TRAINING EVALUATION

for the
Public Health Supply Chain

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By

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On behalf of the People that Deliver (PtD) Initiative

Content

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Any omissions or mistakes in the text or resource citations are fully the responsibility of the authors.
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Abbreviations

HR	Human Resources
HRD	Human Resources Development
HRM	Human Resources Management
ISC	Immunization Supply Chain
KPI	Key Performance Indicator
MOH	Ministry of Health
OECD	Organization for Economic Co-operation and Development
PtD	People That Deliver
SC	Supply Chain
SCM	Supply Chain Management
TNA	Training Needs Assessment
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
WHO	World Health Organization

Executive Summary

This report has been commissioned by People that Deliver (PtD) and it is the first of its kind to look at training evaluation within the Public Health Supply Chain. It emerged from an expressed need by the PtD Board to improve the evaluation of training and development activities with less reliance on training intervention outputs (i.e. the number of individuals trained), towards documenting the outcomes and impacts of training activities leading to improvement in health service delivery. The report is focused on the development of high level organizational impact indicators to be incorporated into PtD's training strategy methodology, linking training to productivity or improved business and operational performance. It is intended to link the indicators to the PtD Theory of Change which articulates increased supply chain performance in order to assess whether the training activity is achieving this.

The research underpinning this report sheds light on the present state of training evaluation within the sector and evaluates the challenges of generating data that will enable countries to assess the impact on organizational performance. As such it is intended to contribute to the wider debate on PHSC performance. The health workforce represents one of the key building blocks of health systems and has been identified as a priority for action for strengthening those systems, this report therefore provides an overall framework for improving organizational performance and impact over time. In doing so it aims to build on workforce development processes already in place in many organizations by providing a holistic model incorporating performance management, continuous professional development and competency assessment. Where available case studies and examples have been developed to examine the initiatives taken in some countries.

Although public health supply organizations have made significant efforts to ensure that their training strategies are aligned with organization performance and improved health outcomes, they are still unable to demonstrate the efficiency and cost-effectiveness of their investment in training and its contribution to organizational outcomes. In particular, there is a lack of supporting management information and performance measures. Where performance indicators do exist, they are generally measures of training activity (i.e. the number of training days per staff member) rather than effectiveness. Therefore, public health supply organizations are not evaluating training strategies, in part because of the lack of appropriate performance targets and data. The absence of an adequate evaluation methodology and the lack of expertise also influence the reasons why organizations may not systematically carry out evaluations. These challenges are being addressed through this report.

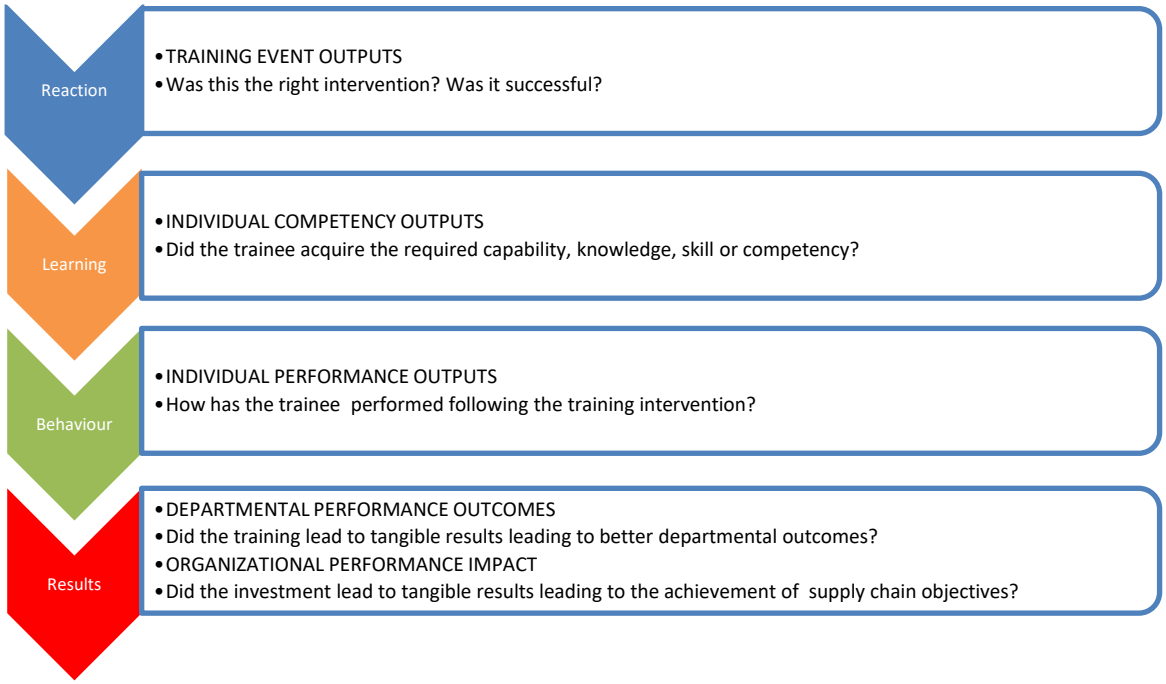
One of the main outputs of this report is the provision of guidance to governments and stakeholders of low to middle income countries on how to evaluate training and provides examples of indicators at various levels. This report is therefore part of broader efforts to enhance country capacities to generate, analyze and use data to assess health workforce performance and track progress towards their workforce development related goals. This report aims to increase that technical capacity by offering health managers, supply chain managers, researchers and policy makers a comprehensive and standardized set of indicators for evaluating training impact.

