



# Alternative Public Health Supply Chains: Reconsidering the Role of the Central Medical Store



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## USAID | DELIVER PROJECT, Task Order 4

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### Abstract

Central Medical Stores (CMS) in low-income countries are usually the backbone of public health procurement and distribution models. However, in practice, CMSs have had inadequate performance in areas that include procurement, financial and logistical management, security, and storage. This report identifies a set of approaches that either de-emphasize the CMS, or enact a radical shift in its management. The authors examined the existing logistics systems that incorporate one or more of these approaches in developing countries. These approaches potentially offer a superior solution to improving supply chain performance benefits compared to approaches that continue to emphasize the CMS.

The multiple approaches that are described raise the question of how to choose the approach that most appropriately fits a particular country's setting. A framework for selecting an approach highlights the technical criteria for judging the suitability of an approach, and considers how to address the inevitable situation when multiple approaches do not meet all the technical criteria. These perspectives make it clear that the choice of one of these *alternative* models is not the final or entire solution to the CMS dysfunction.

Cover photo: Central Medical Stores workers loading a truck for distribution of health commodities in Uganda. 2007. Paula Nersesian.

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# Acronyms

3PL	third party logistics provider
ACAME	Association of Central Medical Stores for Essential Drugs (France)
ACT	artemisinin-based combination therapy
C	Celsius
CAME	Central Medical Store (Benin)
CCS	Santiago Chamber of Commerce (Chile)
CENABAST	Center of Suppliers (Chile)
CI	continuous improvement
CMS	Central Medical Stores
EDP	Essential Drug Program
FR	financial resources
HIV	human immunodeficiency virus
JMS	Joint Medical Stores
KPI	key performance indicator
L	leadership
LMIS	logistics management information system
LMU	logistics management unit
MOH	Ministry of Health
MSL	Medical Stores Limited (Zambia)
NGO	nongovernmental organization
NMCP	National Malaria Control Program
NMS	National Medical Stores (Uganda)
PM	performance monitoring
PMI	President's Malaria Initiative
SC	supply chain
SCMS	Supply Chain Management System (project)
SDP	service delivery point
TI	technical infrastructure
UCMB	Uganda Catholic Medical Bureau

UPMB	Uganda Protestant Medical Bureau
UPS	United Postal Service
USAID	U.S. Agency for International Development
USG	U.S. Government
VMI	vendor managed inventory
WH	warehouse



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# Executive Summary

This report focuses on the role of the Central Medical Stores (CMS) in the health systems of developing countries and the approaches to address dysfunctions at the CMSs. These approaches either de-emphasize the CMS or enact a more radical shift in its management structure. This report defines and describes these approaches by category and by their potential benefits. We also provide a framework to guide the selection of an approach by highlighting the technical criteria for determining its suitability. This report promotes these approaches and their potential benefits for health supply system design and support.

## Defining the CMS

CMSs, the backbone of health commodity management for national health systems, have been in place since the 1970s. Since then, the evolution of the roles, authority, and management structure of CMSs makes it difficult to define them in a way that captures the current diversity. Following is the authors' definition—

*A CMS, an agency in the supply chain for health products in a country—*

- is custodian of a central stock, or network of central stocks, of health commodities that replenish inventory for health facilities within the country*
- is mandated to serve the public*
- may or may not be autonomous from the government, but has government oversight*
- stores and distributes (with inventory management) or manages the completion of these functions*
- may be responsible for additional management functions: quantification, supply planning, and procurement*
- has the government as its main client.*

Three predominant management models of the CMS include (1) traditional, (2) autonomous supply agency, and (3) CMS with user fees. The *traditional CMS* represents the first generation of CMSs that were introduced into the public health sector. These warehousing, procurement, and distribution operations were fully government owned and operated. The *autonomous supply agency* represents the second generation CMSs, which was introduced in response to the failings of the traditional CMS model. With it, management responsibility for the CMS rests with an autonomous or semi-autonomous board. The *CMS with user fees* is also a second generation model; it generates some revenue from its warehousing and distribution, which can be used to support operations.

## Defining Alternative Models

Five models de-emphasize the role of the existing CMS (see table 1).

Table 1. Description of Supply Chain Models Without CMS

Alternative Model	Description
Bypass Central Medical Store (CMS)	Products either do not travel through the CMS, or they are in storage at the CMS for a short time before going directly to downstream sites.
Alternative Management of CMS	Management of CMS is replaced or outsourced.
Parallel CMSs with Competition	Introduces additional storage sites that compete with the CMS.
Parallel CMS (complementary; temporary)	Introduces temporary additional storage sites to help distribute certain health commodities.
Parallel CMS (complementary; permanent)	Introduces permanent additional storage sites to complement the CMS capacity with coordination across sites.

To understand the source of potential benefits from the alternative models, two categories of improvements can occur when these models are introduced: *automatic* and *contingent* benefits.

*Automatic benefits* are more direct and the introduced model has immediate consequences. They follow from the direct increase in capabilities, or the introduction of more effective structural resources. *Contingent benefits* result from potential improvements that the new model creates, with additional supportive factors that enable their potential to be realized. Table 2 displays examples of each type of benefit, for each alternative model.

Table 2. Automatic and Contingent Benefits

Alternative Model	Automatic Benefits	Contingent Benefits
Bypass CMS	<ul style="list-style-type: none"> <li>• Reduces variable costs at the CMS related to use</li> <li>• Reduces effects of CMS-based dysfunction; e.g., shrinkage, expiries, etc.</li> </ul>	<ul style="list-style-type: none"> <li>• Lowers inventory requirements in supply chain for the same level of availability to end customers</li> <li>• Increases responsiveness to downstream supply chain sites; e.g., districts</li> <li>• Reduces distribution costs</li> <li>• Reduces supply chain management difficulties for upstream suppliers</li> <li>• Enables CMS to strengthen by building capabilities, or by allowing transition to a different CMS approach</li> </ul>

Alternative Model	Automatic Benefits	Contingent Benefits
Alternative Management of CMS	<ul style="list-style-type: none"> <li>Improves management capabilities from replacement</li> </ul>	<ul style="list-style-type: none"> <li>New management brings initiatives for new capabilities and services</li> <li>Enables CMS to strengthen either by building capabilities, or allowing transition to a different CMS approach</li> </ul>
Parallel CMSs with Competition	<ul style="list-style-type: none"> <li>Empowers donors and downstream supply chain sites; e.g., districts</li> <li>Creates redundant supply chain distribution</li> </ul>	<ul style="list-style-type: none"> <li>Improves service and cost</li> </ul>
Parallel CMS (complementary; temporary)	<ul style="list-style-type: none"> <li>Reduces burden on CMS for handling temporary addition of products to supply chain</li> <li>Creates redundant supply chain distribution</li> </ul>	<ul style="list-style-type: none"> <li>Enables CMS to strengthen by building capabilities, or by allowing transition to a different CMS approach</li> </ul>
Parallel CMS (complementary; permanent)	<ul style="list-style-type: none"> <li>Improves storage capacity across supply chain</li> <li>Creates redundant supply chain distribution</li> </ul>	<ul style="list-style-type: none"> <li>Allows allocation of groups of products to individual CMSs where capability is appropriate; e.g., product requiring refrigeration, extra security, special expiry, etc.</li> </ul>

## Choosing the Alternative Model

The appropriate choice of an alternative model should depend on the following factors:

- drivers of CMS dysfunction
- supply chain structural factors, for example, product characteristics
- capabilities of potential model enablers
- strategic directions for supply chain management and the health system; e.g., type of health supply chain performance required, healthcare reform direction, health supply chain capability development, and sustainability
- overall cost for implementation and operational management of the implemented model.

These country-specific factors create *technical requirements* for a category of alternative models. Consideration of a country's technical requirements for a solution and the features of the alternative models usually leads to the following observations:

- It is unlikely that any one alternative model will fill all the technical requirements.
- It is likely that prioritizing the technical requirements, and determining the degree to which requirements are met, will need to be formalized.
- Given mapping of alternative models and technical requirements, the following are possible perspectives when selecting a particular model:

- Consider the model choice as a transition model.
- Consider the model as part of a portfolio of steps to address dysfunction.
- Consider additional hybridization/innovation of existing models to address unmet requirements.

## Conclusion

Although in this report, we describe a deliberate approach to model selection to de-emphasize the role of the CMS, our case studies show less deliberation and more happenstance when selecting a specific option. Generally, the changes came from opportunity in the form of capability of the enablers; and often, but not always, includes discontent with the current CMS performance. One implication is that *addressing CMS dysfunction may not be just a process of promoting one of these options to de-emphasize the current CMS over another; but, more important, a process of improving the prospects for various model enablers.*

In addressing CMS inefficiencies, de-emphasizing the existing CMS's role in the supply chain is one set of alternatives to strengthening the CMS. However, the general steps involved in either strengthening or de-emphasizing the CMS are very similar, including (1) identifying the factors that caused the inefficiency and possible priorities for addressing these factors; and then (2) addressing the factors driving the inefficiency. The challenges for both are similar. The similarities reflect the fact that *in selecting the approach for addressing the CMS, one should consider all possible options relative to each other, including both options to strengthen the CMS and to de-emphasize its role or change its management.*

To address the inevitable situation when multiple approaches do not meet all the technical criteria, our perspectives on selection all agree that the selection *should probably be considered as potential next steps or potential parts of a larger approach to addressing health supply chain performance in developing countries; not as the final step or solution.* In fact, in some cases, de-emphasizing the CMS may actually give the CMS the opportunity, or an operating precedent, to support its strengthening, so it can return to its original role in the supply chain.

# Introduction

Central Medical Stores (CMS) in low-income countries are usually the backbone of public health procurement and distribution models (Vogel and Stephens 1989; Yadav, Tata, and Babaley 2011). These CMSs have traditionally been completely government-owned enterprises; but, more recently, they have been given management autonomy, with government oversight (Drug Supply Choices: What Works Best? 1998). The roles of the CMS have generally included the national procurement of healthcare commodities, storage and handling of inventory commodities, and distribution to various sections of the national public health system; and, in some cases, the private-sector health system. Although, conceptually, these models have all the necessary components for a supportive supply chain for healthcare delivery; in practice, CMSs are often characterized by inadequate performance in areas, such as procurement, financial and logistical management, security, and storage (Govindaraj and Herbst 2010).

Solutions for improving the performance of the CMS have included introducing autonomy, exposing them to the market, holding them accountable for their performance, and giving them residual claim on surpluses from its operations (Drug Supply Choices: What Works Best? 1998; Govindaraj and Herbst 2010). These solutions continue the emphasis on the CMS and its management within a more public sector-based mindset. Alternative approaches to strengthening the CMS that seek either to de-emphasize the CMS, or to enact a more radical shift in its management, have been considered; and implemented in some developing countries.

This document examines a set of approaches that de-emphasize the CMS, discuss their potential benefits, and describe features of the selection process for an approach that will meet the needs of a particular country setting.





# Defining the Dominant Central Medical Store Model

This section includes a general description of CMSs, their dominant management models, examples of some dysfunctions that have plagued them, and steps taken to strengthen the existing CMSs.

## Defining the CMS

Since their beginning in the 1970s and 1980s as solely government-run entities, CMSs have had several structural changes (Drug Supply Choices: What Works Best 1998; Govindaraj and Herbst 2010). A conventional definition of a CMS must incorporate these structural changes, but still identify the collection of models we want to study and, after this study is complete, propose potential alternatives. The following definition captures the current diversity and complexity in the existing CMSs. For this definition to be as appropriate as possible, it was created based on various descriptions of CMSs; it was generated during a workshop comprising various individuals involved in health systems technical assistance (Drug Supply Choices: What Works Best? 1998; Govindaraj and Herbst 2010; Yadav, Tata, and Babaley 2011).

*A CMS, an agency in the supply chain for health products in a country—*

- *is custodian of a central stock, or network of central stocks, of health commodities that replenish inventory for health facilities within the country*
- *is mandated to serve the public*
- *may or may not be autonomous from the government, but has government oversight*
- *stores and distributes (with inventory management) or manages the completion of these functions*
- *may be responsible for additional management functions: quantification, supply planning, and procurement*
- *has the government as its main client.*

At its foundation, the CMSs we focused on are managed warehousing networks—but, in many cases, the *network* is only a single storage site—with oversight from, if not ownership by, the national government that supports the public health commodity distribution needs of the country. In many cases, the CMS management is also responsible for procuring and distributing the health commodities.

## Management Models for the CMS

The focus of the structural changes made within CMSs during the past four decades has been on their management models, with a view to improving performance. Three management models of CMSs can be identified, in practice (Drug Supply Choices: What Works Best? 1998; Govindaraj and Herbst 2010). The first is the *traditional CMS*, which represents the first generation of CMSs introduced to the public health sector. These warehousing, procurement, and distribution operations are fully government owned and operated, are effectively a department or unit of the MOH, and are

financed from government or donor funds. The second CMS model is the *autonomous supply agency*. This model represents one of the second generation of CMSs that was introduced when the traditional CMS model failed. With this model, an autonomous or semi-autonomous board manages the CMS. This structure reduces the political influence on the choice of operations management personnel at the CMS, to ensure that capable individuals have an opportunity to be chosen for these crucial management positions. The third CMS model is the *CMS with user fees* model. This model, also a second generation model; came into prominence following programs like the Bamako Initiative, which, for cost-recovery, tried to introduce user fees into the operations of public-sector programs. Under this model, to support operations, the CMS generates revenue from its warehousing and distribution; and, in some cases, the CMS may have rights to any residuals profits.

## CMS Inefficiencies

As described in the introduction, the existing CMS models have frustrated many global and national health stakeholders that would seek to depend on them to support their public health efforts.

