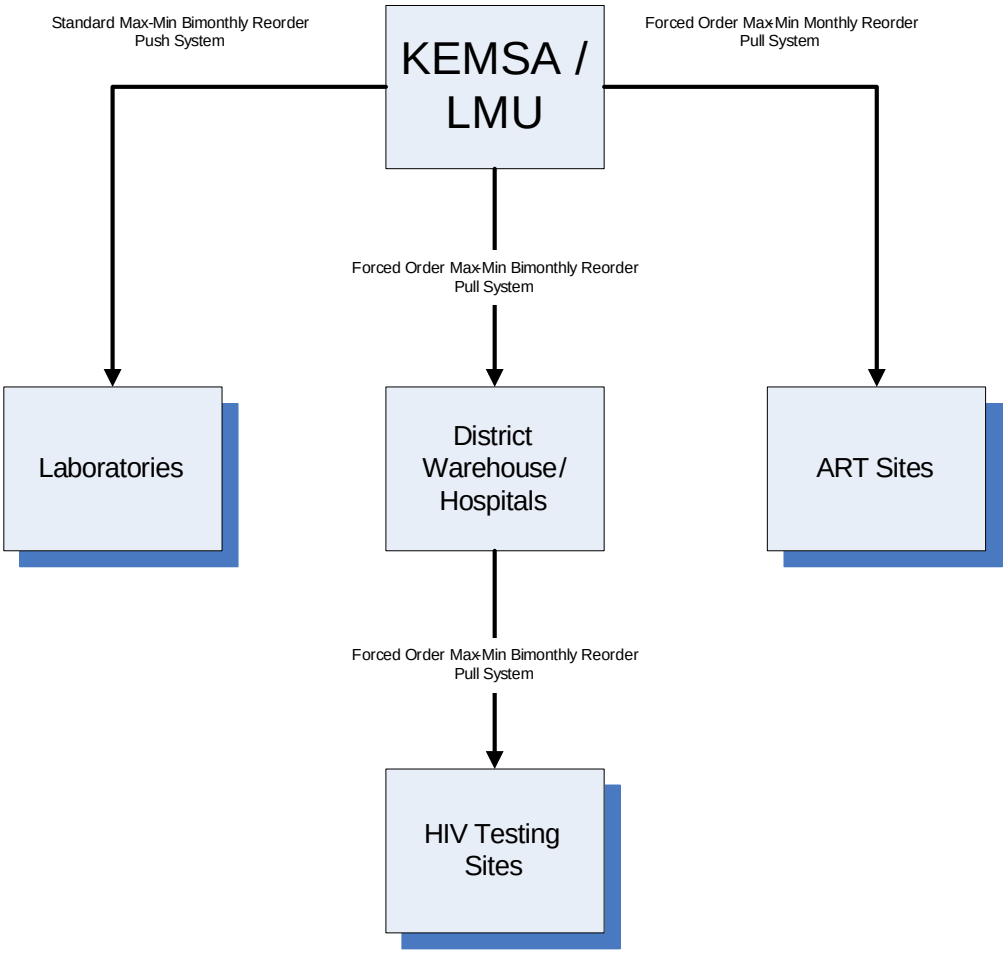
Table 1. Kenya Logistics Systems

	ARVs	HIV Test Kits	Lab Supplies
Design	Pull	Pull	Push
Ordering/ Review Period	Monthly	Bi-monthly	Bi-monthly
Max/Min	Forced ordering	Forced ordering	Standard
Levels	Two – KEMSA to SDPs	Three – KEMSA-Districts-SDPs	Two – KEMSA/ NPHLS-SDPs

The ARV and HIV test kit logistics systems are designed to be pull systems, meaning that the quantity of a commodity to be ordered is determined by the person placing the order (at the

facility and district levels, not at the central level in this case). The laboratory supply logistics system is designed to be a push system where the resupply quantity is determined by the person filling the order at the central level. Both HIV test kits and laboratory supplies are reordered on a bi-monthly basis (every other month), while ARVs are ordered monthly. The ARV and HIV test kit logistics systems are both a forced ordering max/min inventory control system, meaning that all of the supplies are reordered during each reorder period up to the maximum stock level. The laboratory supply logistics system follows a standard inventory control system where only the supplies that have reached the minimum stock level are reordered. Finally, the ARV and laboratory supply systems both have two levels, the central and the service delivery point (SDP). None of these supplies are stored at intermediate warehouses such as at the district level. The HIV test kits system has three levels with the district warehouse as the intermediate level, where products are stored and orders are calculated. Figure 2 depicts the three supply chains for managing HIV tests, ARV drugs and laboratory supplies in Kenya.

Figure 2. HIV Tests, ARV Drugs and Laboratory Commodity Supply Chains in Kenya



DEVELOPMENT OF COMPUTERIZED LMIS

As mentioned, the idea for a computerized LMIS in Kenya emerged in 2001, and a number of different software packages were explored before the custom-built solution was selected. The process of selection was characterized by transitions in leadership and changes in funding. Over the course of five years, this effort was funded by three different sources, each with their

own objectives. As a result, throughout the software development process there were multiple funders requesting different enhancements and outputs to the system. Further complicating factors included changes to the manual logistics system design for HIV tests and ARV drugs and changes to the design of the manual records and reports used to collect and transmit data to the central level. The computerized LMIS had to accommodate these changes in data inputs as well as resolve the fact that not all data inputs were collected across all commodity categories.

The resulting computerized LMIS was complex and difficult to navigate because the vision of the system was not defined from the start. Furthermore, there was no individual designated to manage and negotiate the funder-driven needs to ensure that all changes were in line with the ultimate vision of the software. In addition, multiple partnerships with the MOH and KEMSA formed during system development, which only increased the complexity of the system. Thus, the resulting software product assessed by the team did provide the required information, but did not do so in a user-friendly manner. Following the assessment, however, members of the team that reviewed the software took on the role of product manager, gathered input from users about requirements and shared these with the software programmer, who was able to implement the majority of the changes and recommendations suggested in a fairly rapid manner. As a result, the current version of the software is vastly improved and has a number of new, improved features that enable information to be accessed in a more user-friendly manner.

UGANDA

The MOH of Uganda, with JSI, preferred to utilize and customize an existing software program for computerized LMIS called Supply Chain Manager (SCM). SCM is a program built using Microsoft Access that was developed for the central level management of LMIS data. SCM was chosen with the option to customize it to the needs of Uganda and to the management of HIV/AIDS commodities. Uganda does not currently use SCM for the management of laboratory supplies because these commodities are not managed following the principles of a full supply logistics system. The resupply quantity for laboratory supplies in Uganda is determined using a rationing formula based on facility priorities, not on past usage of commodities.