While it is recognized that these indicators are influenced by a wide range of factors and measuring the specific contribution of training to the public health supply chain goals is difficult, the intention of this

report is to develop and provide a set of evaluation indicators in which practitioners are more readily able to isolate the effects of training from other variables when considering organizational performance.
In recent years, organizations have developed approaches to isolate the effects of training from other variables when considering organizational performance. The studies demonstrate that where the correct information is identified, gathered and analyzed that a link between training and organizational performance can be established.

Proposed Training Evaluation Model

The proposed model for evaluating training covers evaluation before, during, and after an intervention and can also be used to evaluate the overall training strategy within the organization. The model can be applied to formal classroom training or to less formal on-the-job training, rotations, project work, conferences etc. The model reflects aspects of the training evaluation model developed by Dr. Donald Kirkpatrick and Jack Phillips which identifies five levels at which trainings could be evaluated: Reaction, Learning, Behavior, Results and Return on Investment.



- The first blue arrow on the model relates to the training intervention (the activity that we be assessed), followed by the outputs that are possible at the individual level.
- The orange arrow shows that providing training to staff leads to improvements in their content knowledge, skills, and abilities.
- The next output shows that the trainee applies their new learning on the job; these individual performance outputs are shown in green.
- Finally, the red arrow shows improvements at two levels, firstly in the departmental outcomes resulting from the improved performance of the newly-trained staff member and secondly in impact on organizational or overall supply chain performance.

The five levels of evaluation are therefore:

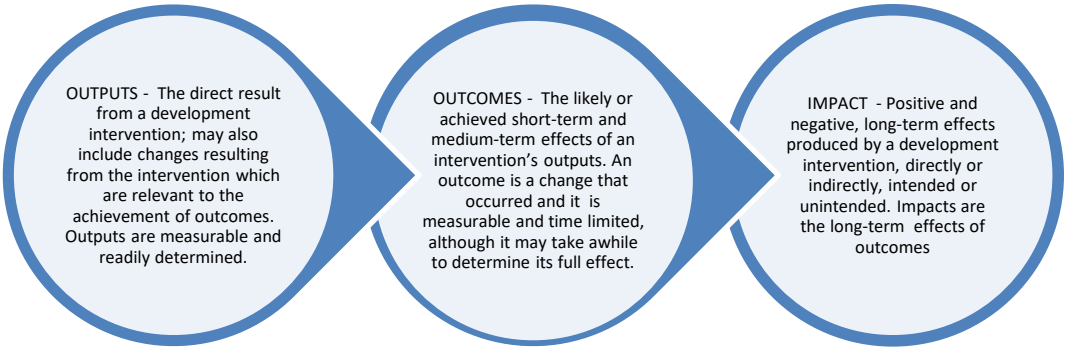
(1) the reaction of the individual and their thoughts about the training experience;

(2) the trainee's resulting learning and increase in knowledge and competency from the training experience;
(3) the individuals' behavioral change and performance improvement after applying the skills on the job; (4) the results or effects that the individual's performance has on the department; and
(5) the results or effects on organizational performance.