In Sudan, in 2005, the national control laboratory failed 38 percent of the samples of imported medicines drawn from the CMS; in the previous five years, the samples tested had a 12 percent failure rate. In addition, the CMS inconsistently followed the testing procedures and regulations (Mohamed 2008). In Benin, the central medical store (CAME) lacked the storage capacity to handle the volume of products purchased by various healthcare service collaborators; as a result, poor stock management practices occurred (Ndoye et al. 2009). In 2001, poor functioning by the CMS in Ghana was cited as the cause of shortages of essential drugs and supplies; improvements in availability during the next two years was more attributable to access to the open market than to improvements at the CMS (EGEVAL 2005). In some cases, prices at the CMS were higher than the open market. In Malawi, one deterrent to successfully providing an essential health package is the inability of the CMS to quantify need and hold adequate buffer stock (Mueller et al. 2011). In addition, in Malawi, high profile cases of theft and corruption at the CMSs have resulted in donors withholding funds meant for the health sector (Ngozo 2011).

Many reasons have been given for the dysfunctions found in CMS operations, including the government's undue political interference; lack of both operational management capacity and infrastructure resources, including funding; the CMS' preferred and protected status in healthcare procurement; and poor accountability for performance results.

## Addressing CMS Deficiencies

Many examples of CMS strengthening efforts do exist. In Tanzania, the performance of the CMSs improved after a systematic approach to management, supply monitoring, and documentation (Wiedenmayer 2000). Using multidisciplinary training and procurement policy changes, the Association of Central Medical Stores for Essential Drugs (French acronym, ACAME) improved the performance of national CMSs in many Francophone African countries (Millot 2006). In a study of three Francophone countries—Senegal, Cameroon, and Burundi—improvements in efficiency-related and equity-related outcomes were observed after efforts to strengthen the CMS. Improved efficiency-related outcomes—including service quality and inventory availability—occurred after autonomous boards were introduced to improve management decision-making, increase accountability and transparency, adjust policy and regulations, and provide technical and financial assistance. Improvements in equity-related outcomes—including affordability and geographic accessibility—occurred after social obligations were emphasized; for example, by having a mix of

stakeholders on the CMS management board; and from constraining specific decision rights, for example, by de-emphasizing commercial objectives.

Various stakeholders, e.g., donors, have championed alternative approaches to strengthening the CMS and they have been implemented in some country settings. These approaches either de-emphasize the CMS or enact a more radical shift in its management; they can, potentially, offer a superior solution to improving supply chain performance benefits compared to approaches that continue to emphasize the CMS. The superiority of these approaches generally results from a better fit to specific factors that characterize country health systems; such as healthcare and supply chain strategy, product segmentation, dynamics driving supply chain benefits, level of capability across the public and private sector, and general resources.

The next section describes, in detail, approaches that de-emphasize the role of the existing CMS; or cause a more radical shift in its management than typical strengthening approaches.



# Defining Alternative Health Supply Chain Models

This section describes detailed approaches that de-emphasize the role of the existing CMS or offer a more radical shift in its management than typical strengthening approaches. Included are case studies of existing models that de-emphasize the CMS.

## Introducing Alternative CMS Models

Table 3 identifies five models with a de-emphasized role for the existing CMS and a brief description of each.

Table 3. Description of Supply Chain Models Without Central Medical Stores

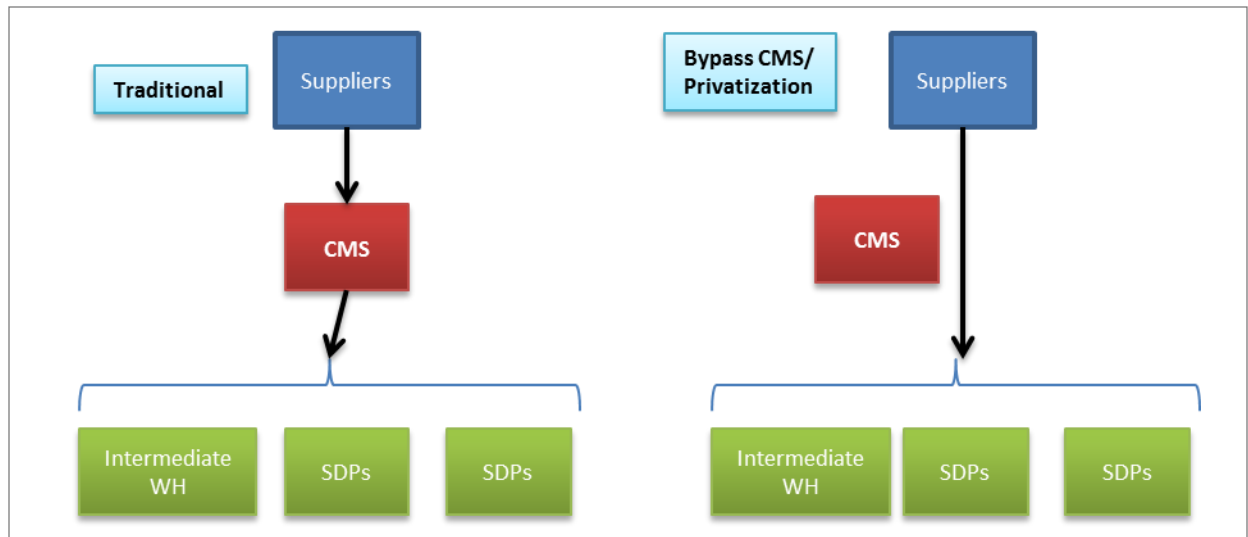
Alternative Model	Description
Bypass CMS Role	Some health commodities do not travel through the CMS; instead, they are directly available to lower-level facilities from the private suppliers, avoiding the CMS's storage and distribution processes
Alternative Management of CMS	CMS management is replaced or outsourced
Parallel CMS with Competition	Introduces additional storage sites that compete with the CMS
Parallel CMS (complementary; temporary)	Introduces temporary additional storage sites to help distribute certain health commodities
Parallel CMS (complementary; permanent)	Introduces permanent additional storage sites to complement the CMS capacity, with coordination across sites

### Bypass CMS Role

This category includes all the models where health commodities do not travel through the CMS, but bypass the CMS and go directly to downstream sites (see figure 1). Different approaches can be used for this outcome. In one approach, tiers below the CMS; for example, regional warehouses send orders to tiers above the CMS, e.g., suppliers for inventory replenishment requests. Another approach—vendor managed inventory (VMI)—has tiers below the CMS sharing inventory and consumption data with tiers above the CMS or third parties; these upstream tiers or third parties make decisions about inventory replenishment (Watson, Serumaga, and McCord 2012). While full privatization of the CMS role is discussed in another section in this guide, the CMS can also be bypassed using some level of CMS privatization.

Not all products need to be on a Bypass CMS model for the approach to be beneficial. The most appropriate health commodities for this approach include products that have a short shelf life, are expensive, or are service-mission critical. These models tend to shorten the overall storage and distribution time and reduce the opportunity for leakage of product from the supply chain.

Figure 1. Bypass the Central Medical Store



## Angola

Theft has seriously impeded the provision of malaria commodities to clients in Angola. Four known thefts of donor-financed artemisinin-based combination therapy (ACTs) occurred at the country's CMS Angomedica between mid-2008 and May 2009, and involved half a million treatments worth almost U.S.\$650,000<sup>1</sup>. The CMS management model in operation was a traditional one, but the root cause for the CMS dysfunction appeared to be a lack of governance and accountability. The largest theft of ACTs—including Global Fund and MOH commodities—from Angomedica in December 2008 resulted, at least partly, from the lack of clear responsibilities for National Essential Drug Program (EDP), which had oversight for the ACT distribution program and Angomedica personnel. However, a second theft occurred even after tighter security and internal controls were established, including limiting access to the warehouse to EDP personnel.

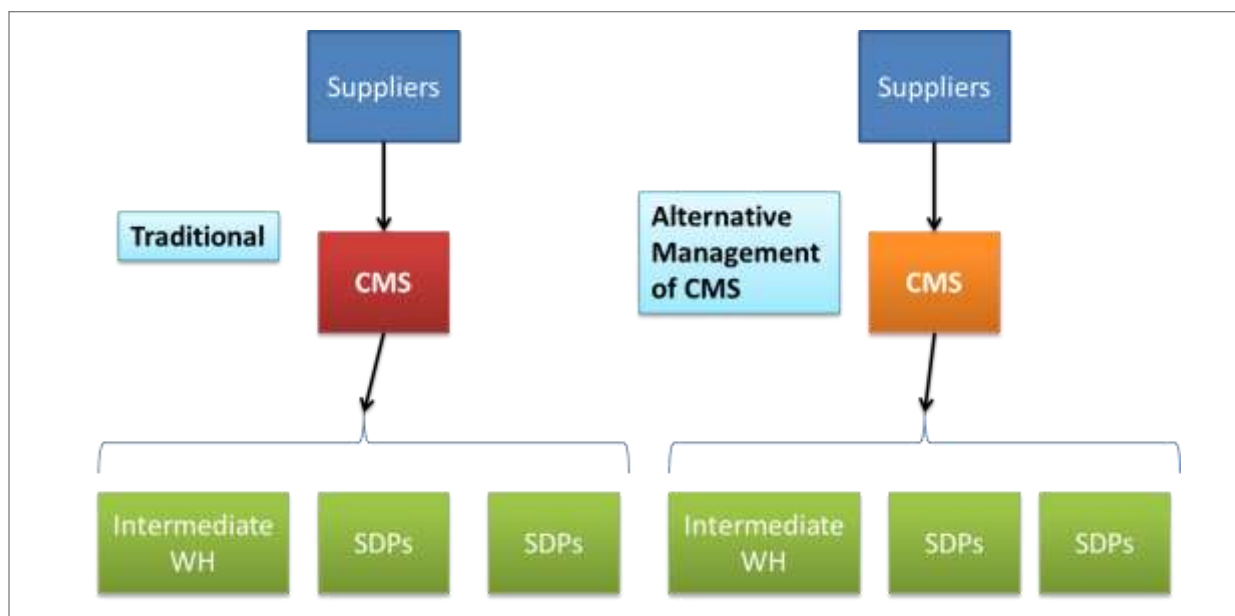
The alternative model that was introduced falls under the Bypass CMS category. To stop further commodity losses, the donor instructed its implementing partner to stop handing over commodities at the central-level Angomedica warehouse and to begin transporting ACTs to the provincial level. At this point, commodities could enter the public supply chain for distribution to the facility level. By July 2012, this approach had been used four times, with two shipments in 2010 and two in February and June 2011. No further thefts have occurred before the commodities were delivered to the provinces. This structure will remain in place until further notice from the donor.

<sup>1</sup> All dollar amounts in this document are U.S. dollars.

## Alternative Management of CMS

This category includes all the models where the roles and responsibilities of a CMS are maintained with the original CMS, but the management and administration of the CMS are replaced (see figure 2). This category of approaches is similar to the approach of privatizing/replacing the CMS because new management could be from the private sector as a third party, or from a social enterprise-based organization—for example, a nongovernmental organization (NGO). (See appendix B for a discussion on privatizing the CMS.) The difference is that working within the existing CMS, or an existing CMS framework, places some constraints on the overall available resources, and also influences the time required to change the management structure. Botswana is a good example (SCMS 2011; Crown Agents 2012).

Figure 2. Alternative Management of Central Medical Store



### Botswana

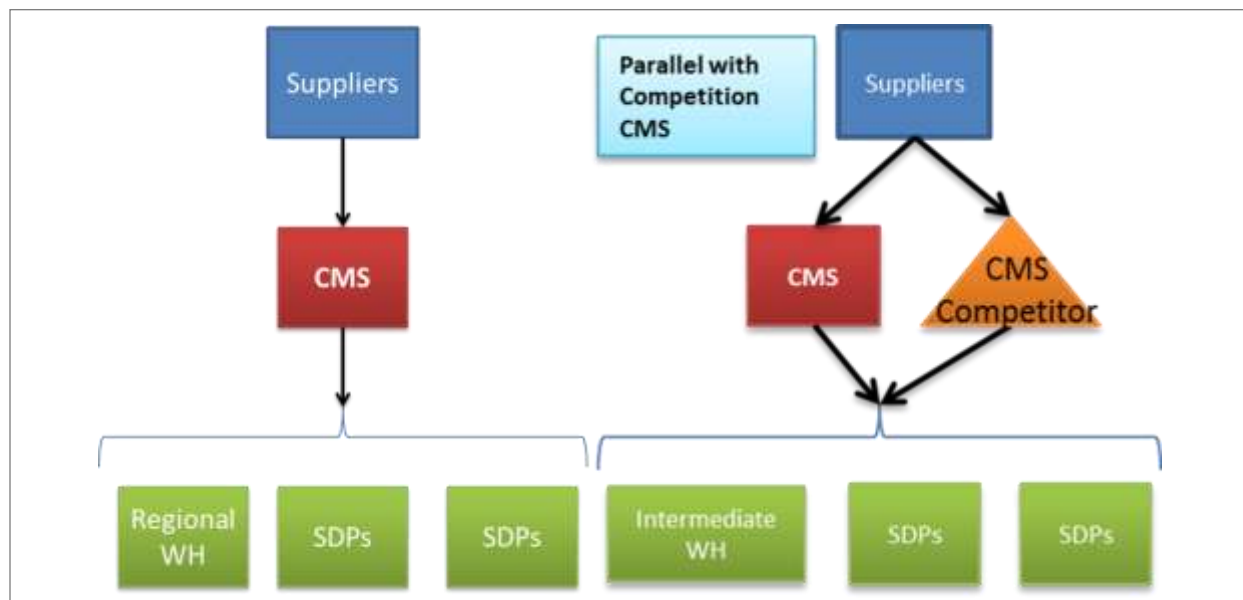
This case study of de-emphasizing the CMS in Botswana looks at using alternative management of the CMS to provide general health commodities. In 2009, to transition to a semi-autonomously managed CMS, the Supply Chain Management System (SCMS) project assumed senior management positions in the CMS.