LOGISTICS SYSTEMS

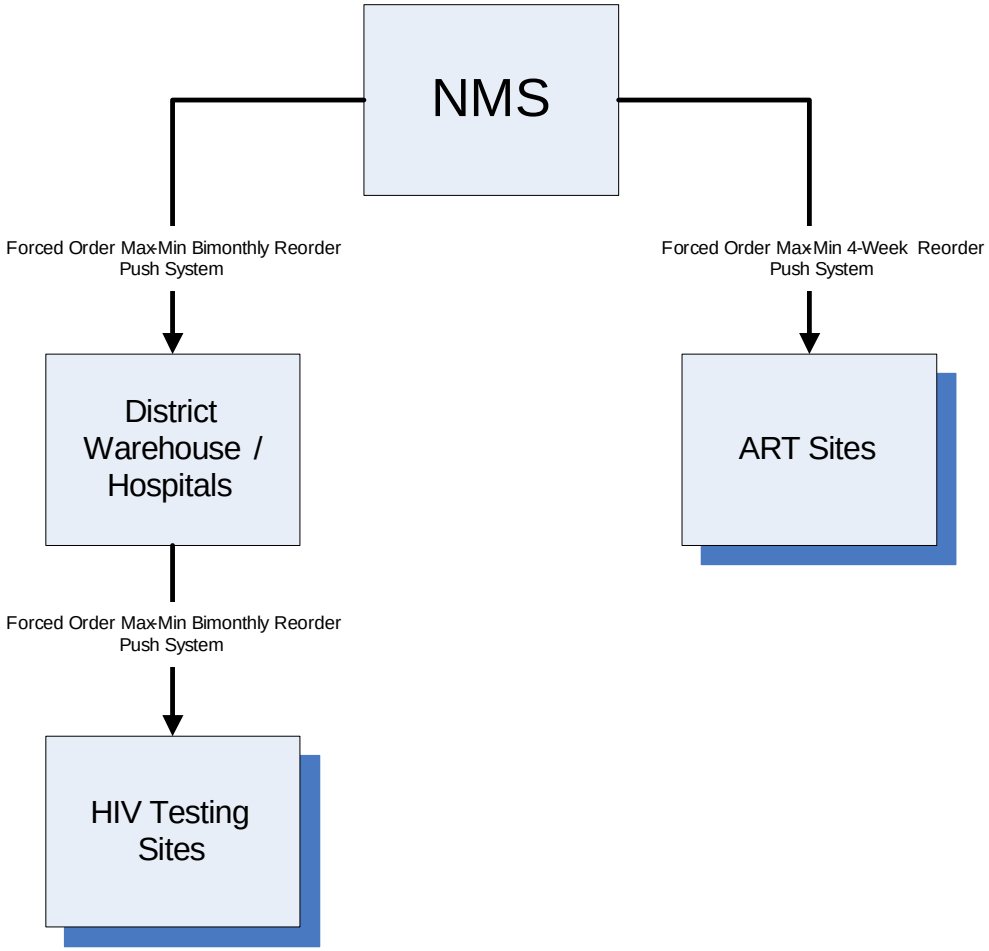
Table 2 summarizes the two logistics systems reviewed in Uganda.

Table 2. Uganda Logistics Systems

	ARVs	HIV Test Kits
Design	Push	Push
Ordering/ Review Period	Four weeks	Bi-monthly
Max/Min	Forced ordering	Forced ordering
Levels	Two – NMS to SDPs	Three – NMS-Districts-SDPs

The two logistics systems are designed to be push, forced-ordering systems. The ARV system has a review period of every four weeks while the HIV test kit system is bi-monthly (every other month). Finally, the ARV system has two levels, the central and the service delivery point (SDP). None of these supplies are stored at intermediate warehouses such as at the district level. The HIV test kits system has three levels with the district warehouse as the intermediate level. Figure 3 depicts the two supply chains for managing HIV tests and ARV drugs in Uganda.

Figure 3. HIV Tests and ARV Drugs Supply Chains in Uganda



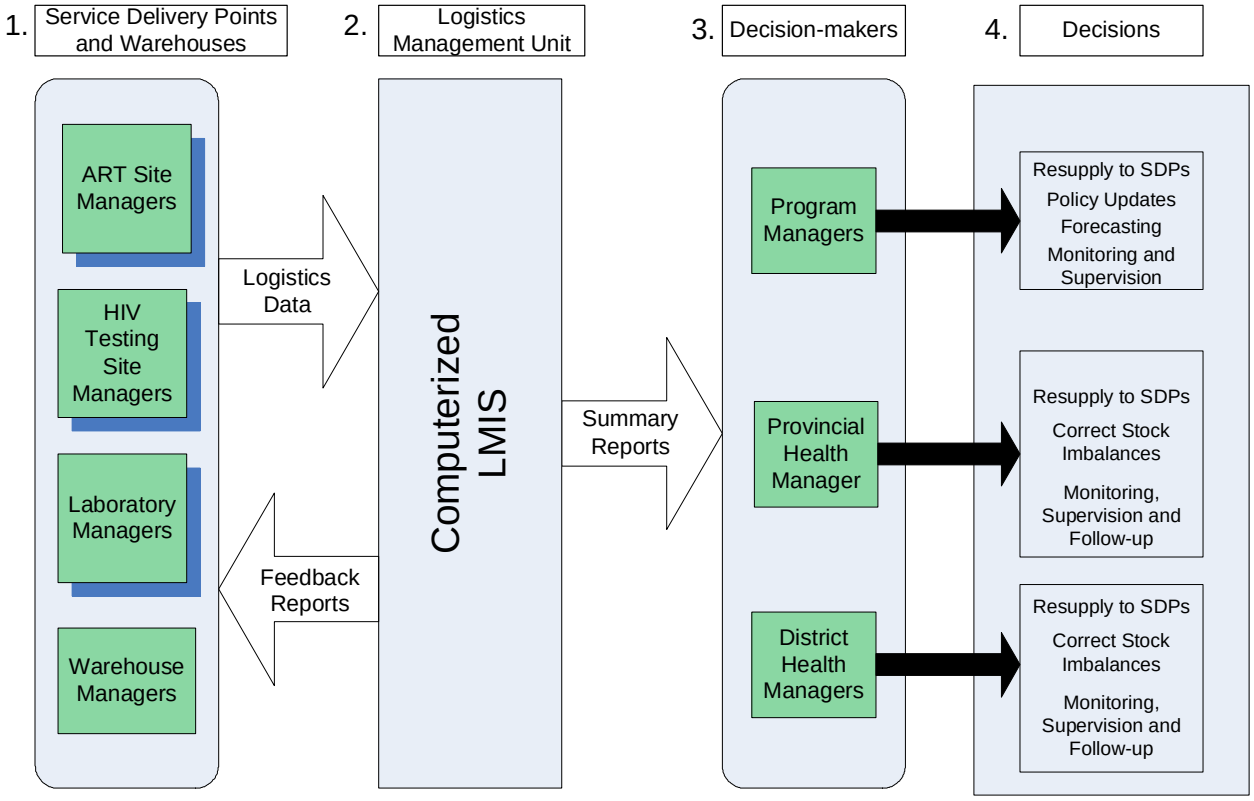
DEVELOPMENT OF COMPUTERIZED LMIS

SCM was customized by a US-based software programmer based on feedback from Uganda-based staff. These changes adapted the software in a way that supported the management of ARVs and HIV test kits and also that matched the structural requirements of the Uganda logistics system. Customization of SCM was funded by a single donor and managed by one in-country product manager. The vision of the system was developed and managed by the DELIVER project with input from the MOH. SCM customization in Uganda took place over a two-year period and is still ongoing as the need for more options arises. SCM has been instrumental in streamlining the resupply process and in maintaining national logistics data. As successful as SCM has been, there are serious constraints to the use of SCM, such as the lack of an inventory control system (ICS) and limitations to certain reports. As a result, much of the SCM data must be exported to Excel and reorganized or married with data from another system (the NMS ICS software) in order to make management decisions on resupply.

LESSONS LEARNED

The desired outcome of a computerized LMIS is a user-friendly system that meets the LMIS requirements and is used by the appropriate people to make informed logistics decisions. The right information needs to flow from the point-of-use to the computerized LMIS in a timely manner, and be converted into information that can be used for decision-making at all levels of the system. Figure 4 below provides an illustrative example of the information flow in a typical LMIS.