Within this model, measurement at every level is necessary since the likelihood of seeing change is more realistic at levels 1 to 4 and proving changes at these levels will make a strong case that changes seen at level 5 are attributable to training. Consequently levels 1 to 4 is where the organization will first see positive results.

Link between Evaluation Levels and Outputs, Outcomes and Impact

The evaluation model refers to outputs, outcomes and impact and these have been taken from program management results frameworks which provides a breakdown of terms that are used to describe changes at different levels from the delivery of goods and services to long-term, sustainable change in people's lives. Whilst the terminology is in common use, there is great inconsistency in how the terms are interpreted. The definitions differ across organizations as such there is little consistency. For the purpose of this report, the authors have chosen to use the definitions originally developed by Organization for Economic Co-operation and Development (OECD, 2010).



Data Collection and Analysis

This report draws primarily on two sources: a) notes from a limited number of key informant interviews with both supply chain and monitoring and evaluation experts conducted in the summer of 2017 and b) a desk review of literature on training evaluation and indicators. This approach enabled the identification of several indicators that can be applied universally across all public health supply chain models outlined in Section 7 whether government run, partly outsourced or fully outsourced. These indicators were shared with a wide group of supply chain capacity development and monitoring and evaluation experts for analysis and feedback.

Effective evaluation of training interventions in countries requires agreement upon a core set of indicators at the subnational, national and international levels to inform decision-making among national authorities and other stakeholders. The ongoing and consistent measurement of these indicators allows monitoring of how these interventions are being implemented. Once the baseline data have been generated, it enables countries to establish an evaluation framework with periodic targets to determine whether activities have been implemented in the right direction in accordance with the original plans.

Many supply chain organizations assess their performance based on several defined key performance indicators with the level of sophistication varying depending on the supply chain model adopted. These supply chain indicators are limited to the measurement of performance of a health supply chain at both the outcome or process levels, addressing overarching performance and the performance of specific departments or functional areas.

Proposed High Level Organizational Indicators

The set of indicators proposed is neither exhaustive nor absolute. Rather, it is an attempt to build a framework for training and evaluation and facilitate debate on this subject. It should be noted however, that organizational results rely on the organization having a solid quality assurance policy that underpin all its operations and services. At departmental level, standard operating policies must be in place that translate institutional policies into departmental actions that are measurable and auditable. These indicators therefore are intended to provide a measure of internal efficiency of the supply chain system aligned to the strategy of the organization and as such it will take time to see the full impact.

This research aims to select indicators at the right level to make them relevant and applicable across all supply chain models. Each indicator and related sub - indicator are important and interrelated elements can be evaluated as a part of a comprehensive activity, or independently. Indicators have been selected that:

- Link directly to health outcomes and are aligned to the organization
- Are recognized as meaningful and relevant
- Can be tracked and understood across the organization
- Focus on and drive performance improvement

This analysis is not intended to result in the selection of the correct definition of the recommended indicators as definitions differ across organizations. They are designed to be tailored to the specific training and organizational context and reviewed on a regular basis.

These high level organizational indicators are dependent on measurement taking place at every level since the likelihood of seeing change is more realistic at levels 1 to 4 (reaction, learning, behavior and departmental results). Proving changes at these earlier levels will make a strong case that changes seen at organizational level 5 are attributable to training. It is in these previous levels that the organization will first see positive results.

The interview participants highlighted with some level of consistency that the core areas that senior managers in the private, public and parastatal sectors use to determine achievement of the goals and therefore effectiveness in the supply chain as:

1. Commodity Availability
2. Quality
3. Operating Efficiency and Costs

This was consistent with the three objectives of the GAVI Supply Chain Strategy, i.e. availability, quality and efficiency and were selected as a basis for assessing the link between supply chain performance and skills development. The areas are discussed in detail below.