Prior to 2009, the CMS approach in Botswana was a traditional one, with the CMS included as a government department. The new model, with SCMS as senior management, was that of Alternative Management of CMS. SCMS handled all the management functions and decisions at the CMS, except human resources (HR), finance, and services and primarily focused on such areas as quality management, performance measurement, skill building and infrastructure improvements. The purpose of the new model was ultimately to serve as a transition to a semi-autonomous CMS model within 2 years. However, due to changes in the government and a new minister, plus unsuccessful parastatal transitions—like Air Botswana, the national airline—the timeline was extended and the strategy adjusted so that SCMS continued to manage and build capacity of a local team before returning management to the government. The handover is planned for mid-2012, with SCMS continuing to provide support until late 2013.

## Parallel CMSs with Competition

This category includes all the models where the additional entities introduced into the supply chain can mimic the roles and responsibilities of the existing CMS; tiers below and above the existing CMS can now choose which CMS they will patronize (see figure 3). The multiple CMSs essentially compete with each other for business from the lower tiers—service delivery points (SDPs) and intermediate warehouses—for example, suppliers for support from the upper tiers.

Figure 3. Parallel Central Medical Stores with Competition



### Uganda

In the 1970s, Uganda could be described as having a traditional CMS-supported supply system. The CMS was directly under the Ministry of Health management. The CMS was responsible for procurement, storage, and distribution of all health commodities in the public health system in the country. In 1993, by an act of parliament, the government granted the CMS semi-autonomous status and renamed the National Medical Stores (NMS); however, its mandate did not change. Symptoms of CMS dysfunction included frequent and prolonged stockouts of essential medicines at the national level. Most medicines had to be procured from international manufacturers because local manufacturers could not supply the needed commodities; and the CMS team lacked international procurement skills. In addition, there were delays in distributing medicines to SDPs.

The main impetus for change was the NMS' unreliable service. Also, following the Uganda-Tanzania war in 1978–1979, the country had a general infrastructure breakdown. Instead of depending on the NMS as the sole source of medicines for the non-profit sector, two faith-based organizations—Uganda Catholic Medical Bureau (UCMB) and Uganda Protestant Medical Bureau (UPMB)—formed the Joint Medical Store (JMS) in 1979 to procure and distribute health commodities to their SDPs. Although, initially, the JMS was only intended to supply health units belonging to the two bureaus, it evolved into an institution that supplies all SDPs in the country because of the unreliable service from the NMS. The JMS, over the years, gradually developed into a not-for-profit wholesale enterprise that procures, stores, and sells more than 2,000 products; including pharmaceuticals, medical and surgical sundries, equipment, and instruments, as well as laboratory supplies.



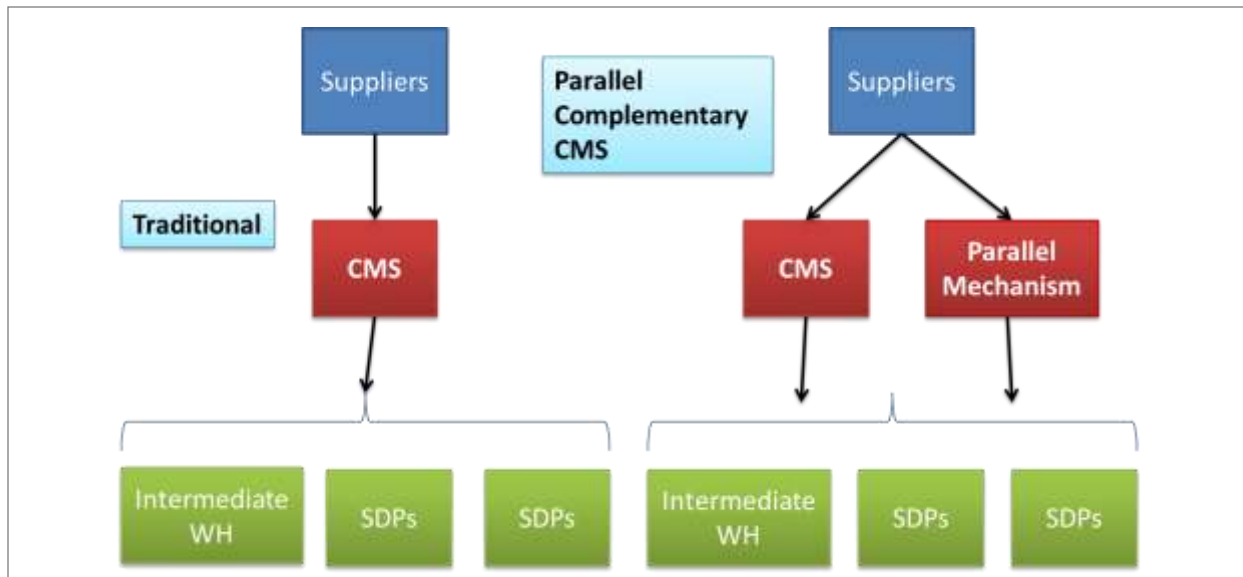
The new model can be categorized as a Parallel CMS with Competition. The competing CMS, JMS, has evolved to offer the following services:

- sells medicines and related healthcare supplies
- sells medical equipment, equipment spares, instruments, and accessories
- provides training to healthcare workers
- repairs and installs medical equipment
- provides advisory services for medicine and medical equipment use and handling
- shares information through an info-bulletin and monthly newsletter.

### Parallel, Complementary CMSs

This category includes all the models where the additional entities introduced into the supply chain can mimic some of the roles and responsibilities of the existing CMS, *but* the entities work together to support the supply chain (see figure 4). This can be temporary or permanent. Seasonal or short-use products that are also bulky, require special handling, or arrive in excessive quantities for the main CMS are more appropriate for the temporary parallel entities. Permanent parallel entities are introduced to complement a more permanent CMS capacity; including coordination to reduce waste and unnecessary duplication of effort. Generally, current CMSs use the same operational approach for all their health commodities; or, in some cases, attempt different approaches for subsets of commodities that are still maintained within the same facility. Both temporary and permanent parallel approaches primarily produce a segmentation effect that strategically creates separately managed channels for storage and distribution suited to particular categories of commodities.

Figure 4. Parallel CMS (Complementary)



## Chile

This case study of de-emphasizing the CMS in Chile looks at the general health commodity provision. Despite a functioning CMS, the Chilean government wanted to take advantage of growing technical capability and technology in general public procurement to support the procurement of medical commodities. The result in Chile was two systems that complement each other—sharing procurement and distribution of medical commodities across Chile.

In Chile, the government thought that a parastatal entity could support supply chain management functions, including procurement; and that the MOH should specialize in providing health services. As a result, in the early 1970s, the government created a semi-autonomous Center for Supplies (CENABAST). The Ministry of Health (MOH) managed it independently and operated it according to commercial-sector principles, with clearly defined performance goals and incentives.

While CENABAST worked to optimize its performance and better serve the health sector during the 2000s, a parallel e-government and procurement reform process was taking place outside the health sector. As part of a Public Management Modernization plan, public procurement was substantially overhauled, leading to a Government Procurement Act in October 1999 and a subsequent new procurement law in 2003 (Bradley 2006). These reforms helped launch the e-procurement department, ChileCompra, which is under the Department of Treasury. This e-platform services all government agencies. Throughout this reform process, the Department of Treasury reformed the regulatory environment and ChileCompra developed its capacity to set up and manage framework agreements.<sup>2</sup> By signing these agreements with suppliers of frequently demanded products—computers, vehicles, and insurance policies—ChileCompra gradually expanded into an electronic catalog from which government agencies could make purchases without the expense and delays of inviting bids (Bradley 2006). Using the e-catalog, more than one supplier is pre-approved for any given product, for an extended period of time, after competing in a competitive bidding process. After the agreement is set up, the supplier's goods are listed in the catalog; the customer then selects products from this catalog.

The MOH aims to transition more and more procurement to ChileCompra in the coming years, except for strategic commodities that are not appropriate for procuring through framework agreements; for example, oncologicals that are often in short supply or are small quantity procurements. While CENABAST still exists, it will continue to procure and distribute many commodities on behalf of health regions; but, it no longer serves all regions for all health commodities. This is expected to be a long-term solution for procuring many commodities. As a result of this transition, in the case of many essential health commodities, the government is establishing a permanent complementary CMS mechanism.

## Benefits of Alternative Models

Potential benefits from the alternative models can be understood by defining two categories that can occur when these models are introduced: *automatic* and *contingent* improvements.

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<sup>2</sup> A framework agreement is an arrangement between the buyer and supplier where both parties agree to the terms of future dealings between them (volumes, price, etc.) without committing to a specific purchase or contract.

*Automatic* improvements are the more direct and immediate consequence of the introduced model. They follow from the direct increase in capabilities or the introduction of more effective structural resources.

*Contingent* improvements result from the potential for improvement that the new model creates, including the additional supportive factors that enable that potential to be realized. The primary result of this distinction is that, generally, implementers will need to pay more attention to benefits resulting from contingent improvements to ensure that the enabling factors for contingent improvement do, in fact, exist and will influence the introduced model as expected. Following are the benefits for each alternative model, including examples from the case studies already described. See table 4 for a summary of these benefits.

Table 4. Automatic and Contingent Benefits

Alternative-Model	Automatic Benefits	Contingent Benefits
Bypass CMS	<ul style="list-style-type: none"> <li>• Reduces variable costs at the CMS related to utilization</li> <li>• Reduces effects of CMS-based dysfunction; e.g., theft, etc.</li> </ul>	<ul style="list-style-type: none"> <li>• Lowers inventory requirements in supply chain for the same level of availability to end customers</li> <li>• Increases responsiveness to downstream supply chain sites, e.g., districts</li> <li>• Reduces distribution costs</li> <li>• Reduces supply chain management difficulties for upstream suppliers</li> <li>• Enables CMS to strengthen, either by building capabilities or allowing transition to a different CMS approach</li> </ul>
Alternative Management of CMS	<ul style="list-style-type: none"> <li>• Improves management capabilities from replacement</li> </ul>	<ul style="list-style-type: none"> <li>• New management brings initiatives for new capabilities and services</li> <li>• Enables CMS to strengthen, either by building capabilities or allowing transition to a different CMS approach</li> </ul>
Parallel CMSs with Competition	<ul style="list-style-type: none"> <li>• Empowers downstream supply chain sites, e.g., districts</li> <li>• Creates redundant supply distribution</li> </ul>	<ul style="list-style-type: none"> <li>• Improves service and cost</li> </ul>
Parallel CMS (complementary; temporary)	<ul style="list-style-type: none"> <li>• Reduces burden on CMS of handling temporary addition of products to supply chain</li> <li>• Creates redundant supply distribution</li> </ul>	<ul style="list-style-type: none"> <li>• Enable CMS to strengthen, either by building capabilities or allowing transition to a different CMS approach</li> </ul>
Parallel CMS (complementary; permanent)	<ul style="list-style-type: none"> <li>• Improves storage capacity across supply chain</li> <li>• Creates redundant supply distribution</li> </ul>	<ul style="list-style-type: none"> <li>• Allows allocation of groups of products to individual supply channels where capability is appropriate; e.g., product requiring refrigeration, extra security, special expiry, etc.</li> </ul>

## Bypass CMS

The primary automatic improvements from a Bypass CMS model result from the reduced role of the CMS in the supply chain. In particular, the variable costs related to CMS use and the effects of CMS-based dysfunction—for example, theft and others—will be reduced. Contingent improvements for the Bypass CMS models include—

- lower inventory in supply chain and attendant inventory costs: inventory losses, inflation, opportunity costs, etc.
- reduced distribution costs
- increased responsiveness to downstream supply chain sites, e.g., districts
- reduced supply chain management difficulties for upstream suppliers.

Table 3 lists the factors that can enable these contingent benefits.

Table 3. Contingent Benefits and Enabling Factors for Bypass CMS

Contingent Benefits	Enabling Factors
Reduced inventory	Minimal inventory pooling loss
Reduced distribution costs	Number of suppliers to the CMS and number of tiers below the CMS are small and not geographically dispersed
Increased responsiveness to downstream supply opportunities	Lead time between CMS and suppliers is short
Reduced supply chain management difficulties for upstream suppliers	Downstream tiers are no longer a source of erratic ordering patterns, or CMS was not a buffer between suppliers and erratic downstream orders

### Angola (Bypass CMS)

Since introducing the approach where malaria commodities bypass the CMS, the root causes of dysfunctions at the CMS remain, but they no longer affect the malaria program.

In this case, the following performance metrics were monitored:

- in-bound logistics costs, including technical assistance costs and security
- time between commodity arrival in-country and delivery to consignees
- theft occurrences.

The results after the Bypass CMS model is introduced include the following:

- Reduced overall costs for an average-size shipment of mixed President’s Malaria Initiative (PMI) commodities for inbound freight and in-country logistics management (see table 4).
- Decreased time between commodity arrival in-country and delivery to consignees by eliminating the transit warehouse in Luanda.
- Enhanced overall commodity security throughout the supply chain.

Table 4. Supply Chain Cost Reduction for Malaria Commodities in Angola

Element	Cost Reduction (\$)
Inbound freight	11,882
Contracted transit warehousing	53,129
In-country transportation	10,400
Security	5,700
Total cost reduction	\$81,111

## Alternative Management of CMS

The primary automatic benefits from the Alternative Management of CMS model result from the improved management of the CMS by managers who do not work directly for the CMS and who replace prior managers. Contingent benefits include new management vision, such as initiatives for further improved service and leveraging improved capabilities for supply chain redesign (see table 5).

Table 5. Contingent Benefits and Enabling Factors for Alternative Management of CMS

Contingent Benefits	Enabling Factors
New management brings initiatives for new capabilities and services	Motivation/benefit for new CMS to pursue offering additional benefits; capability of management for new services
Enables CMS to strengthen by building capabilities or by allowing transition to a different CMS approach	Additional supply chain redesign willingness and capability

## Botswana

The Alternative Management of CMS model in Botswana, ultimately, supports a transition to a semi-autonomous CMS, with hand over to the government planned for mid-2012; enabling this transition is a contingent benefit of the Alternative Management of CMS approach. Until the transition, immediate benefits of the Alternative Management model result from the improved supply chain management capabilities introduced by SCMS in areas such as quality management, performance measurement and management, and skills building. For example the Botswana government generally operates on a balanced score card system. The performance of the CMS stores is linked to the MOH's performance targets. The focus is on two main areas:

- 97 percent availability
- 3 percent or less of procurement value for wastage due to expiry.