Figure 4. Information Flow in an LMIS



Information flows through Steps 1 – 4 at which point decision-making impacts future logistics data and the cycle begins again.

Achieving the desired outcome of a computerized LMIS can be challenging. Five lessons learned from the implementation of computerized LMIS programs in Kenya and Uganda are summarized below, along with supporting appendices, so that future projects can utilize these messages and tools and with greater awareness and plan for and implement successful LMIS computerization.

I. A CLEAR VISION IS KEY TO THE SUCCESS OF A COMPUTERIZED LMIS.

Each of the lessons outlined below depend on one critical element: development of a vision. The current situation and resulting requirements of a computerized LMIS will likely change in the near future, particularly with regards to rapidly changing HIV/AIDS programs. Although

predicting the future is not possible, having a clear vision of what the future will likely hold is important to guide the development and choice of a computerized LMIS.

CREATE A VISION TOGETHER WITH KEY USERS/STAKEHOLDERS

- Don't just think of today, build for the future! Consider your five-year horizon.
- What products will be managed now and in the future?
- Who needs to receive and manage the logistics information for decision-making?
- How stable is the manual LMIS/logistics system? What are the changes that are expected in the future?

Neither the Kenya nor the Uganda system was developed using a thorough vision as the basis for moving forward. Thus, both required a very strong administrator, and in some cases a significant amount of interpretation of the processed data, to ensure that the information provided to decisionmakers was available in an understandable format. Using user-friendliness as a criterion for assessing system quality, it is apparent that both systems can benefit from improvement in this area. The existence of a clear vision and strategy informs implementation according to the software development cycle (Figure 1) and enables the development of a user-friendly program that meets user requirements.

The visioning process is important for characterizing the logistics system and identifying computerized LMIS current and future needs. Some important considerations include: the list of current and future products; the map of data flow in and out of the system (as seen in Figure 2); and computerized LMIS report formats. One major role of the visioning exercise is to determine and clarify expectations of policymakers and users of the system by identifying the financial, technical and human resources available and ensuring that these are adequate to develop or customize a computerized LMIS that meets the country requirements. The process of developing the vision is as important as the ultimate outcome since it will ensure that the decisionmakers are aware of trade-offs involved in developing a custom-built software or customizing existing software packages to meet the country or program needs. For more information about creating a vision, see Appendix 2.

II. EXPECTATION MANAGEMENT IS CRITICAL, PARTICULARLY IN THE CONTEXT OF HIV/AIDS COMMODITY MANAGEMENT.

The two most common expectations that are not managed appropriately are requirements (i.e., what the computerized system needs to do) and time. Everyone that comes into contact with a computerized LMIS will have expectations about how the system will work, what information it will provide, how the information will be provided and when the system will be completed. Many HIV/AIDS programs are under pressure to provide positive results in a short amount of time. Managing these expectations requires strong leadership from a dedicated product manager.

THE PRODUCT MANAGER IS PIVOTAL TO MANAGE EXPECTATIONS.

The users of a computerized LMIS in public health settings vary from data entry clerks to MOH program managers (see Appendix 5 for a sample table of LMIS users). It is important from the start to understand that the computerized LMIS will not meet every request and enhancement that is made by the various users. One major responsibility of the product manager is to manage these requests and enhancements. The product manager is the interpretational link between the user and the software programmer. In general, the product manager should:

- Gather requests, enhancements, and requirements
- Prioritize requests, enhancements, and requirements
- Discuss implications of changes with software programmer
- Communicate changes that will be made with the users and explain why some changes are not possible.

Some requests from the users will not be possible to fulfill for one of the following reasons: because of limitations of the software; because fulfilling the requests would mean sacrificing a critical component of the software; or because these requests are not as high of a priority as other requests, given limited time and funding. The product manager must have the leadership capacity to manage and limit these requests. Appendix 4 provides a sample job description of an in-country product manager.

In Kenya, there was no formalized position for a product manager to serve as the link between the users and the software programmer. As a result, all requests went directly to the software programmer and were not preceded by discussions of priority or implications. The software programmer incorporated as many enhancements as feasible as they were requested. From a user-friendliness point-of-view, the quality of the system suffered because these changes did not tie into an overall vision. Although the users requested the changes, the programmer did not incorporate these changes in a way that ended up being user-friendly and the resulting system was not easy to navigate. Fortunately, subsequent changes to enhance user-friendliness were able to be rapidly implemented, and the system is much improved in terms of this criteria.

CUSTOMIZING AN OFF-THE-SHELF COMPUTERIZED LMIS CAN TAKE AS MUCH TIME AS CUSTOM BUILDING COMPUTERIZED LMIS SOFTWARE.

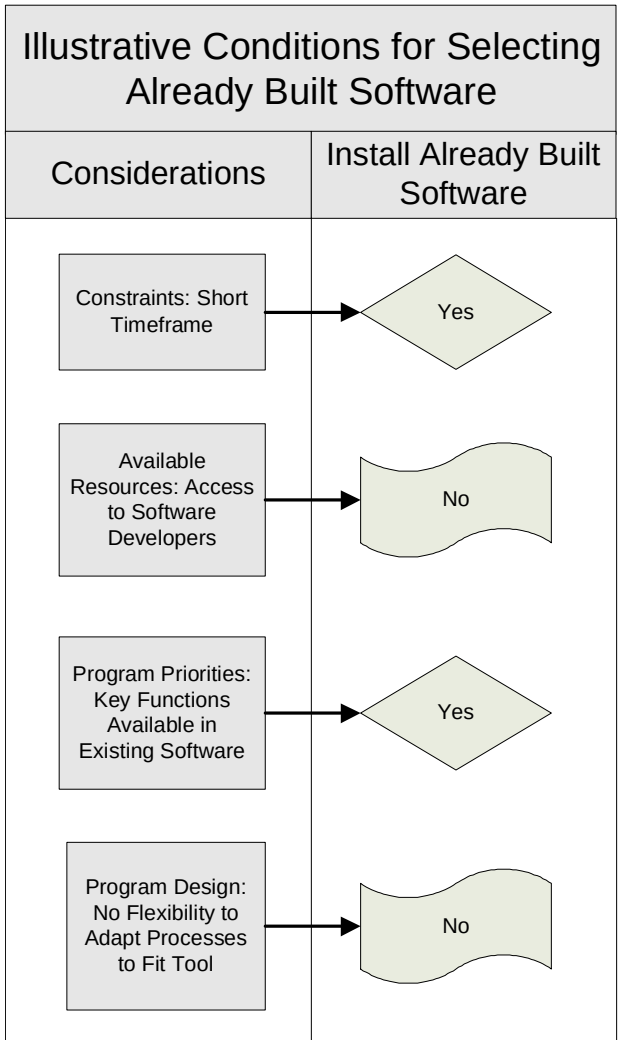
As would be expected, the software development, enhancement and implementation period can be lengthy. During the evaluation process, the team reviewed both a custom-built and a completed (off-the-shelf) software that was customized to meet program requirements. It was expected that custom building software would be time-intensive. An unexpected finding was that customizing the off-the-shelf software application (for the Uganda program) took just as long; however, a different level of resources (both hardware and personnel) was required. In Uganda's case, the program relied upon a software programmer based in the United States who had other competing demands on his time, thus making the process take longer than would otherwise be anticipated. The product manager must ensure that the appropriate time is allocated for enhancement gathering, software development and implementation and that quality, in particular, is not sacrificed for rapid implementation.