SCMS has internal processes and measurements in each department to ensure that all performance targets the same goals.

## Parallel CMS with Competition

The primary automatic improvements from the Parallel CMSs with Competition result from the empowerment of downstream supply chain sites; for example, districts or provinces. This empowerment can result in temporarily lower prices and better inventory availability, with more inventory in the supply chain. Contingent improvements include additional and sustained service

improvement because of the effects of competition. Enabling factors for this contingent improvement include ensuring that CMSs have some access to assistance and resources for improving their service, and potential regulation ensures fair competition between the CMSs.

## Uganda

Using its own procurement and distribution processes instead of the CMS's has enabled the JMS to have higher availability of commodities than the CMS. The JMS, now the leading provider of commodities for faith-based SDPs in the country, has expanded its services to cover international and local NGOs, schools, and health centers in neighboring countries, building new regional distribution centers to support its service offerings.

## Parallel CMS (complementary; temporary)

The primary automatic improvements from Parallel CMS (complementary; temporary) result from the reduced burden on the CMS for handling the temporary addition of products to the supply chain.

## Angola

As mentioned earlier, the impetus for change in managing malaria commodities in Angola was the concern and dissatisfaction with the level of theft and lack of accountability for theft at the CMS. USAID predominantly instigated the change; the USAID | DELIVER PROJECT (the project) was tasked with finding a solution that would bypass the CMS. The final bypass design was not the initial plan described in the previous section. The initial change was to develop a complementary CMS approach. The final bypass model grew out of improvements being applied to this process and the leveraging of partner capabilities.

For the first two provincial deliveries after the ACTs arrived in Luanda by air charter from Europe, an independent security firm witnessed them being unloaded into trucks provided by United Parcel Service (UPS), a partner of the project. After this, instead of completing the delivery at the Angomedica warehouse, which was done in the past, the trucks traveled under security escort to a transit warehouse contracted by the project. At the transit warehouse, workers unloaded commodities and conducted a full piece count. After UPS, the warehousing provider, the security company, and representatives from the project agreed on the count, they transferred the chain of custody for the commodities to the warehousing provider. It took two days for the goods to arrive at the transit warehouse after arriving in Luanda. The security company guarded any vehicle that was parked overnight awaiting unloading.

Initially, using the transit warehouse was necessary because it provided a central-level site where the commodities from different suppliers could be consolidated, repacked into provincial consignments, and temporarily stored while transport was being arranged. With the second provincial distribution, various commodities arrived into Luanda within four days of each other; it only required three days to receive commodities into the warehouse, then three days to load all the vehicles destined for the provinces. Considering the relatively short amount of time the transit warehouse was used, the project analyzed the feasibility of eliminating the transit warehouse and altering its delivery approach to further streamline and strengthen the integrity of the supply chain. After initial estimates showed a potential cost savings and a shorter delivery time, the project decided to consolidate the PMI commodities from different suppliers into preconfigured provincial consignments at the air charter's ground-handling agent in Europe. After the charter aircraft arrived in Luanda, the preconfigured

orders are now loaded directly onto vehicles for subsequent delivery to the provinces, avoiding the use of a transit warehouse in Luanda.

## Parallel CMS (complementary; permanent)

The primary automatic improvements from Parallel CMS (complementary; permanent) result from the improved storage capacity across the supply chain. Contingent improvements include allocating groups of products to individual CMSs that have specific capability; for example, products requiring refrigeration, extra security, special expiry procedures, etc. Enabling factors include technical assistance to help allocate the products across the CMS and the overall willingness to add redesign initiatives.

### Chile

As mentioned earlier, the CENABAST in Chile did not have any initial dysfunction. However, the new public procurement mechanisms provided flexibility that CENABAST could not provide because of design, geographic location, and the procurement regulatory environment.

Generally, the government found that by using framework agreements, instead of the traditional bidding process, they saved \$7,000 with every procurement. Further, according to a report by the Santiago Chamber of Commerce (CCS), the framework agreements reduce the average price per procurement between 7 and 10 percent, rising to more than 20 percent for computers and laptops (Bradley 2006). Finally, when considering the end-to-end supply chain, using framework agreements to arrange procurement and distribution offers many benefits. These include (1) regions avoiding quantifications one year in advance; (2) regions being able to respond more quickly to fluctuations in demand by placing orders on demand; (3) suppliers delivering directly to lower levels; and (4) *procurement specialists* (in ChileCompra), rather than health specialists, managing the contracts, and more of the procurement costs, with guidance and support from the MOH Directorate of Essential Medicines.

## Summary

In this section we described five models that de-emphasized roles for the existing CMS and provided case studies for these models in operation. We also describe the dynamics that drive the benefits expected from each of the categories—immediate benefits and additional benefits that rely on other factors being at work. The multiple approaches available to de-emphasize the role of the CMS in the supply chain imply that the choice of which approach to use in a particular setting is important. In the next section, we consider choosing an appropriate approach for a particular developing-country setting.





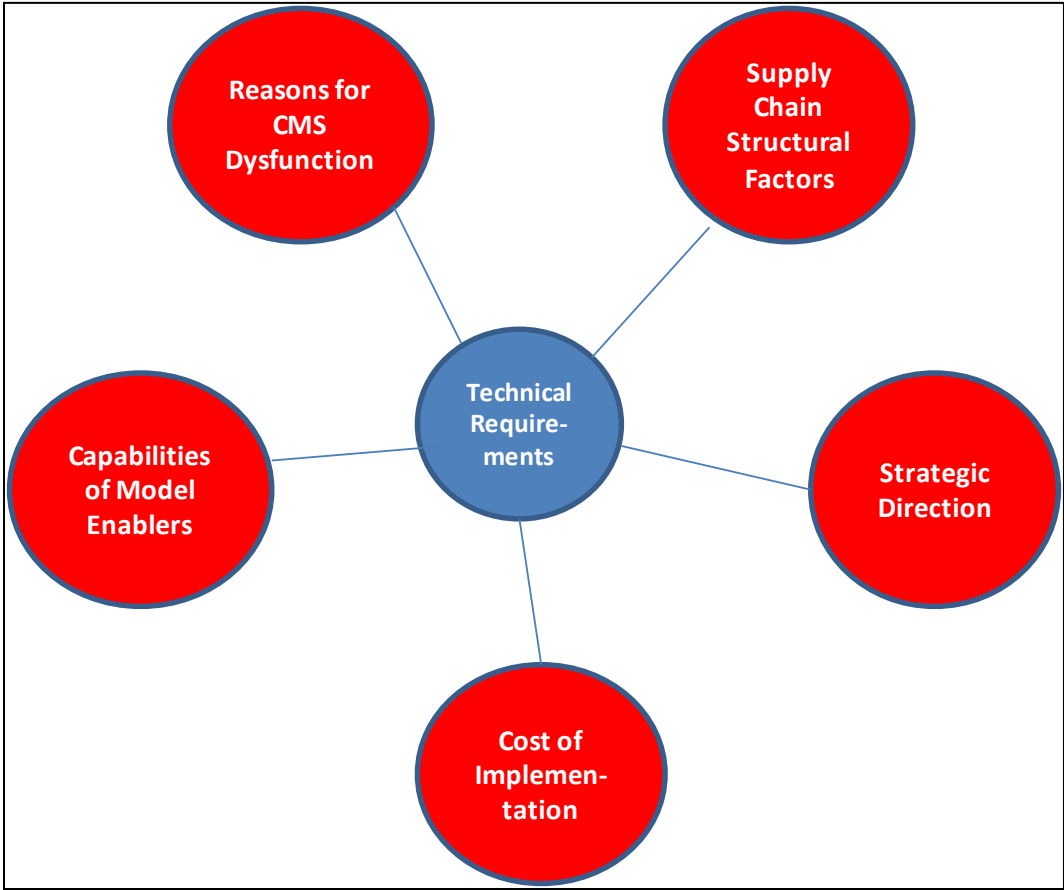
# Choosing Alternative Models

This section looks at choosing an appropriate alternative model, with a focus on the factors that are most important when selecting an alternative model (see figure 5). The appropriate choice of an alternative model should depend on the following factors:

- drivers of CMS dysfunction
- supply chain structural factors required for specific product characteristics
- capabilities of potential model enablers
- strategic directions for supply chain management and the health system
- overall cost of operating and managing the implemented model.

These factors, described for a particular country setting, are the *technical requirements* for a category of alternative models.

Figure 5. Technical Requirements for Supply Chain Models



The alternative models, based on the dynamics of their operation, will differ in the degree to which they meet particular technical requirements; the choice of an alternative model should depend on mapping the alternative model to the technical requirements of the setting.

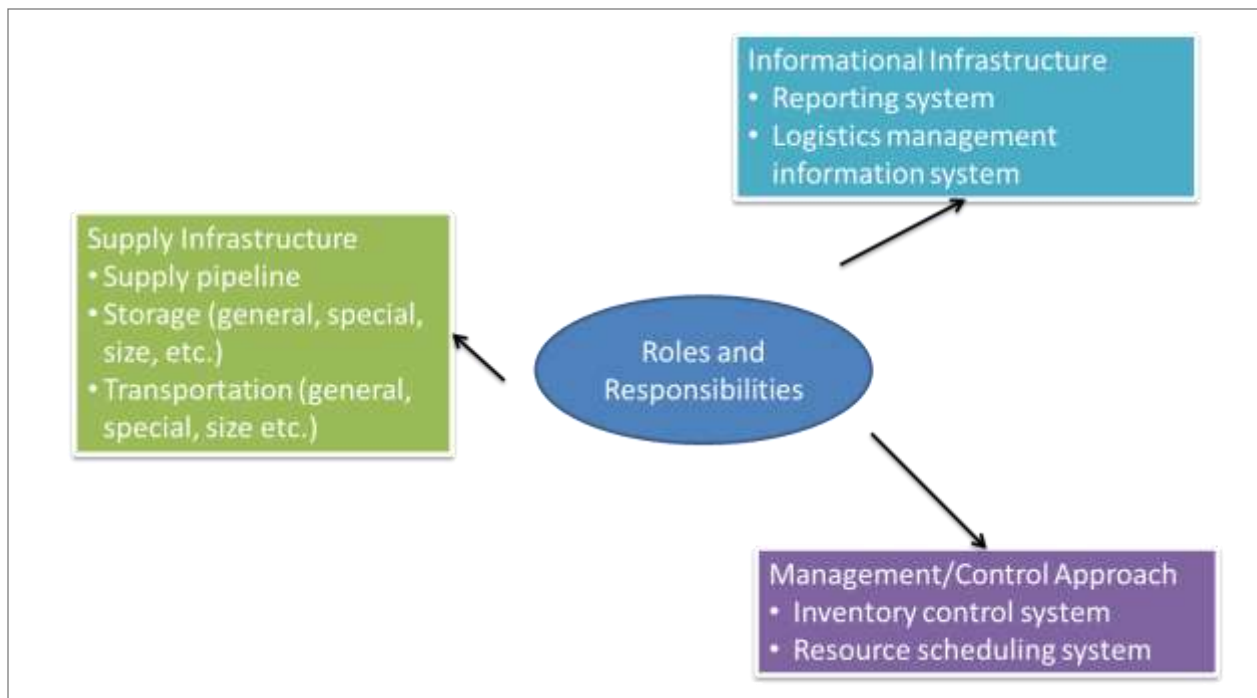
## Reasons for CMS Dysfunction

Because this section is concerned with the performance of supply chain models with and without a CMSs, it is helpful to have a framework for understanding the drivers of supply chain performance. The framework does not need to be exhaustive, but it should be extensive enough to provide persuasive explanations for the diversity in performance across models, with and without CMSs. In this section, we explain drivers of CMS dysfunction in terms of capability, structural, and capability-structural fit–based drivers. We also describe the drivers that each category of alternative model would most appropriately address.

## Factors Driving Supply Chain Performance

The system design elements of a supply chain system can be divided into two categories: (1) structure and (2) roles and responsibilities. Within the structure category are subcategories that include supply infrastructure, informational infrastructure, and management/control approach. Figure 6 shows examples of components within each of these subcategories. Roles and responsibilities represent the division of activity and oversight for participants and stakeholders within the supply chain.

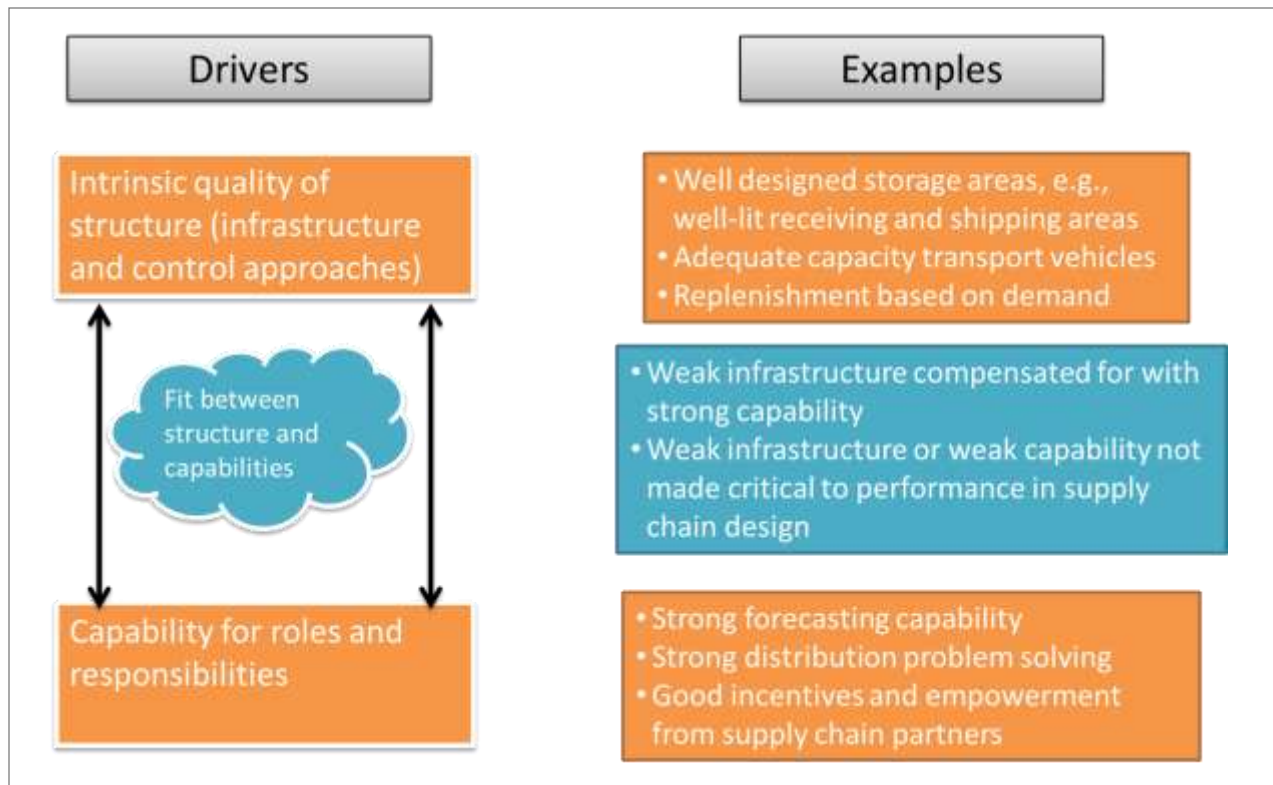
Figure 6. Supply Chain System Design Elements



The performance drivers align to these two categories of supply chain design elements. The three drivers of performance are (1) the intrinsic quality of structure, (2) capability for roles and responsibilities, and (3) fit between quality of structure and capabilities. Some examples of structural

quality include well-designed storage areas, adequate capacity in transport vehicles, and consumption-driven replenishment system instead of planning-driven replenishment. Examples of strong capability include strong forecasting capability, good distribution problem solving, and good incentives and empowerment from supply chain partners. Examples of good fit between structure and capabilities include weak infrastructure that is compensated for with strong capability, and weak infrastructure or capability that is deliberately avoided through the design of the supply chain (see figure 7).

Figure 7. Drivers of Supply Chain Performance



### Drivers of CMS Dysfunction Addressed by Alternative Models

The Bypass CMS and Alternative Management of CMS models can address most capability-based drivers and drivers based on the fit between the structure and capability. Parallel CMSs with Competition can address capability-based drivers, especially if they are incentive/willingness-based. Parallel Complementary CMSs can address capability drivers because storage requirements can be shared over multiple sites in the network. In table 6, we summarize the drivers that can be addressed by alternative models; in table 7, we categorize the factors driving the CMS dysfunction in the case studies described in the earlier section; we found general similarities.

Table 6. Factors Driving CMS Dysfunction Addressed by Alternative Model

Alternative-Model	Factors driving CMS Dysfunction
Bypass CMS, Alternative Management of CMS	<ul style="list-style-type: none"> <li>• Few capability-based drivers (skill set and incentives/willingness based)</li> <li>• Limited structural-capability fit</li> </ul>
Parallel CMSs with Competition	<ul style="list-style-type: none"> <li>• Deficient skills/capacity</li> <li>• Low incentive/willingness-based capability drivers</li> </ul>
Parallel CMS (complementary)	<ul style="list-style-type: none"> <li>• Deficient skills/capacity</li> <li>• Deficient performance culture</li> <li>• Lack of governance/accountability</li> </ul>

Table 7. Factors Driving CMS Dysfunction in Case Studies

Case Study	Factors Driving CMS Dysfunction
Angola (Bypass CMS)	<ul style="list-style-type: none"> <li>• Incentives/willingness-based factors (lack of governance/accountability)</li> </ul>
Uganda (Parallel CMS with Competition)	<ul style="list-style-type: none"> <li>• Structural factors (lack of infrastructure, lack of demand/customer focusing mechanisms)</li> <li>• Deficient skills/capacity</li> </ul>
Chile (Parallel CMS [complementary; permanent])	<ul style="list-style-type: none"> <li>• Structural factors (unintended consequences of government regulation)</li> </ul>
Botswana (Alternative Management of CMS)	<ul style="list-style-type: none"> <li>• Skills-based and incentives/willingness-based factors (deficient skills/capacity, lack of governance/accountability)</li> </ul>

## Supply Chain Structural Factors

Specific supply chain structural factors in the supply chain can also drive the choice of the alternative model. The most significant factor involves product characteristics. Following is a description of the product characteristics most appropriately suited for each category of alternative models.

### Product Characteristics

The Bypass CMS model is best used for products that have a short shelf life, are expensive, or are mission critical. In the Angola case study, donated malaria commodities were the focus of the Bypass CMS approach; but, in Zambia, the focus was laboratory controls with a short shelf life. Parallel CMSs (complementary; temporary) are best used for seasonal products; or products with a short use period and/or are bulky, require special handling, or have excessive quantities. The other models are less specialized and, as a result, more appropriate for products with a long shelf life, are cheap, non-critical, or have substitutes. In our other case studies—Uganda (Parallel CMS with Competition), Botswana (Alternative Management of CMS), and Chile (Parallel CMS

(complementary; permanent)—were applied to more general health commodities. In Chile, commodities were designated across the two supply mechanisms to take advantage of their unique capabilities, e.g., strategic commodities that are not appropriate for procurement through framework agreements or small quantity procurements that would remain with CENABAST. See table 8.

Table 8. Product Characteristics

Alternative Model	Product Characteristics
Bypass CMS	Products: Short shelf life; expensive, service mission critical
Alternative Management of CMS, Parallel CMSs with Competition, Parallel CMS (complementary; permanent)	Products: Long shelf life, cheap, non-critical, has substitutes
Parallel CMS (complementary; temporary)	Products: Seasonal, short-use and bulky, requires special handling, excessive quantities

## Capabilities of Supply Chain Partners and Enablers

To support the Alternative CMS model, each alternative model requires particular capabilities in potential or existing supply chain partners and in the MOH/national government. The capability for the MOH/government is usually located in a management group, such as a dedicated logistics management unit within the MOH. Here we describe the capabilities that particularly suit each category of alternative model.

All alternative models require the appropriate basic or advanced warehousing capabilities. The Bypass CMS model specifically requires that existing nodes/partners in the supply chain can assume the essential activities originally performed by the CMS and that now must pass to these partners. In addition, the capabilities required from the MOH/government are the management of the nodes/partners in the supply chain that have now assumed greater responsibilities or activities. The Alternative Management of CMS and Parallel CMSs models all require third party capabilities for supporting accountability and transparency for governance and the capability of the MOH/government to manage these third parties. The Parallel CMS (complementary) models also require distribution coordination capability across the parallel channels; which can be located in the CMS or with an MOH/government team.

Table 9. Potential Enablers

Alternative Model	Potential Enablers
Bypass CMS	<ul style="list-style-type: none"> <li>Existing or introduced nodes/partners in the supply chain can assume responsibilities for any essential activities that CMS no longer performs</li> <li>MOH/government: Management of nodes/partners as they assume more responsibilities</li> </ul>
Alternative Management of CMS	<ul style="list-style-type: none"> <li>Basic or advanced capabilities in warehousing, as required</li> <li>Third party capabilities for supporting accountability and transparency for governance</li> <li>Special relationships, if possible, with stakeholders</li> <li>MOH/government: Third party management capabilities</li> </ul>
Parallel CMSs with Competition	<ul style="list-style-type: none"> <li>Basic or advanced capabilities in warehousing, as required</li> </ul>
Parallel CMS (complementary; temporary)	<ul style="list-style-type: none"> <li>Basic or advanced capabilities in warehousing, as required</li> <li>Third party capabilities for supporting accountability and transparency for governance</li> <li>MOH/government: Third party management capabilities</li> </ul>
Parallel CMS (complementary; permanent)	<ul style="list-style-type: none"> <li>Basic or advanced capabilities in warehousing, as required</li> <li>Third party capabilities for supporting accountability and transparency for governance</li> <li>Distribution coordination across parallel channels</li> </ul>

## Strategic Direction for Health and Supply Chain Systems

Strategic direction refers to the planned features of the health and supply chain systems that should then govern the individual choices for support and strengthening of these systems (to develop toward these planned features). Strategy determined by country decision makers answers the question of what countries want their systems to be. It moves beyond a simple preference for better performance by recognizing that (1) performance has multiple dimensions, (2) performance across some dimensions requires tradeoffs, and (3) certain levels of performance can be achieved in many ways. Strategy, therefore, dictates the types of performance that will be pursued at the cost of others, if necessary; and, in some cases, how it will be pursued. The types of strategic questions that would influence the choice of an alternative model include—

- What type of performance do we want from the public health system?
- What type of capabilities do we want to build?
- What characteristics of the health systems do we want to have?

Many frameworks bundle specific capabilities, characteristics, and performance expectations into a synergistic whole, e.g., efficiency, equity. Many strategic directions are expressed in terms of these frameworks, instead of their subcomponents; and some frameworks build on other frameworks. As expected, these frameworks can overlap. Here, we identify four areas relevant to the strategy-type of health supply chain performance, healthcare reform direction, health supply chain capability development and sustainability, and the fit of each category of alternative model to these areas. These are not the only areas or frameworks that can be used to analyze the alternative models.

## Type of Health Supply Chain Performance

A number of different frameworks can be used to measure supply chain performance. Here we use a simple efficiency-based versus equity-based performance framework for the CMS. Efficiency-based performance refers to the extent to which costs or resources are economically used (WHO 2012). Equity-based performance refers to the extent to which there are differences in the health services provided to various groups within the country—for example, rural areas versus urban, and different socioeconomic groups (Starfield 2002). The approach to managing the CMS can support one or both kinds of performance; it should be dictated by the health supply chain strategy.

As captured in table 10, all the alternative approaches can support improved efficiency-based performance. Parallel CMSs with Competition, Alternative Management of CMS, and Parallel CMS (complementary; permanent) can potentially support the improvement of equity-based performance, either because of the increase in capacity or the capability that can be leveraged for equity-based performance gains.

## Health Reform Directions

Politically, specific healthcare reform directions have been identified to improve healthcare delivery, including—

- *Privatization* involves the transfer of ownership and government functions from public to private bodies; it may consist of voluntary organizations and for-profit and not-for-profit private organizations, with varying degree of government regulation.<sup>15</sup>
- *Decentralization* involves the transfer of authority and responsibility from the central level of the MOH to field offices, organizations not directly under its control, or lower-level autonomous units of government (WHO 2012).
- *Service integration* involves the coordination of multiple health service options to provide holistic health delivery (WHO 2012).
- *Financing* involves the monitoring of health transactions in sufficient detail to support various approaches to financing health delivery; e.g., insurance schemes, voucher systems, etc.

Again, the approach to managing the CMS can support one or multiple healthcare reform directions; it should be dictated by the health supply chain strategy. As shown in table 10, all the alternative approaches are directly in line with privatization and are potentially supportive of financing healthcare reform directions. In addition, Bypass CMS/Privatizing the CMS and Parallel CMS with Competition are directly in line with decentralization, while Alternative Management of CMS potentially supports decentralization.

## Health Supply Chain Capability Development

Capabilities represent specific skillsets and motivation for identifiable activities within the supply chain, including—

- procurement and forecasting
- warehousing
- inventory management
- information system management
- distribution
- distribution fleet management
- coordination
- third party management.

A health supply chain strategy will include deliberate decisions about which capabilities to strengthen, and by how much; the approach to managing the CMS can support the desired capability development. As shown in table 9, third party management capabilities will need to be developed in the public health system for almost all the approaches, except the Parallel CMS with Competition. Coordination capabilities are needed for Parallel Complementary CMSs. CMS-related capabilities—for example, warehousing, distribution, inventory management, etc.—are needed for the Bypass CMS (in tiers above or below CMS) and the Parallel CMS with Competition approaches.

## Sustainability

Health supply chain sustainability can be described as the ability of a health system to maintain the various factors that drive supply chain performance. The factors considered here are the same structural, capability-based, and structure-capability fit factors described previously. As a result of the multiple factors that can contribute, sustainability represents a complex framework with significant overlap with other strategic framework directions. As such, it is practical to subdivide sustainability into the following subgroups:

1. *Structural sustainability.* The ability of a health system to maintain non-human resources needed for performance.
2. *Skillset sustainability.* The ability of a health system to maintain the human skill needed for performance.
3. *Motivation sustainability.* The ability of a health system to maintain worker motivations needed for performance.
4. *Structural-capability fit sustainability.* The ability of a health system to maintain the appropriate fit between the structure and capability needed for performance.

### Structural Sustainability

Although financial resources are only one of the structural factors that contribute to sustainability, they have generally received most of the attention when sustainability is being considered. Still other non-human resources are required for performance; ideally, structural sustainability should include



some consideration of those resources, as well. We, therefore, consider structural sustainability to be focused on the efficient use of existing resources, maintenance of these resources to ensure their effective life is as long and inexpensive as possible, and options for replenishing these resources—revenue generation, equipment replenishment, and others.

### Skillset Sustainability

Skillset sustainability is focused on the efforts to acquire adequately trained individuals, either through training or directly from the labor market; and to keep them in the health system. Turnover is probably the most significant challenge to skillset sustainability in the public sector.

### Motivation Sustainability

Motivation sustainability is focused on the efforts and mechanisms required to keep the health system workforce generally motivated for supply chain performance; and then, specifically, motivated along the individual performance directions that are appropriate for the health supply system. These mechanisms represent both implicit drivers—for example, performance cultures—and explicit drivers—for example, financial schemes—to reward performance. Usually, with funding, explicit drivers of motivation are simpler to maintain than implicit drivers, such as performance culture.