NO COMPUTERIZED LMIS WILL MEET EVERY USER'S REQUIREMENTS.

Country-specific needs, changing priorities and program requirements mean that no computerized solution will meet all of the latest requirements. This is especially important to note for already developed software. There might be an expectation that software that has been implemented for HIV tests, laboratory supplies and ARV drugs can be installed for another country's program and meet all of the users' needs. This is unrealistic. However, if a program is flexible (i.e., able to make process changes to meet the software needs), changes to the software can be minimized.

The choice of a computerized LMIS and the amount of customization will depend on program needs and resources. For example, how information is entered and retrieved can depend on program resources. In Kenya and Uganda, both computerized LMIS's have benefits and limitations which reflect program needs and resources. In Kenya, the system is able to manage many different commodity categories and can provide a wider and more complex range of analysis to users. Data in the system is also easier to maintain because all of the data is physically stored in one database. Thus, when a facility is added, it is added once and the change is reflected in all product categories. The limitation of the system was that obtaining aggregated or analyzed data was complex and often not intuitive. The complexity of the Kenya computerized LMIS made it difficult for users to navigate to and find the appropriate report. As with the other changes mentioned earlier, this has since been resolved for the routine reports, which are the reports that users access most on a regular basis.

DEVELOP YOUR STRATEGY BASED ON PROGRAM PRIORITIES, CONSTRAINTS, CURRENT CONTEXT AND AVAILABLE RESOURCES



In Uganda, the software application is simpler (i.e., fewer tables, fewer functions) and can be installed and running in a fairly short timeframe. However, it requires separate databases for each product category. Extracting the information for decision-making by product category is very easy as long as reports by product category are needed. However, because there are multiple databases, national-level reports are not available. In addition, data maintenance is more challenging since any system change, such as adding information about a new facility, must be made in each database.

III. PROPER PLANNING AND IMPLEMENTATION STEPS MUST BE FOLLOWED FOR QUALITY SOFTWARE.

Using tools for software development – such as use cases, involving users in testing the software, following established standards and developing procedures manuals – will help ensure high quality software and data.

In Kenya, omitting testing of the system by users ("user acceptance testing") meant that the system was put into production with serious flaws and the users lost confidence in the system.

In fact, at one point they even stopped using it. Even as the flaws were addressed, managers had to work to convince people to use the system and, over time, gain the users' trust. Similarly, because there was no user acceptance testing when making revisions to the Uganda system, during one of the software upgrades the version was missing core functionality, and critical data could not be entered in a timely manner. Consequently, quality suffered and time was lost in the case of both systems.

IV. IMPLEMENTING A SUCCESSFUL SYSTEM DEPENDS ON HAVING THE RIGHT PEOPLE IN THE RIGHT ROLE MAKING THE RIGHT DECISIONS.

Committed and skilled staff designing, managing, programming and using the computerized LMIS will help contribute to a successful system.

One of the most important roles, as mentioned earlier, is that of the product manager. It is crucial not only that the role exists, but also that the person filling the role has the right profile for the position. First, the product manager must be able to communicate effectively with the software programmer and the users in order to understand and negotiate their respective needs. Of equal importance, the product manager must be an experienced technician and understand the context in which the computerized LMIS is unfolding in order to be able to interpret and translate the user requests into both short- and medium-term implications for the software programmer and for the program itself. The product manager must also be able to interact with users at all levels of the system, from the facility level to senior policymakers and donors, and do so proactively to ensure the system meets their needs. The individual should have the ability to understand when the users' requests are appropriate for the system, and if they are not, to negotiate with the users to ensure they remain committed to the system even though not all changes will be implemented.

In Uganda, the Supply Chain Manager software had a strong product manager. This manager was connected to the right people in the MOH as well as other external clients to ensure that the changes made to Supply Chain Manager were appropriate for the program, met the users' needs and were presented in a manner that ensured their use for decision-making. Without the product manager, the critical logistics information that was captured by Supply Chain Manager would likely have been neglected by some key decisionmakers. This critical position made the system implementation and ongoing use successful in Uganda.

In Kenya, because of the lack of a formal role of a product manager, the software programmer often adopted a secondary role of anticipating policymakers' needs and conducting advocacy with a broad range of users about the potential utility of the system. The users included project officers who manage the routine resupply decision to the facilities as well as other MOH program managers. However, the programmer was not empowered to fulfill the range of product manager functions, including that of following through with the high-level MOH officials who needed to be involved.

V. BUILDING OWNERSHIP OF THE SYSTEM WILL ENSURE QUALITY DATA IS USED FOR DECISION-MAKING.

As with implementation, having the right people "owning" the system will help contribute to the system's success and continued use. The computerized LMIS can only provide the information; it is the responsibility of the user to turn that information into action. Thus, by involving appropriate users, the data from the system can be used to make informed logistics decisions.

As shown in Figure 4, the information that comes out of the computerized LMIS is used by different people at different levels. For example, the summary reports are used by the program managers to supervise sites and to make resupply decisions. At the facility level, the feedback reports are used to supervise staff, monitor stock levels, and confirm resupply quantities. It is the responsibility of the program managers or the facility-level staff to use the data from these reports to make decisions and monitor the system.

As mentioned earlier, the product manager's role is to ensure that the right people use the system and that they view it as the source of information that they need to make decisions. Building ownership is the process of showing the importance of the system to users. Building ownership with some of the high-level MOH officials and key decisionmakers is critical. These users are the ones who will ensure sustainability and encourage other users to rely on the system for information. An effective technique for building ownership is to include managers and policymakers in the visioning exercise as key users and supporters of the system from the start. These individuals, who should include program managers, supply chain managers and distribution or logistics managers, are likely to take ownership of the system and can then take responsibility for advocating and ensuring the use of this critical data in the management of the system. A major role of the product manager is to gain this ownership and to make sure the system "belongs" to the final clients, usually the MOH or another health management department/program.

Managers of the system should be available from the beginning to work with all users and stakeholders to ensure that the product meets expectations. Users, as shown in Appendix 5, include data entry staff up to high-level MOH officials. Any person who uses the information in the system should be considered a user, even if that individual does not physically access the system.

When planning for implementation of the system, it is important to plan for adequate time to train all users. Part of building ownership is providing users with enough information, resources and training to manage the system. When a computerized LMIS is implemented, there will be significant changes to the way central-level logistics information is managed. These changes cannot happen without the proper guidance, feedback and buy-in.

In Kenya, the computerized LMIS was originally solely used for resupply decisions at KEMSA and did not consider the information needs of different managers and policymakers. Thus, managers and policymakers felt little ownership of the system and had no knowledge of what data was available from the system and how it could be used to facilitate their responsibilities. To build ownership of the system, key central-level management reports were presented to stakeholders throughout the MOH to obtain their input. The product managers also outlined the types of data that could be made available to MOH program managers and how the system could be used routinely as part of the managers' jobs. This process helped the MOH understand the utility of the system and the impact the information from the system has on their programmatic decision-making.

CONCLUSIONS

ULTIMATELY, THE COMPUTERIZED SYSTEM MUST BE ABLE TO SUPPORT CRITICAL REQUIREMENTS FOR AN LMIS FOR MANAGING HIV TESTS, LABORATORY SUPPLIES AND ARV DRUGS.