### Structural-Capability Fit Sustainability

This sustainability is focused on the interdependence between the factors driving supply performance to ensure that the dynamics between the factors help drive performance in a positive, rather than negative, direction. The source for this sustainability is usually the executive decision maker and management level of the health system. Here, those with oversight and discretion over the design of the system and allocation of its resources must monitor this fit and take action to realign it, when necessary.

### Discussion

An assessment of the various models reveals different levels of support for sustainability (see table 10).

Bypass CMS directly supports structural sustainability because it tends to use fewer resources, for example, warehousing resources—although net resource could be higher, depending on how Bypass is executed. Bypass CMS can also support skillset/motivational sustainability, especially when it requires external parties with superior capabilities to do more by using or acquiring additional skills; and the public sector to do less; or to acquire a skill that can be leveraged over other activities, for example, third party management.

Alternative Management of CMS directly supports skillset/motivational sustainability because it can use the private sector to provide the skillset required and some of the implicit drivers of motivation, e.g., performance culture. It can be structurally sustainable, but this depends on the level of inefficiencies that can be eliminated from the system and the operating cost of the new model. The autonomy and accountability that the alternatively managed CMS has can also be supportive of structure-capability fit, because these features can encourage continued attention to those dynamics.

Parallel CMS with Competition is directly supportive of motivational sustainability because of the competition introduced, but it may not be structurally sustainable; for example, if the market cannot provide sufficient support.

Parallel CMSs (complementary; temporary) tend to have direct structural, capability, and structure-capability fit sustainability because of both their temporary nature and the usual direct fit between the needs of the commodity and the capability/incentives of the infrastructure or third party that is temporarily contracted to support the commodity.

Parallel CMSs (complementary; permanent) tend to support skillset/motivational sustainability, especially if the division of services required—or the products supported across CMSs—are such that the skillsets/motivation needed at a CMS are similar to each other. This can potentially narrow the skillset/motivation requirements at each CMS, which makes them easier to maintain.

## Cost of Implementation and Continual Execution

The final dimension that should influence the choice of the alternative model is the—

- cost and effort involved in implementing the model
- costs and effort involved in continually executing the model after it is implemented.

Following is a discussion of implementation and operations management. We conclude with a general ranking of the costs for each category of alternative model.

### Implementation

The implementation activities that we focus on in this section include (1) how the implementation should be managed and the type of problems faced and (2) the necessary activities needed to implement the alternative model. We focus on the following components for managing implementation:

- leadership
- financial resources
- participative structure
- technical infrastructure.

These components are defined in table 11. In the following subsections, we describe the features of each of the implementation management components that are most suited to each alternative model.

Table 10. Strategic Direction for Health and Supply Chain Systems

Alternative Model	Type of Supply Chain Performance Improvement	Health Reform Direction Supported	Capabilities Developed	Type of Sustainability Supported
Bypass CMS	<ul style="list-style-type: none"> <li>• Efficiency-based performance</li> </ul>	<ul style="list-style-type: none"> <li>• Health: Privatization, decentralization, service integration,* financing*</li> </ul>	<ul style="list-style-type: none"> <li>• CMS-related capabilities at tiers above or below the CMS (warehousing, distribution, inventory management, etc.)</li> <li>• Third party management capabilities if external suppliers assume greater responsibilities</li> </ul>	<ul style="list-style-type: none"> <li>• Structural; skillset,* motivational*</li> </ul>
Alternative Management of CMS	<ul style="list-style-type: none"> <li>• Both efficiency- and equity-based performance</li> </ul>	<ul style="list-style-type: none"> <li>• Health: Privatization, decentralization,* financing*</li> </ul>	<ul style="list-style-type: none"> <li>• Third party management capabilities</li> </ul>	<ul style="list-style-type: none"> <li>• Skillset; motivational, structural*, structural capability fit*</li> </ul>
Parallel CMSs with Competition	<ul style="list-style-type: none"> <li>• Efficiency-based performance, equity-based performance*</li> </ul>	<ul style="list-style-type: none"> <li>• Health: Privatization, decentralization, financing*</li> </ul>	<ul style="list-style-type: none"> <li>• CMS capabilities</li> </ul>	<ul style="list-style-type: none"> <li>• Motivational, may not be structurally sustainable</li> </ul>
Parallel CMS (complementary; temporary)	<ul style="list-style-type: none"> <li>• Efficiency-based performance</li> </ul>	<ul style="list-style-type: none"> <li>• Health: Privatization, service integration, financing*</li> </ul>	<ul style="list-style-type: none"> <li>• Within network coordination</li> <li>• Some third party management capability</li> </ul>	<ul style="list-style-type: none"> <li>• Structural, motivational, skillset, structure-capability fit</li> </ul>
Parallel CMS (complementary; permanent)	<ul style="list-style-type: none"> <li>• Efficiency-based performance, equity-based performance*</li> </ul>	<ul style="list-style-type: none"> <li>• Health: Privatization, service integration, financing*</li> </ul>	<ul style="list-style-type: none"> <li>• Within network coordination</li> <li>• Some third party management capability</li> <li>• Product segmentation and supply chain redesign</li> </ul>	<ul style="list-style-type: none"> <li>• Skillset*, may not be structurally sustainable</li> </ul>

\*Potentially supportive of strategic direction

Table 11. Definitions of Implementation Components

Implementation Management Component	Definition
Leadership (L)	Responsible for managing relationships and sequencing activities required for implementation
Financial Resources (FR)	Financial resources needed for additional resources and commitments needed to implement the alternative model
Participative Structure (PS)	Set of stakeholders that should also participate with leadership to implement the alternative model for its best chance of success
Technical Infrastructure (TI)	IT systems and decision-making operational processes, as well as technical assistance

### Leadership

As summarized in table 12, a dedicated MOH team is an appropriate leadership option for all alternative models. A logistics management unit (LMU) is also an appropriate leadership option for all except Parallel CMSs with Competition. Some donors or their implementation agents can also appropriately assume leadership for Bypass CMS and Parallel CMS (complementary; temporary) models.

### Financial Resources

We describe the financial resource requirements relative to establishing a completely new CMS for a country with an approximate population of 10 million. The financial resources in this situation would be high.

As captured in table 12, the low to moderate cost of resources seems appropriate for Bypass CMS, Alternative Management of CMS, and Parallel CMS (complementary; temporary) because of the lack of a permanent addition of physical resources, such as storage. Parallel CMS (complementary; permanent) models could require a higher level of financial resources because they add significant physical resources, such as storage. Parallel CMS with Competition has a larger range of required financial resources, e.g., low, when a third party assumes the complete cost of introducing the competitive CMS offering, to high when the public health stakeholders must create the CMS with Competitive from their own resources.

### Participative Structure

Generally, the more products affected by the shift from the current CMS model, the more stakeholders should be involved in the participative structure. Models like Alternative Management of CMS and Parallel CMS (complementary; permanent) should involve almost all the stakeholders of the public health system, including any relevant third parties. Models, such as Bypass CMS and Parallel CMS (complementary; temporary), require only the affected stakeholders to participate; and for the Bypass CMS, the representatives of the surrounding tiers of the original CMS, especially those who will assume some activities previously done by the CMS. The Parallel CMS with Competition, although affecting multiple products, may not require all stakeholder participation for implementation because the model empowers these stakeholders by adding channels, as opposed to directly affecting the existing channels.

## Technical Infrastructure

The level of technical infrastructure usually follows the financial resources required for the implementation, but it is also affected by the extent of dysfunction in the CMS. For example, for the Alternative Management of CMS, additional technical infrastructure may be needed if the original CMS dysfunction is high.

## Necessary Activities

Although many activities must accompany the implementation of the alternative model, here we focus on particularly significant ones. In particular, recall from the benefits discussion in the previous chapter that some improvements from the alternative models are contingent on specific factors being present. Our necessary activities also include those that ensure the factors required for contingent improvements.

As summarized in table 12, the assessment of capability—especially warehousing capability, either third party or in tiers above or below CMS, for example—is one activity that is common across the various alternative models. For alternative models where the government or MOH will lose direct control of operations of the CMS—Alternative Management of CMS, Parallel CMSs with Competition—some or all of the following activities may be necessary: temporary government support until the new entity is established; considering legislation (e.g., medicine price controls and expectations for rarely used medicines) to ensure an obligation to health; and managing resistance of the CMS employees.

In addition, specific to alternative models, are activities, such as—

- managing pilot programs and procurement contract reform (Bypass CMS)
- discussing with new management the initiative and inclinations for new services
- creating a strong management board (Alternative Management of CMS)
- assessing the existing CMS to sustainably compete
- passing legislation to ensure public health obligation (Parallel CMS with Competition)
- ensuring logical product segmentation and good coordination across parallel channels—Parallel CMS (complementary; permanent).

## Case Studies: Resources and Environment Required for Implementation

### Angola (Bypass CMS)

Key resources required for implementing the Bypass CMS approach in Angola were third party logistics provider (3PL) and security providers, and technical supply chain assistance. Third party logistics provided the initial in-transit warehouse and transportation to and from this warehouse, but it then transitioned to providing inventory consolidation at Leige, Belgium, and transportation from Luanda Airport to provincial MOH depots. Third party security ensured the presence of an independent verifier of shipment quantities and added security for distribution within Angola.

Particular challenges of the initial implementation included the need for a 3PL provider with both air and road modes of transportation experience. Although the project was able to work with a 3PL provider with strong road network experience, it had no experience with internal air transport.



Table 12. Summary Implementation Management Components and Necessary Activities for Alternative Models

Alternative Model	How Should It Be Managed?	Necessary Activities
Bypass CMS	<ul style="list-style-type: none"> <li>• L: Donor, logistics management unit (LMU), dedicated MOH team</li> <li>• FR: Low to moderate (cost of essential activity shift from CMS)</li> <li>• PS: Relevant stakeholders and affected tiers of supply chain</li> <li>• TI: Low to moderate</li> </ul>	<ul style="list-style-type: none"> <li>• Capability assessment of tiers above and below CMS</li> <li>• Pilot programs, if no precedent for task shifting</li> <li>• Procurement contract reform to support contracting with suppliers to assume greater responsibilities and activities</li> </ul>
Alternative Management of CMS	<ul style="list-style-type: none"> <li>• L: LMU, dedicated MOH team</li> <li>• FR: Low to moderate</li> <li>• PS: All stakeholders</li> <li>• TI: Moderate to high (depends on extent of CMS dysfunction)</li> </ul>	<ul style="list-style-type: none"> <li>• Capability assessment of CMS Alternative Management</li> <li>• Manage resistance of CMS employees</li> <li>• Temporary government protection until established</li> <li>• Consider legislation; e.g., medicine price controls and expectations for rarely used medicines, to ensure obligation to health</li> <li>• Additional alternative management</li> <li>• Initiative/inclination discussions</li> <li>• Strong management board</li> </ul>
Parallel CMSs with Competition	<ul style="list-style-type: none"> <li>• L: Dedicated MOH team, third/private party</li> <li>• FR &amp; TI: Low to high (high if public sector sets up CMS or existing CMS will need support)</li> <li>• PS: Some stakeholders</li> <li>• FR &amp; TI: Low to high (high if public sector sets up CMS or existing CMS will need support)</li> </ul>	<ul style="list-style-type: none"> <li>• Assess CMS ability to eventually compete</li> <li>• Temporary government protection until established</li> <li>• Consider legislation; e.g., medicine price controls and expectations for rarely used medicines to ensure obligation to health, irrespective of competitive resolution; e.g., one dominant CMS</li> <li>• Manage resistance of CMS employees</li> </ul>
Parallel CMS (complementary; temporary)	<ul style="list-style-type: none"> <li>• L: Donor, LMU, dedicated MOH team</li> <li>• FR: Low to moderate</li> <li>• PS: Affected stakeholders</li> <li>• TI: Low to moderate</li> </ul>	<ul style="list-style-type: none"> <li>• Capability assessment of third party; e.g., warehousing, third party-related</li> </ul>

Alternative Model	How Should It Be Managed?	Necessary Activities
Parallel CMS (complementary; permanent)	<ul style="list-style-type: none"> <li>• L: LMU, dedicated MOH team</li> <li>• FR: Moderate to high</li> <li>• PS: All stakeholders</li> <li>• TI: Moderate to high</li> </ul>	<ul style="list-style-type: none"> <li>• Capability assessment of warehousing provider</li> <li>• Ensure that product segmentation across CMSs is logical</li> <li>• Ensure coordination across CMSs for service integration</li> </ul>

L: Leadership, FR: Financial Resources, PS: Participative Structure, TI: Technical Infrastructure



The ongoing execution also presented challenges. With freight consolidation done in Europe, procurement activities must be completed during specific times to ensure that commodities are simultaneously available for packing. Also, suppliers should be capable, if necessary, of preparing orders according to special instructions for consignee breakdowns, labeling, and shipping documents. Establishing backup plans are needed in case transport to the final destinations cannot begin directly from the arrival port.

#### Uganda (Parallel CMS with Competition)

The JMS—in competition with the CMS—was initially started to service a particular market. This market preference allowed the organization to develop during its initial years to the point that it could begin to offer the services to a broader market. The JMS also, over decades, showed an ability to recognize needs in its customers and potential customers, and then to expand its service offerings; in some cases, adding capabilities that were not simple extensions of existing capability—for example, equipment supplies, production, and advisory. This recognition of need, in addition to the capability to meet this need, can be favorably compared to the seeming lack of such recognition and response in the national CMS. These efforts by the JMS to increase services took place despite challenges, such as the general infrastructure breakdown in Uganda following the war in 1978–1979 and the general insecurity in the country. Both factors made transporting commodities difficult, and some parts of the country unreachable.

#### Chile (Permanent Complementary CMS)

The procurement reforms leading to ChileCompra required a significant monetary investment by the Chilean government, donor support, and technical support from entities like the General Services Administration, the U.S. Government’s main acquisition agency; the World Bank; the Organization of American States; and the Inter-American Development Bank. It also required major modernization in technology across the overall government system.

Finally, some regions resisted the changes; they preferred to procure from local suppliers to encourage local economic development. Further, any effort to ensure transparent processes is challenging and it can be met with resistance from those who are not seriously committed to the reform process.

#### Botswana (Alternative Management of CMS)

The primary resource required in Botswana was a 3PL with the requisite capability to manage the CMS and the motivation to assume these management responsibilities. Crown Agents supports the SCMS management staff, which has significant experience in managing warehouses in developing countries. In this case, SCMS also had to be willing to share control of the CMS with the government, because not all the functional departments within the CMS are under its control. In addition, the government procures or provides some services; therefore, SCMS had to accept the resulting service quality.

#### Operations Management of Model

In describing the operational management requirements of the model, we focus on the execution of the model after implementation, because the efforts and activities required at implementation may be significantly different from those after implementation.

Specifically, we focused on—

- challenges for continual execution
- performance monitoring and continuous improvement.

For each, we describe the particular features that are the most relevant for each alternative model (see table 13 for a summary).

Challenges for continuing execution are very specific for each alternative model. We describe only a few of the major ones. Particular challenges for the Bypass CMS model include coordinating with related products that either still travel through the CMS or are received from other suppliers. Another challenge for this model is that it potentially involves resources allocated to a smaller subset of products, which reduces the economies of scale. Some challenges for Alternative Management of CMS are ensuring some remaining government control, collaborative problem solving, and preexisting tensions between the public and private sector. For Parallel CMS with Competition, ensuring some remaining government control is one of the biggest challenges. Some of the most significant challenges for Parallel and Complementary CMSs are coordination across channels and planning the use of temporary channels.

Performance monitoring and continuous improvement refers to the structure and processes for (1) identifying and recording performance, in particular, guiding management activity; and (2) identifying performance deficiencies and determining and executing solutions for the deficiencies.

For performance monitoring, relevant key performance indicators (KPIs) and, in some cases, additional audits—Alternative Management of CMS, Parallel CMS with Competition, and Parallel CMS (complementary; permanent)—are important. For continuous improvement, we focus exclusively on leadership for these activities. (Additional activities for continuous improvement are also significant, but they may not vary as much between models.) For the Bypass CMS, Parallel CMS with Competition, and Parallel CMS (complementary; temporary) the leadership during implementation would be most appropriate for the leadership of the continuous improvement activities. The leadership options for these models included donors, logistics management units, and dedicated MOH teams. A dedicated MOH team would also be appropriate to lead continuous improvement efforts for a Parallel CMS (complementary; permanent). For the Alternative Management of CMS, a collaborative team that includes representatives of the management of the CMS and public health stakeholders would be more appropriate. Although CMS management, in this case, may be able to manage continuous improvement efforts on their own, the collaborative team structure facilitates feedback on more appropriate improvement directions, general information sharing on the improvement program, and coordination on supply chain activity changes while the improvements are taking place.

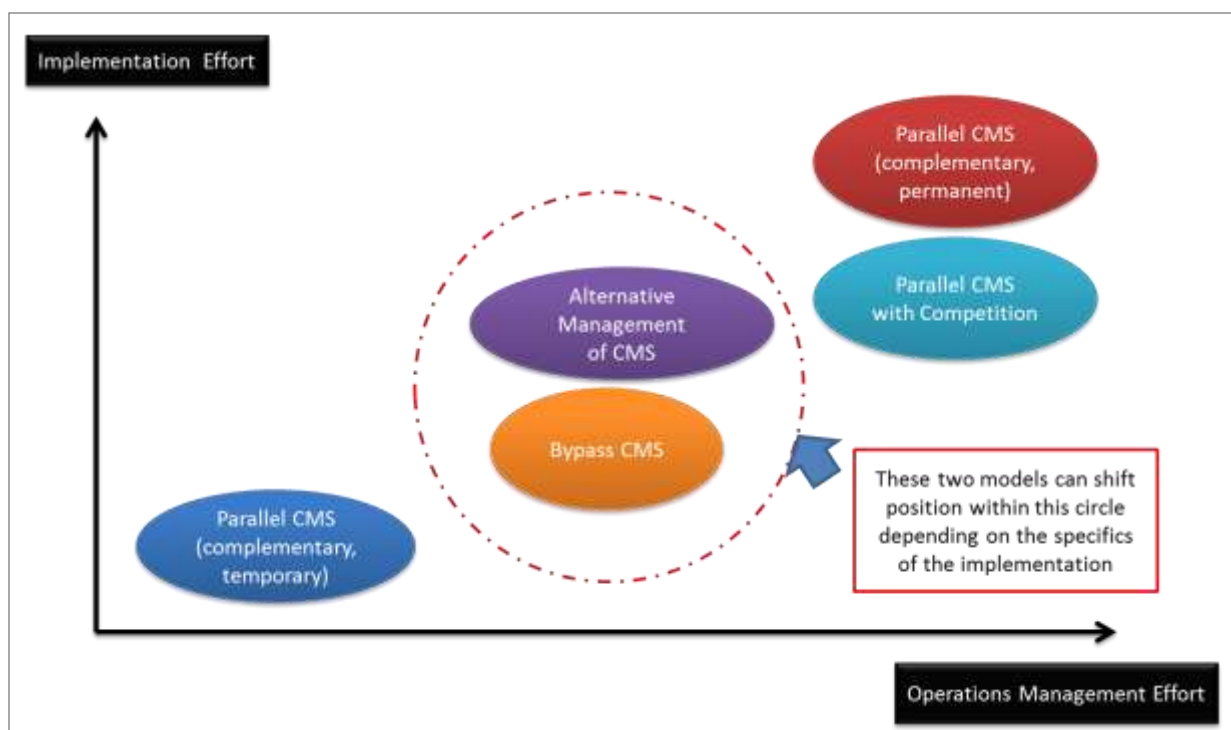
Table 13. Challenges for Operations Management

Alternative Model	Challenges for Continual Execution	Performance Monitoring (PM) and Continuous Improvement (CI)
Bypass CMS	<ul style="list-style-type: none"> <li>• Coordination with related products still moving normally through CMS</li> <li>• Potentially reduced economies of scale</li> </ul>	<ul style="list-style-type: none"> <li>• PM: Key performance indicators (KPI) (distribution)</li> <li>• CI leadership: Original leadership during implementation</li> </ul>
Alternative Management of CMS	<ul style="list-style-type: none"> <li>• Tensions with public sector</li> <li>• Government control</li> </ul>	<ul style="list-style-type: none"> <li>• PM: KPIs, audits</li> <li>• CI leadership: Collaborative teams</li> </ul>
Parallel CMSs with Competition	<ul style="list-style-type: none"> <li>• Government control</li> </ul>	<ul style="list-style-type: none"> <li>• PM: KPI (distribution), audits</li> <li>• CI leadership: Leadership during implementation</li> </ul>
Parallel CMS (complementary; temporary)	<ul style="list-style-type: none"> <li>• Coordinated planning with sufficient lead times</li> </ul>	<ul style="list-style-type: none"> <li>• PM: KPIs (distribution)</li> <li>• CI leadership: Leadership during implementation</li> </ul>
Parallel CMS (complementary; permanent)	<ul style="list-style-type: none"> <li>• Coordination across CMSs</li> </ul>	<ul style="list-style-type: none"> <li>• PM: KPIs (warehousing, distribution—individual and collective—audits)</li> <li>• CI leadership: MOH dedicated team</li> </ul>

## Implementation Summary

Many of the activities described in this section on the cost of implementation and operations management will vary, in terms of cost of effort, and depending on the circumstances of the implementation and the parties expending the effort. We ranked the various models by relative effort for implementation and operations management (see figure 8). The Parallel CMS models require a high level of effort, either complementary or with competition. It may appear that Parallel CMSs with Competition would require less effort. However, the performance by the CMSs and the competition between the CMSs must be managed; and this type of effort, although different from running the CMSs directly, is still significant. The Parallel Temporary CMS requires less effort. The low effort requirements are primarily because the model is temporary. Between these two levels of effort are the three remaining models. In general, bypassing the CMS requires a lower implementation effort than Alternative Management of CMS. However, this position can change, depending on the circumstances of the implementation; and, for example, who is assuming leadership.

Figure 8. Implementation versus Operations Management Effort for Alternative Models



## Choosing the Alternative Model

In this section, we discuss how alternative models can be chosen for a particular setting. In the previous sections, we described the various alternative models in terms of how they fit with (1) drivers of traditional CMS dysfunction, (2) supply chain structural characteristics, (3) capabilities of model enablers, and (4) strategic directions for health and supply chain systems. We refer to these components when they describe a particular country setting as part of the *technical requirements* for an alternative solution. The country's budget for implementation and operations management is another technical requirement for an alternative solution; we also describe the activities required for implementation and operations management for these models, and include approximate relative cost. A country's technical requirements for a CMS solution, and an understanding of the features of alternative models, provides context for identifying certain steps and observations for choosing a particular alternative model to address current dysfunction. Following is a list of these observations.

1. *It is unlikely that any one alternative model will fulfill all the technical requirements.*

Rarely are all our requirements met by a single choice. Usually, choice involves a trade-off across requirements. To make the appropriate choice for an alternative model solution, decision makers must be very specific in detailing the technical requirements for a particular country setting and the expected performance for the different alternative models, for each requirement.

2. *Prioritizing the technical requirements, and specifying the degree to which the requirements are met, should probably be formalized.*

Following the first statement, to make choices about alternative models, we will probably need to objectify<sup>3</sup>—or depersonalize—the technical requirements; and, because one particular alternative model may not meet all the technical requirements, we may also need to objectify the partial fulfillment of requirements.

3. *Given the mapping of alternative models and technical requirements, the following are potential approaches for considering a particular model:*

- Consider the model choice as a transition model.
  - Consider the model as part of a portfolio of steps to address dysfunction.
  - Consider an additional mix/innovation of the existing models to address unmet requirements.
- A. Considering the model choice as a transition model is one approach for mapping the alternative models and only partial fulfillment of the technical requirements. The transition model is called this because it enables, in some way, the ultimate shift to a more permanent approach to the CMS. This could mean that this permanent approach maintains the CMS's role in the supply chain—for example, strengthening the CMS—or it may de-emphasize it by using a different alternative model. This enablement can be considered in multiple ways:
- a) Addresses only some of the dysfunctions of the CMS, usually the most debilitating or costly ones.
  - b) Tests some of the capabilities required for the expected permanent approach to the CMS to determine if the capabilities are in place, or it allows this capability to be developed in a less demanding setting.
  - c) Enables the implications of shift from the current CMS approach to be more easily envisioned and to generate buy-in.
  - d) In some cases, the ultimate shift from the current CMS model may be unclear until the transition model presents a more concrete sense of the options and opportunities for further change; for example, the Angola case study.

The case studies in Angola and Botswana reveal alternative models being used as transition models. For Botswana, the expected permanent approach to the CMS is a strengthened CMS.

- B. Considering the model choice as part of a portfolio of activities to address CMS dysfunction reduces the reliance on the alternative model choice as the sole solution; and, therefore, reduces the negative implications if the technical requirements are not being met. Although usually more costly, a portfolio of activities has diversification properties similar to that of a portfolio of financial investments, which tends to reduce the risk and magnitude of failure for the basket of interventions. This approach views the shift from traditional CMS within a much larger set of health and supply chain improvement efforts; the structure and leadership to execute within such a setting must be appropriate. The approach also allows the use of an alternative model to be seen as a complement to the ongoing CMS strengthening efforts.

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<sup>3</sup> In this context, objectify means to express, in a concrete and comparable way, across different requirements, the implication of their partial fulfillments.

- C. Finally, the models described here allow for significant customization to meet any outstanding technical requirements. Further innovation beyond these models is still possible and recommended. The mapping of alternative models on technical requirements and formalizing the priorities of the requirements can identify areas for innovation within the alternative models, so as to try to meet high-priority technical requirements.

A final approach, which was not explicitly stated, but could be rationalized, is formalizing the priorities of the requirements and the implications of the unmet requirements, to choose the model that is determined to be the best. This approach ignores the other levers that exist for addressing supply challenges, including the dynamic nature of capability development—especially the effect of time—in a way that the other approaches discussed here do not. As such, we do not emphasize it as an appropriate approach, although it has and will continue to be used in such deliberations.

# Discussion and Conclusion

In response to the systematic dysfunction in the CMSs’ performance in developing countries detailed in this document, we examined multiple options for de-emphasizing the role of the CMSs in their respective health supply chains. One principle used to identify these options was an evidence base for their improvements to the supply chain. As a result, one particularly popular theoretical approach—using privatization to replace the current dysfunctional CMS—was considered, but ultimately dropped from the final list of options because of limited evidence. (See appendix B where we make the case that, in the future, this option for de-emphasizing the current CMSs may be more appropriate.)

The multiple options for de-emphasizing the current CMSs raise the question of how to select an option for a particular setting. The discussion in this report centered on criteria to use when selecting an ideal option, including the environmental factors of the settings and deliberate choices by health system designers about the particular characteristics desired for the system. In reality, our case studies showed less deliberation and more happenstance in selecting a particular option (see table 14). In general, changes resulted from the capability of enablers—often coupled, but not always, as in the case of Chile—discontent with the current CMS performance. In developing countries, the limitations of model enablers are a reality, with two implications.

1. *Our evidence base may not represent the ideal approach to addressing each country situation and the options described should be considered in this light.*
2. *Addressing CMS dysfunction may not be only a process of promoting these options for de-emphasizing the current CMS; but, more important, improving the prospects for various model enablers in order to increase the number of choices potentially available for de-emphasizing the current CMS and improving the performance of the supply chain.*

Recurring model enablers across multiple alternative models include third party assessment, management and coordination capabilities, logistics capabilities (especially warehousing), third party relationship capabilities within the private and non-profit sectors, and flexibility within the existing health supply chain beyond the CMS.