Whether the computerized system is custom-built or already built, it must be able to support the most critical requirement of an LMIS – the ability to provide data for resupply decisions. While this seems intuitive, changing program requirements as well as ad hoc requests from stakeholders may make it difficult to maintain priorities. Standard requirements are summarized below and noted in more detail in Appendix 1.

At a minimum, a computerized LMIS must track all of the logistics data from each facility in the system and provide information to managers for decision-making. Generally, the computerized LMIS monitors stock levels throughout the supply chain, calculates reorder quantities for individual facilities, provides data for estimating future demand in the system, and identifies facilities requiring supervision. There will be certain “peripheral requirements” that are requested but cannot be included in the software for one reason or another. It is important to recognize this and prioritize the critical requirements while developing and implementing the software. Ensuring the quality and integrity of the software outweighs the importance of including all of the “peripheral requirements”.

APPENDIX 1: STANDARDS FOR COMPUTERIZING LMIS FOR HIV/AIDS COMMODITIES

Summary of Required LMIS Standards		
1.	Background Data	Input of key facility, product and logistics system information
2.	Logistics Data from Facility Report	Input of data points collected from the LMIS facility (SDP or Warehouse) report such as stock on hand, quantity consumed/used, losses and adjustments
3.	Quantity Required Calculation	Using the AMC, calculation of the quantity of each product that each facility requires
4.	Discrepancy between Quantity Issued by Warehouse and Quantity Received at Facility	Flags discrepancy between the quantities issued from a warehouse and the quantities that were received at a facility
5.	Non-Reporting Facilities	For a defined time period, list of facilities that have not submitted a logistics report
6.	Reporting Rates	For a defined time period, displays the percent of facilities that reported
7.	AMC	For a defined time period, displays the AMC for a facility or nationally including HIV tests by purpose of use
8.	Stock Status	For a defined time period, displays the months of stock of a product(s) by facility and nationally, including highlight of stock imbalances
9.	Stockout Alert	Displays incidence of stockouts by facility and nationally
10.	Program Reporting	Over a period of time, displays key program data items by facility or nationally such as products dispensed to users/used, number of ART patients, and HIV tests used by purpose of use
11.	Graphs	Over a period of time, displays key line and/or bar graphs such as products dispensed to users/used and stock status

Summary of Highly Recommended ICS/LMIS Standards		
12.	Issuing Stock	Allows distribution decision-making following FEFO based on current stock status at the warehouse
13.	Expiration Date Review	For a defined time period, displays products by facilities with a defined number of months of shelf life remaining to arrange for redistribution of supplies close to expiry
14.	ARV Regimen Information	Certain ARV regimen information can be critically important to the decision-making process. This section reviews ARV regimen MOS, ARV patient data by regimen and dispensed to user data by regimen

REQUIRED LMIS STANDARDS

Use Case #1: Input Background Data

Summary

After navigating to the input screen, data entry clerk(s) at the Logistics Management Unit (LMU) (the user) enters the background data (e.g., new facility or commodity) into the system. The purpose is to capture and define key elements of the distribution system.

Main course of events

1. The user enters new background data by program (ARV, HIV test kit, laboratory supplies). Data input values include:

Facility information

i. facility name, address, contact person
ii. facility type
iii. supplying facility
iv. distribution role – SDP or warehouse, distribution level
v. active/inactive
vi. maximum and minimum months of stock (MOS) by program

Product information

i. name, category
ii. dispensing unit
iii. packing size
iv. active/inactive
v. maximum and minimum months of stock (MOS) by program (if different for different products)
vi. defined ARV regimens
vii. funding restrictions (i.e., one form of d4T can only go to MOH sites), if applicable

Logistics system information

i. reporting/delivery period by product category
ii. number of periods for average monthly consumption/usage (AMC) by product category
iii. unit of measure (English or metric)
iv. type of max/min system (forced order, continuous review, standard)

2. The user prompts the system to save.
3. The system saves the information with the change date, keeping a file with the old record.

Extension #1: The user edits existing information

1a. The user edits existing facility, product or logistics system information.
2a. The user prompts the system to save.
3a. The system saves the information with the change date, keeping a file with the old record.

Extension #2: The user deletes existing information

1a. The user deletes existing facility, product or logistics system information.
2a. The user prompts the system to save.
3a. The system saves the information with the change date, keeping a file with the old record.

Use Case #2: Input Logistics Data from Facility Report

Summary

When the facility reports are received for the reporting period, data entry clerk(s) at the Logistics Management Unit (LMU) (the user) enter the logistics data from the report into the system.

Main course of events

1. The user enters the data from each facility report into the system for the reporting period. Data input areas include:

a. Facility report data
    i. report name
    ii. reporting period
    iii. facility reporting
    iv. opening balance (optional)
    v. stock on hand (SOH)/closing balance/physical count
    vi. quantity issued
    vii. quantity dispensed/used
    viii. quantity received
    ix. losses and adjustments
    x. quantity requested
    xi. incidence of stockout (yes or no)
    xii. current number of patients on ART (for ART program only)
    xiii. quantity of HIV tests used by purpose of use (VCT, PMTCT, etc.) (for HIV test kits only)

2. The user prompts the system to save.
3. The system saves the information with the change date, keeping a file with the old record.
4. The user requests a report on the logistics data from the facility report (SOH, quantity issued, quantity dispensed/used, quantity received, losses and adjustments, quantity dispensed and incidence of stockout).
5. The system pulls this data by facility.

Extension #1: Data entry error

1a. The user enters the data from the facility report incorrectly and the data does not sum correctly for any point in the following formula:
    a. Opening balance + quantity received – quantity issued/quantity used +/- losses/adjustments = SOH

2a. The system prompts the user to confirm this data is inputted correctly.
3a. The user adjusts the data.
4a. The math now sums correctly, the system allows the user to proceed.

Extension #2: Facility error

1a. The user enters the data from the facility report correctly but the data does not sum correctly for any point in the following formula:
    a. Opening balance + quantity received – quantity issued/quantity used +/- losses/adjustments = SOH

2a. The system prompts the user to confirm this data is inputted correctly.
3a. The user confirms that the data is inputted correctly.
4a. The math does not sum, the system makes an automatic adjustment to correct the math and flags this adjustment in the Adjustments Summary Report.
5a. The user/supervisor calls the facility to discuss the inaccuracy of the report.
6a. The user enters the corrected data.

Extension #3: Missing data

1a. The user enters the data from the facility report but some data (SOH, issues/dispensed/used, received, losses/adjustments, or quantity requested) is missing, either because it was not on the report or the user accidentally omitted it.
2a. The user prompts the system to save.
3a. The system displays an error message stating that there is missing data and the user should confirm the missing data by entering a zero.
4a. The user adjusts the data as available and prompts the system to save.
5a. The system saves the information with the change date, keeping a file with the old record.

Use Case #3: Calculated Quantity Required

Summary

The program manager (user) requests the Quantity Required report by facility and by product to determine the amount of each product to issue to each facility.

Main course of events

1. Use cases 1 and 2 are completed.
2. The user selects the Quantity Required report for a set time period, which provides the calculated quantity required of each product by facility.
3. The system calculates the quantity required of each product for each facility using the appropriate formula:
    a. HIV test kits: Max (AMC x Max in months) – SOH = quantity required
    b. ARVs: Max (AMC x Max in months) + Quantity required for new patients – SOH = quantity required
    c. Lab Supplies: Reorder decision –
        i. If Closing Balance ≥ Min do not order
        ii. If Closing Balance < Min, order as follows: (AMC x Max in months) – SOH = quantity required
4. The system rounds the quantity required up to the packing size unit.
5. The system provides the calculated Quantity Required report and also displays the Quantity Requested that was inputted during Use Case #2, step 1.
6. The program manager determines the amount to issue by product by facility and provides this information to the central medical stores.
7. The central medical stores (CMS) issues the amount required as determined by the program manager.
8. CMS provides the quantity issued in a paper copy of the Quantity Issued report to the LMIS data entry clerk.

Extension #1: Discrepancy between quantity requested and calculated quantity required

4a. The quantity requested by the user in step 1 of use case 2 ≠ the calculated quantity required by the system in step 3 of user case 3.
4b. The system flags the discrepancy and type in the Distribution Discrepancy report.
4c. The user uses the Distribution Discrepancy report to determine the cause of this difference.

Extension #2: Quantity on order

3a. The system flags that the facility ordering has a quantity on order that has not yet been received.
3b. The system recalculates the quantity required by subtracting the quantity on order from the calculated quantity required.

Use Case #4: Quantity Issued ≠ Quantity Received

Summary

The program manager (user) conducts a review of the distribution system and wants to verify that the distribution system is working (verifying the quantity issued is equal to the quantity received). The program manager finds a discrepancy between what was issued from the higher level facility and what was received at the lower level facility in the Distribution Discrepancy report. The Distribution Discrepancy report prompts the program manager to provide supervision to those facilities with discrepancies.

Main course of events
Use cases 1 – 4 are completed.

The user runs the Distribution Discrepancy report by reporting period.

The system compares quantity issued from issuing facility from last reporting period to quantity received at receiving facility from current reporting period.

If there is a discrepancy between the two data items in step 3, the system flags this in the Distribution Discrepancy report.

Use Case #5: Non-Reporting Facilities

Summary
After use case #2 is inputted for each facility report received in each reporting period, the program manager (user) periodically requests a feedback report on the facilities that have not reported in order to follow up on the status of the report so the reorder quantity can be determined.

Main course of events
1. Use cases 1 and 2 are completed.

The user defines a reporting period for a product category/program.

The user runs the Non-Reporting Facility report.

The system compares the facilities that have reported for the defined period in step 2 with all active facilities defined in use case #1 step 1a for the product category/program.

Use Case #6: Reporting Rates

Summary
The program manager (user) periodically requests a report on the reporting rates of all facilities by program in order to provide supervision support to the facilities who are consistently not reporting and to provide feedback to all active facilities.

Main course of events
1. Use cases 1 and 2 are completed.

The user runs a Reporting Rate report and selected the period of time for a product category/program.

The system flags all of the active facilities that have not reported for the defined time period and calculates the reporting rate percent using the following formula:

a. Reporting Rate = # of facilities reporting/total # of facilities x 100%

The user follows up with the non-reporting facilities to determine the problem.

Use Case #7: Average Monthly Consumption/Usage

Summary
The program manager (user) periodically requests a report on the average monthly consumption/usage by facility and nationally.

Main course of events
1. Use cases 1 and 2 are completed.

The user requests the Average Monthly Consumption (AMC) report for a product category/program by facility and defines a particular time period.

The system calculates the AMC using the following formula:

a. AMC = total consumption/usage for AMC period ÷ AMC period, AMC period is defined in use case 1, step 1cii.

The system provides the requested report by facility.

The user requests the Average Monthly Consumption (AMC) report for a product category/program nationally for a particular time period.

The system calculates the national AMC using the following formula:

b. National AMC = (sum of total consumption/usage for AMC period for all reporting facilities/SDPs, not issues data) ÷ AMC period, AMC period is defined in use case 1, step 1cii.

The system provides the requested report with the percentage of reporting facilities that the national AMC represents.

Extension #1: HIV test kit AMC by purpose of use

1. The user requests the Average Monthly Consumption (AMC) report for HIV test kits by purpose of use by facility for a particular time period.

The system calculates the AMC using the following formula:

a. AMC = total consumption/usage for AMC period ÷ AMC period, AMC period is defined in use case 1, step 1cii.

The system provides the requested report.

The user requests the Average Monthly Consumption (AMC) report for HIV test kits by purpose of use nationally for a particular time period.

The system calculates the national AMC using the following formula:

b. National AMC = (sum of total consumption/usage for AMC period for all facilities – not issues data) ÷ AMC period, AMC period is defined in use case 1, step 1cii.

The system provides the requested report.

Use Case #8: Stock Status (MOS)

Summary

The program manager (user) requests a report on the stock status (MOS) by facility and nationally at the end of each reporting period to monitor stock status by facility and the national stock status.

Main course of events

1. Use cases 1 and 2 are completed.

The user requests the Stock Status (MOS) report for a set period of time by product by facility.

The system calculates the MOS using the following formula:

a. MOS = [closing balance/SOH/physical count ÷ AMC. For higher level facilities, the facility (SDP) AMC is used for this calculation] rounded to the next whole number.

The system provides the requested report.

The user requests the MOS report for a set period of time by product nationally.

The system calculates the national MOS using the following formula:

b. [National MOS = aggregated closing balance/SOH for all facilities and distribution centers ÷ aggregated AMC for all facilities (SDPs)] rounded to the next whole number

The system provides the requested report.

Extension #1: Stock Imbalances

4a. The user requests a Stock Imbalance report for a particular time period to determine if any facilities are overstocked, understocked or stocked out.

4b. The system calculates stock imbalances using the following formulas:

a. Overstock = MOS > Max
b. Understock = MOS < Min
c. Stockout = MOS = 0

4c. The system provides the requested report on any product that has stock imbalances.

Use Case #9: Stockout Alert

Summary

The program manager (user) requests a report on incidence of stockouts by facility and nationally in order to prompt immediate action.

Main course of events

1. Use cases 1 and 2 are completed.
2. The user requests the Stockout Alert report for a set period of time by product by facility.
3. The system flags all facilities that have reported a stockout during the defined period of time and provides a list of these facilities in the Stockout Alert report.

Use Case #10: Program Reporting

Summary

The program manager (user) requests dispensed to user/usage data to inform stakeholders about the amount of each product that have been dispensed to the users or used (in the case of HIV test kits and lab supplies) over a period of time.

Main course of events

1. Use cases 1 and 2 are completed.

The user requests the Dispensed to User/Usage report by product by facility for a defined period of time.

The system pulls this data from the facility transactions for the defined time period and provides the report.

The user requests the Dispensed to User/Usage report by product nationally for a defined period of time.

The system aggregates this data from the facility transactions for the defined time period and provides the report.

Extension #1: Required ARV data items

The user requests the total number of patients on ART by facility for a defined period of time.

The system pulls this data from the facility transactions for the defined time period and provides the report.

The user requests the total number of patients on ART nationally for a defined period of time.

The system aggregates this data from the facility transactions for the defined time period and provides the report.

Extension #2: HIV Test Kit data items
The user requests the total number of HIV tests used by purpose of use by facility for a defined period of time.

The system pulls this data from the facility transactions for the defined time period and provides the report.

The user requests the total number HIV tests used by purpose of use nationally for a defined period of time.

The system aggregates this data from the facility transactions for the defined time period and provides the report.

Use Case #11: Graphs

Summary
In order to represent certain stock assessments pictorially to stakeholders, the program manager (user) requests graphs showing stock status and dispensed to user/usage.