Table 14. Impetus for Change in Case Studies

Case Study	Impetus for Change
Angola (Bypass CMS)	<ul style="list-style-type: none"> <li>• Donor dissatisfaction</li> <li>• Extreme CMS dysfunction</li> </ul>
Uganda (Parallel CMS with Competition)	<ul style="list-style-type: none"> <li>• Unreliability of service from CMS</li> <li>• General lack of infrastructure</li> <li>• Common interest in supply between non-profit organizations</li> </ul>
Chile: Parallel CMS (complementary; permanent)	<ul style="list-style-type: none"> <li>• Available procurement capacity of national alternative</li> </ul>

Case Study	Impetus for Change
Botswana (Alternative Management of CMS)	<ul style="list-style-type: none"> <li>• Extreme CMS dysfunction</li> <li>• Management study</li> </ul>

In addressing CMS inefficiencies, de-emphasizing the existing CMS role in the supply chain is one set of alternatives to strengthening the CMS. However, the general steps involved in either set of approaches are very similar, including (1) identifying the factors that cause the inefficiency and possible priorities for addressing these factors; and (2) addressing the factors driving inefficiency and, where possible, focusing on identified priorities. The challenges for both are similar. They include the willingness of government and the CMS personnel to pursue the approach and to allocate resources to support them; although the scale of this challenge may be higher for de-emphasizing the CMS.

Other challenges include the magnitude of the effort, which usually increases with the level of deficiency; resource shortages; number of facilities in the network; level of reorganization required for the network; and any new agents that must be introduced into the supply chain. Others include the difficulty in identifying the priority for factors driving the inefficiency; the negative effect of past failures; and any novelty in and, thus, unfamiliarity with the changes to be made. These similarities reflect the fact that *in selecting the approach for addressing the CMS, all possible options, relative to each other, should be considered; including both options to strengthen the CMS and to de-emphasize its role or change its management.*

Finally, the approach to model selection also identified multiple perspectives on selecting the alternative option:

- Consider the model choice as a transition model.
- Consider the model part of a portfolio of steps to address dysfunction.
- Consider additional hybridization/innovation of existing models to address unmet requirements.

All perspectives share the idea that the choice of the alternative model is not the final destination in the evolution of the healthcare supply chain, or the entire solution for the CMS dysfunction. Even, in some cases, de-emphasizing the CMS provides the CMS the opportunity, or an operating precedent, to support its strengthening and return to its original role in the supply chain. Therefore, our alternative models should not be seen as static with respect to the evolution of supply chain capabilities, or in isolation with respect to the solution for addressing supply chain performance. That is, *consider the models presented here as potential next steps, or potential pieces of a larger approach, to address health supply chain performance in developing countries, and not the final step or solution.* Most important is the roadmap or supply chain master plan for health supply chain systems development that supports a holistic and dynamic perspective to addressing supply chain dysfunction, with the CMS as its source, instead of a singular and static one.



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## Appendix A

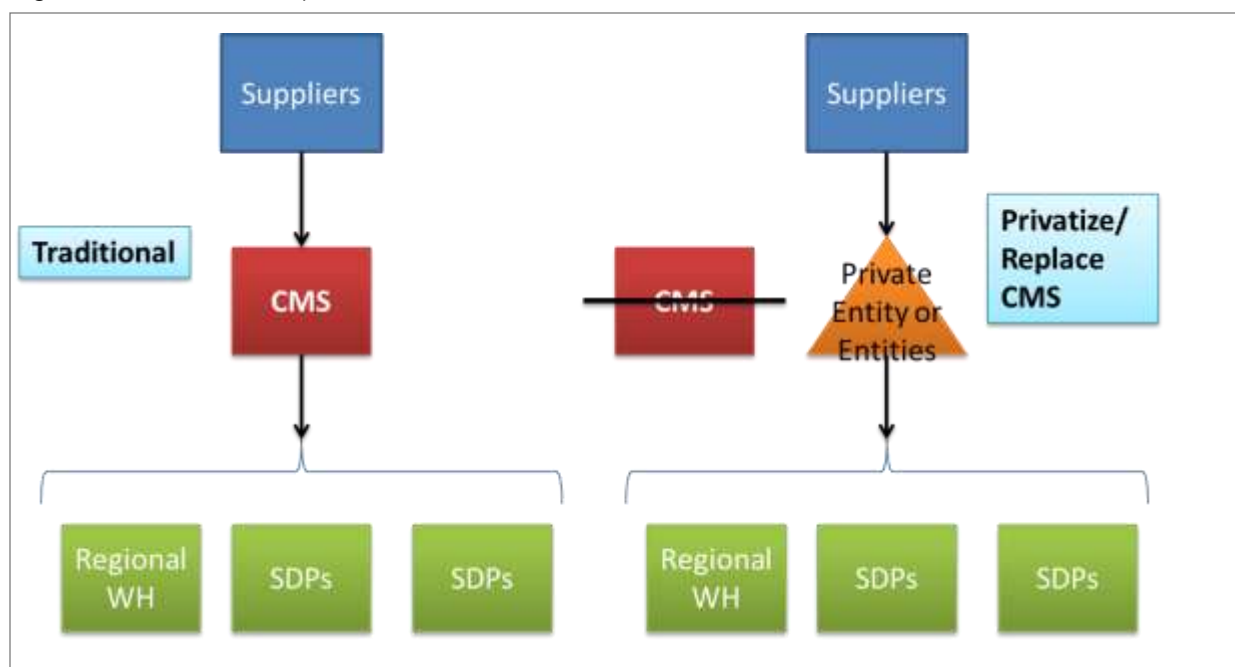
# Other Alternative Models for the CMS—Full Privatization of the CMS

Another potential category of models are available for the CMS and its prominent role in the health supply chains of developing countries. We refer to this category as privatize/replace CMS; as the name suggests, this category includes all the models where the roles and responsibilities of a CMS are maintained, but the original CMS is phased out of the supply chain and replaced by a different entity, or set of entities, which assume those roles and responsibilities (see figure 9). Classical privatization can take many forms, (Mohamed 2008) including—

1. eliminating a public function and its assignment to the private sector
2. selling assets to private firm
3. deregulating, by eliminating the government's responsibility for setting standards and rules for a good or service
4. contracting, by using a government financing of services provision specified in a contract with the private sector
5. using vouchers, provided by the government, or using financed cards that permit private individuals to purchase from a private provider
6. franchising by the public sector to establish a model that is funded by a government agency, but implemented by approved private providers
7. charging user fees, allowing public facilities to generate income through drug sales or other services.

We focus on forms 1–5. In a public health setting, the new entity introduced to the supply chain can be either a traditional private-sector entity, or one of the many social enterprises that also operate in the public health setting; e.g., NGOs. Form 6, franchising, is more representative of our model of Alternative Management of CMS. Form 7 matches the CMS with the user fees model described as one of the existing management models.

Figure 9. Privatize/Replace the Central Medical Store



## Making the Choice to Privatize CMS

When selecting an alternative model, it is important to use a process that considers the technical requirements of the country setting and how the alternative model fits these requirements. Here we discuss the technical requirements most appropriate for privatizing the CMS.

### Benefits and Capabilities of Model Enablers

Classic privatization is said to have the following advantages:

1. fosters and initiates competition, which drives down costs
2. ensures that management is directly affected by costs
3. increases operational flexibility because of reduced bureaucracy
4. when available, provides access to more developed private sector capabilities.

(DeHoog 1984; Savas 1987; Hartley 1986; Moore 1987; and Ascher 1987)

The primary automatic benefits from a privatize/replace CMS model result from the improved capabilities of the new CMS that replaces the previous CMS. Contingent benefits include new management vision that can include initiatives for further improved service, and leveraging improved capabilities for supply chain redesign. In addressing drivers of supply chain performance, *privatizing the CMS* can address specific structural and capability factors. It is the only model that can address the structural driver of the lack of financing, resources, and infrastructure. With respect to health commodities, a privatized CMS can manage a wide variety of products, as allowed by the capabilities and competition in the private sector; but, generally, it can manage products with a long shelf life, that are cheap, non-critical, or have substitutes. Capability enablers in the private sector

include the appropriate basic or advanced warehousing capabilities, and third party capabilities for supporting accountability and transparency for governance. In addition, the MOH/government requires the capability to manage these third parties.

## Strategic Direction for Health and Supply Chain Systems

Privatization of the CMS supports efficiency-based performance; potentially, it can support the improvement of equity-based performance, either because of the resulting increase in capacity or capability that can be leveraged for equity-based performance gains (see table 15). Obviously, privatization of the CMS is directly in line with privatization of the health system, in general. It is also, potentially, supportive of financing healthcare and decentralization. With respect to capability development, third party management and coordination capabilities will need to be developed when privatizing the CMS. With respect to sustainability, privatization of the CMS shares similarities with the Alternative Management of CMS. It directly supports skillset/motivational sustainability, because it can use the private sector to provide the skillset required and some of the implicit drivers of motivation; e.g., performance culture. It can be structurally sustainable, but this depends on the level of inefficiencies that can be driven out of the system, and the operating cost of the new model. The autonomy and accountability that the privatized or alternatively managed CMS possess can also be supportive of structure-capability fit, because these features can encourage continued attention to those dynamics.

Table 15. Privatization of the Central Medical Store

Factors driving CMS dysfunction addressed		<ul style="list-style-type: none"> <li>• Deficient skills/capacity</li> <li>• Deficient performance culture</li> <li>• Lack of governance/ accountability</li> <li>• Lack of financing/resources/infrastructure</li> </ul>
Product characteristics		<ul style="list-style-type: none"> <li>• Usually commodities with a long shelf life; are cheap, non-critical, and have substitutes</li> <li>• Specialized products depend on private-sector capabilities and competition</li> </ul>
Capabilities of potential enablers		<ul style="list-style-type: none"> <li>• Basic or advanced capabilities in warehousing, as required</li> <li>• Third party capabilities for supporting accountability and transparency for governance</li> <li>• MOH/government: Third party management capabilities</li> </ul>
Strategic direction	Type of supply chain performance	• Efficiency-based performance, equity-based performance*
	Health reform direction	• Health: privatization, decentralization*, service integration*, financing*
	Capability Development	<ul style="list-style-type: none"> <li>• Third party management capabilities</li> <li>• Cross-agency coordination</li> </ul>
	Sustainability	• Skillset: motivational, structural*, structure-capability fit*

\*Potentially supportive of strategic direction

## Cost of Implementation and Continual Execution

To implement the privatization of the CMS, leadership options include a dedicated MOH team or a logistics management unit (LMU) (see table 16). High financial resources could be required because implementation may include a costly private-sector option that has a higher level of service offerings. As the number of products affected by the shift from the current CMS model is usually very high, the participation managing the implementation should, appropriately, involve all public health system stakeholders, including any relevant third parties. The technical infrastructure should be moderate because it primarily involves the management processes for choosing and coordinating with the private sector. Necessary activities for implementation include the assessment of capability, especially warehousing capability; and some or all the following activities, especially because the government or MOH will lose direct control of the CMS operations; temporary government support until the new entity is established; consideration of legislation—e.g., medicine price controls and expectations for rarely used medicines—to ensure obligation to public health objectives; and managing the resistance of CMS employees.

Challenges for privatization of the CMS are similar to those of the Alternative Management of CMS; the most significant include monitoring performance, ensuring some government control remains, collaboratively solving problems and the existing tensions between public and private sector. For performance monitoring, relevant key performance indicators (KPIs) and additional audits are important; for continuous improvement, a collaborative team that includes representatives from the management of the CMS and public health stakeholders would be appropriate for improving leadership.

The overall effort to implement and manage operations to privatize CMS is similar to the Alternative Management of CMS model, but it can vary, depending on the circumstances of the implementation; and, for example, who is assuming leadership.

Table 16. Implementation and Operations Management to Privatize the CMS

Implementation	How should be managed?	<ul style="list-style-type: none"> <li>• L: logistics management unit (LMU), dedicated MOH team</li> <li>• FR: Moderate to high</li> <li>• PS: All stakeholders and third party logistics provider (3P)</li> <li>• TI: Moderate</li> </ul>
	Necessary activities	<ul style="list-style-type: none"> <li>• Capability assessment of 3PL; e.g., warehousing, 3PL- related</li> <li>• Temporary government protection until established</li> <li>• Consider legislation; e.g., medicine price controls and expectations for rarely used medicines to ensure obligation to health</li> <li>• Manage resistance of CMS employees</li> </ul>

Challenges for operations management	Challenges for continual execution	<ul style="list-style-type: none"> <li>• Monitoring</li> <li>• Problem solving</li> <li>• Tensions with public sector</li> <li>• Government control</li> </ul>
	Performance monitoring (PM) and continuous improvement (CI)	<ul style="list-style-type: none"> <li>• PM: KPIs (warehouse and distribution), audits</li> <li>• CI Leadership: Collaborative teams</li> </ul>

## General Discussion

Unlike the models discussed earlier, it is unlikely that the privatization of the CMS is isolated from general privatization of the health system. Columbia is an example of general privatization of the health system in a developing country (De Groote, De Paepe, and Unger 2005; Echeverri 2008). This wholesale privatization of the health system has had, at least, mixed results. Suggested reasons for poor performance of such efforts include the lack of—

- public funds to drive demand-side reforms
- management skills for managing third party relationships
- real competition between competent and substantial private providers
- legal and political environment that can enforce regulations and resist patronage and corruption
- participation of low-income groups in government policy design.

(Echeverri 2008)

The reality that privatizing the CMS is probably coupled with, or a small part of, privatization of the entire health system—an approach that has even greater challenges within the developing country context—reduces the appropriateness of recommending privatization of the CMS as a way to deemphasize the CMS in the health supply chain of developing countries, at this time. It is possible that as factors develop and lead to improved prospects for privatizing the health system, in general, then prospects for privatization of the CMS, in particular, will also improve.





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