Main course of events
1. Use cases 1 and 2 are completed.
2. The user requests the national Stock Status graph for a defined list of products.
3. The system prepares a bar graph of the stock status to date for each defined product.
4. The user requests a facility Stock Status graph for a defined list of products.
5. The system prepares a bar graph of the stock status to date for each defined product by facility.
6. The user requests the national Dispensed to User/Used graph for a defined list of products for a set period of time.
7. The system prepares a bar graph of the Dispensed to User/Used data for each defined product.
8. The user requests a facility Dispensed to User/Used graph for a defined list of products for a set period of time.
9. The system prepares a bar graph of the Dispensed to User/Used data for each defined product by facility.

HIGHLY RECOMMENDED ICS/LMIS STANDARDS

The following use cases are highly recommended to perform supply chain management functions effectively. These include warehouse information that is required to complete resupply decisions, review of expiration dates of products at facilities in the system, and patient and product information by ART regimen. The ART regimen information is incredibly useful for validating or adjusting resupply decisions when there is not a proliferation of ARV formulations.

Use Case #1: Issuing stock

Summary
When the central warehouse issues stock from the warehouse to the lower level facility following FEFO, the data entry clerk (user) inputs the quantity issued by product by receiving facility from a report received from the warehouse.

Main course of events

1. Use cases 1 – 3 are completed.
2. The user requests a distribution report that states which stock from CMS should go to each facility.
3. The system identifies the stock required with the first expiry as the item to be issued.
4. The warehouse staff use the report to prepare the stock issues by facility.
5. The user inputs the quantity of each product by receiving facility issued from CMS.
6. The system captures the entered information and the period for which these issuances occurred.

Extension #1: Discrepancy between quantity required and quantity issued

4a. The quantity required calculated by the system in step 4 of user case 3 ≠ quantity issued inputted by the user in step 5 of use case 4.

4b. The system flags the discrepancy and type in the Distribution Discrepancy report.

4c. The program manager uses the Distribution Discrepancy report to determine the cause of this difference.

Extension #2: Supply Restrictions by Funding

3a. One product (e.g., Stavudine, d4T) has multiple suppliers/funders and these different brands/generic formulations are restricted to only certain facilities.

3b. The system identifies the correct branded/generic formulation, according to FEFO, to be distributed to the correct facility as defined in Use Case 1, step 1b vii.

Use Case #2: Expiration Date Review

Summary

The program manager (user) periodically requests an Expiration Data Review report to determine the quantities of each product with less than a defined number of months of shelf life remaining in order to arrange for redistribution of supplies that are close to expiry, if applicable.

Main course of events

1. Facility reports are entered into the system, including product with less than X months to expiry: number and expiry date.
2. The user requests a report with the quantity and MOS of a defined product with less than X (depending on input from Use Case 1 step 1b vii) months of shelf life remaining by facility.
3. The system flags all product due to expire within X months. For each product, the system:
    a. Lists all quantities and expiry date (one product may have more than one expiry date so the system will list the quantity for each expiry date)
    b. Calculates the MOS of the stock for each quantity by expiration date using the following formula: MOS = quantity for each expiry date ÷ AMC for the product by facility.
4. The system provides the requested report.

Use Case #3: ART Regimen Information

Summary

The program manager (user) periodically requests information on patients by ART regimen and months of stock (MOS) of ART regimens. The patient data by ART regimen is important to validate resupply decisions and can be critical for resupply decisions if the consumption data has inconsistencies such as stockouts. The ART regimen MOS looks at the lowest MOS of all drugs in a regimen to determine how long the full regimen will last instead of looking at individual drugs, some of while have more months available than others.

Main course of events

1. Background data and facility reports are entered, including preferred ARV formulations associated with each regimen and number of ART patients by regimen.
2. The user requests the Stock Status (MOS) report for a set period of time by ARV regimen by facility.
3. The system calculates the MOS using the following formula:
    a. Regimen MOS = closing balance/SOH of each regimen ÷ AMC. For higher level facilities, the facility (SDP) AMC is used for this calculation.
4. The system provides the requested report.
5. The user requests the MOS report for a set period of time by ARV regimen nationally.
6. The system calculates the national MOS using the following formula:
    a. National Regimen MOS = aggregated closing balance/SOH of each regimen for all facilities and distribution centers ÷ aggregated AMC for all facilities (SDPs)
7. The system provides the requested report.
8. The user requests the total number of ART patients by regimen by facility for a defined period of time.
9. The system pulls this data from the facility transactions for the defined time period and provides the report
10. The user requests the total number of ART patients by regimen nationally for a defined period of time.
11. The system aggregates this data from the facility transactions for the defined time period and provides the report.

Extension #1: Dispensed by regimen

1. The user requests the national Dispensed to User graph by ARV regimen for a set period of time.
2. The system prepares a bar graph of the Dispensed to User/Used data for each defined regimen.

APPENDIX 2: CONSIDERATIONS FOR DEVELOPING A VISION AND A STRATEGY

- Looking into the future (5 years): What products will be managed now and in the future? Will the system requirements grow and change in purpose? Where will the system be housed? Are there or will there be other computerized systems that the LMIS needs to communicate with (ICS, WMS, forecasting software etc).
- How stable is the manual LMIS/logistics system? What are the changes that are expected in the future? Will the key logistics system design features be similar (i.e., can there be one database or multiple databases)?
- What are the advantages and limitations of an existing software application like Supply Chain Manager and how will they impact the implementation (e.g., some limitations from Uganda are that since there is not an ICS module for the central medical stores, they have to do a lot of external work in excel to provide the information to the medical stores about what supplies to distribute)? Will this still be appropriate in the future or will there need to be significant enhancements? How long is it expected for these enhancements to take?
- Who needs to receive and manage the logistics information for decision-making? The system will need to be mapped out for the flow of information into and out of the system. All people interacting with the system will need to understand the expectations for the information flow and all should be involved in agreeing on the format of the information. Can system “success” be defined by each user of information?
- How is the information relevant to policymakers and donors? Are policymakers and donors key users? If so, should they meet on a regular basis?
- What are the available resources? How can we make use of these? How many donors/funders are involved? Who will fund the enhancement/upkeep of the software?
- Are the right people available? Is there someone who can play the role of the in-country product manager? If there is not one person appropriate as the product manager, is there a combination of people who can manage the software?
- What is the budget and timeframe for this activity?

APPENDIX 3: CONSIDERATIONS FOR IMPLEMENTATION OF COMPUTERIZED LMIS

I. Identification of In-Country Product Manager (a focal person for computerized LMIS). See Appendix 5 for a sample job description.
    i. If one person is not available or fully qualified to fill this role, consider identifying a team of people who can work together to ensure the product quality.

II. Identification of number and staff to be data entry clerks to enter data from the reports coming from facilities into the database.
    i. Consider scale-up plans and logistics system roll out plans to determine the number of data entry staff required.
    ii. How many sites? How many different programs/systems (HIV test kits, ARVs, contraceptives, etc.)
    iii. Who will fund this position?
    iv. Where will the system and staff be located?

III. Hardware and software required
    i. Number of computers? Depends on the number of programs/systems.
    ii. Appropriate computer memory size will be needed at the central level to host the databases.
    iii. Computers will need to have appropriate software (e.g., in the case of Supply Chain Manager, Microsoft Access is required)

IV. Start-up/Implementation Visit
    i. Team of two from home office: Product Manager and software developer for two weeks
    ii. Facilitate meetings with all stakeholders to present the concept, agree on data requirement, coding of facilities, etc. This will make managing expectations easier. This workshop will also address issues around the flow of information, the types of feedback needed, etc.
    iii. Install and train the in-country product manager and the data entry clerks on the use of the software.
    iv. Identify eventual adaptations required, based on stakeholder requirements.

APPENDIX 4: SAMPLE SCOPE OF WORK FOR IMPLEMENTATION OF SUPPLY CHAIN MANAGER SOFTWARE FOR ARVS

Purpose of the Visit: To assist in the implementation and customization of *Supply Chain Manager (SCM)*, software developed by the DELIVER project to manage LMIS data at the central level. This initial trip will focus on developing the vision for SCM, creating the databases for the management of ARV logistics data and training staff on the use of SCM. Additionally, the trip will plan for the implementation of SCM to manage HIV test kit logistics data.

Specific Objectives for TDY Visit

- Work with all potential users of SCM to develop the vision and gather requirements for the program, including all stakeholders. If necessary, conduct a ½ day meeting with all stakeholders to present the concept (advantages/limitations), discuss the expectations for the future, agree on data and report requirements, coding of facilities, flow of information, the types of feedback needed, etc. Develop a checklist of information required.
- Install, configure, demo, and trial run a system with sample data using SCM application and take the users through the entire work-flow process to ensure ability to manage the database on a day-to-day basis.
- Develop the actual databases for SCM for ARVs and input all facilities and products according to agreed upon coding.
- Identify and train the In-country Product Manager on the management of the SCM database, role and responsibilities with regards to identifying the needs for improvement/adaptations/changes to the software; communication requirements with key policymakers and donors; data entry QA and use of data for decision-making.
- If already employed, train data entry staff on use of system.
- Familiarize In-country Product Manager and other users with the User's Guide, the SDG's software development methodology and resources available online at http://sdg.jsi.com. Write job aids related to frequently used work-flows and provide these to the users.
- Identify hardware and software requirements: number of computers, required software, appropriate memory size, etc.
- Identify enhancements, recommend next steps, plan resources (time, financial, and human) required for any desired changes to the software to enhance functionality and/or ability to meet system requirements. Recommend alternative means to enhancements (e.g., ad-hoc reports, data exported to Excel, etc.)

Level of Effort for Initial TDY visit

1. Two weeks in country for one product manager and one software programmer, plus prep work before arrival and post work after departure
2. Colleagues from DELIVER office available to work with team during and between visits. One colleague in particular should be identified to play the role of in-country product manager and be available to manage all in-country aspects of software and data management after the team departs.

APPENDIX 5: SAMPLE JOB DESCRIPTION FOR IN-COUNTRY PRODUCT MANAGER

The In-Country Product Manager for the Computerized Logistics Management Information System (LMIS) has the primary responsibility for oversight of all procedures related to the central-level computerized LMIS. The Computerized LMIS provides critical logistics information to managers of health commodity distribution systems and central-level decisionmakers.

Responsibilities:

The In-Country Product Manager is part of a team that supports the logistics management information system (LMIS) activities of the MOH. Specific responsibilities include, but are not limited to, the following:

- Provide overall supervision of the computerized LMIS, including input in the analysis, design, and implementation of the system in-country. This may include analyzing user needs, developing system requirements, and managing or monitoring the implementation of software and hardware.
- Work with counterparts to develop, revise, or enhance computerized LMIS for use in-country.
- Respond to requests for information from all MOH and cooperating partners.
- Serve as a liaison between the Logistics Management Unit (LMU) and the MOH/cooperating partners regarding data or information requests.
- Serve as a liaison between LMU and Headquarters staff regarding database adaptation requests.
- Ensure the overall quality and of the logistics data in the computerized LMIS.
- Ensure the appropriate use of the logistics data by the right people.
- Ensure overall compliance with all procedures and reporting of the logistics system.
- Perform other duties as necessary to support LMU and MOH.
- Assist in testing new versions of the computerized LMIS as received from the software developers.
- Conduct training workshops and on-the job training about the computerized LMIS as needed.

Qualifications: Applicants for this position should possess the following minimum qualifications:

- Knowledge in public health commodity logistics
- Ability to engage senior-level MOH and cooperating partner officials
- Customer service experience
- Excellent written and oral English skills
- Ability to work independently with minimal supervision and manage projects using a process-oriented approach

- Excellent organizational skills and an eye for detail
- Computer literacy in Microsoft Office software (Word, Excel, Power Point), experience with Access databases a plus
- Basic understanding of computer software development process
- Experience in implementing warehouse management systems a plus

APPENDIX 6: SAMPLE TABLE OF COMPUTERIZED LMIS BUILDERS AND USERS

Builders	Summary of Role	Specific Responsibilities
In-Country Product Manager	To interact between the software programmer (SP) and all other users during development and testing of the software, supervise the data entry process and be familiar with the logistics and software database	• Gather input about enhancements from the users (other than the SP) during development, testing and implementation • Prioritize the enhancements • Discuss the enhancements with the other users and explain the timeline based on priorities • Provide ongoing feedback and management of data entry issues to data entry clerks via the assistant SP
Software Programmer (SP)	To manage the development and maintenance of the software	• Develop and unit test the software • Work with the product manager to prioritize requested enhancements • Make enhancements and ad hoc reports as requested • Provide supervision to the data entry clerks and assistant SP
Data Entry Clerks	To enter background data and routine reporting data into the system	• Enter and update background data for each program as it comes available • Routinely enter facility reports • Discuss with the assistant SP if the quality is not adequate • Make any requested adjustments to the data entered into the system based on feedback from the project officers
Assistant Software Programmer (if appropriate)	To assist with software programming, conduct daily quality control of data entry and provide training and retraining of data entry clerks.	• Liaise between product managers and data entry clerks about data entry issues and inquires • Training and retraining of data entry clerks • Conduct daily data entry quality control (10% of records daily) • Assist with system programming under the supervision of the SP
IT Helpdesk	To support the SP in any software updates for computerized LMIS users	• If necessary, install software (computerized LMIS) on all user computers • Create link between computerized LMIS and other databases, as appropriate

Builders	Summary of Role	Specific Responsibilities
Project Officers and/or counterparts within the MOH division	To monitor LMIS reporting from facilities, determine reorder quantities to the appropriate facilities, use data from routine summary reports for logistics decision-making, build capacity in counterparts on how to use the system and therefore use the data from the system for logistics decision-making, to use the feedback reports to monitor performance, conduct supervision, gather data for forecasting Know and use the system comprehensively to be advocates for the system with counterparts	• Review and/or print appropriate summary and feedback reports for project officers from the system when the data entry is complete • Convey any adjustments required to the data entered into the system to the data entry clerks and assistant software programmer • Periodically monitor issues and receipt dates and discuss with appropriate MOH contact as required • Print and distribute feedback reports for each reporting period to the appropriate recipients (divisions, districts, provinces, etc.)
Warehouse Manager	To ensure that the requested order quantities received from the project officers are filled and distributed	• Review and fill requested quantity to issue following FEFO •
Manager, Other Information System(s)	To provide information managed outside of the computerized LMIS that is relevant to logistics management.	• For example, provide data on what was issued, when it was issued and when it was received to data entry clerk • For example, provide regular facility stock report (with SKU and expiration dates) to LMIS data entry clerk
MOH Division Heads/ Management	To oversee the flow of commodities and information to and from the field	• Periodically run or use reports for policy level decision-making and resource mobilization
General Management	To conduct advocacy with the MOH Division heads through relationships	• Serve as a resource to in-country staff during system implementation • Act as a further interface between LMIS and divisions, especially on policy and resource mobilization issues

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