Commodity Availability

As a key objective of the PHSC, this indicator can be used independently recognizing that several sub indicators all contribute to the achievement of commodity availability. As a high-level indicator, it is designed to be measured organizationally while the following sub indicators: commodity selection; inventory accuracy rate; stock out rate; order fill rate and forecasting accuracy can be measured departmentally.

- Percentage of items available /total number of all items on national essential medicines list (NEML) or EML or restricted procurement list based on national procurement plans

Quality

The impact of quality is critical within the supply chain and has 2 important components: the cost of good quality and the effects on poor quality on health outcomes. The public health supply chain must ensure good quality is consistent through quality inspection activities, prevention mechanisms, and other quality control vehicles.

Two high level indicators are proposed organizationally recognizing that other indicators can be assessed at departmental level:

- **Percentage of Commodities that Undergo Quality Testing -** Number of commodities or shipments tested for quality/total number of commodities or shipments received in country x 100
- **Percentage of Procured Commodities that meet Stringent Regulatory Authority (SRA) or WHO standards -** Number of commodities procured that meet SRA or WHO standards/total number of commodities procured x 100

Operating Efficiency and Costs

These indicators help to improve operating efficiencies and the cost of the supply chain due to reduced lead times, improved service levels, and increased commodity quality and aims to calculate the total delivered cost. Elements of cost includes costs for warehouse space and management, receiving inventory and stocking, processing orders, inventory in stock costs, picking and transportation.

Three high level indicators are proposed organizationally which comprise of total delivered cost:

- **Total Warehousing Cost -** Sum (labor, space, utilities, material, equipment, eLMIS etc.)/quantities of stocked units
- **Inventory Holding Cost -** Annual inventory holding cost/sum of all capital and non-capital costs
- **Total Transportation Cost -** Sum of all transportation costs during a specified period

It is acknowledged that some countries may have difficulty finding the data to measure operating efficiency and costs, they do provide a useful benchmark of performance. This analysis considers the amount of effort required in collecting, reporting and analyzing the data particularly in low-resource contexts where KPI's are not well reported on. Therefore, the proposed indicators intend to balance the value of the data in terms of it tells the organization about the training outcomes with the amount of effort required to collect it. It is recommended therefore that the PHSC focus primarily on Commodity Availability and Quality indicators. The review of the proposed Operating Efficiency and Cost indicators is only recommended where data is available.

Therefore, other things being constant (i.e. funding, available skilled human resources, and appropriate operational tools being available), these high level organizational indicators are proposed and require further inputs and debate within the supply chain, capacity development and monitoring and evaluation communities.

Evidence

The importance of sound empirical evidence for informed policy development, decision-making and the monitoring of progress towards achieving supply chain performance is widely recognized. Evidence is needed to support countries to make the case for training both in national budget allocation and in their cooperation with donors. However, knowledge about what works and what does not is still very limited, signaling a need for more evidence and further research.

Currently little empirical data or evidence exists in this field and the results of this research are expected to contribute to a wider debate and the design of an evaluation methodology for public health supply chains. This represents the first step towards quantifying the return on investment or impact of training activities on supply chain improvements. Thereafter, it is intended that this will lead to the generation of new evidence supporting the application of the proposed indicators across the different supply chain models. Proving this concept will involve research in countries that have near robust systems where all elements in the research can be tested.

A comprehensive listing of the most widely used evaluation methods and indicators. (Levels 1, 2, 3 and 5) for evaluating training in public health supply chain organizations is provided in Annex 1 and draws on best practice. This listing will be updated after the validation process.

It is not intended to replicate the myriad of supply chain indicators used globally. Therefore, examples of relevant level 4 indicators can be found in USAID | DELIVER (2010). Measuring Supply Chain Performance: Guide to Key Performance Indicators for Public Health Managers. Task Order 1.

1 THE PUBLIC HEALTH SUPPLY CHAIN

1.1 Supply Chain Management

Well-functioning supply chains are the backbone of the public health system. A supply chain (SC) is the collection of steps that ensures that commodities are readily available to the end user in the right quantity and quality. Supply chain management (SCM) refers to the process that ensures that supply chains are efficient and cost-effective. Supply chains are critical to the provision of health services.

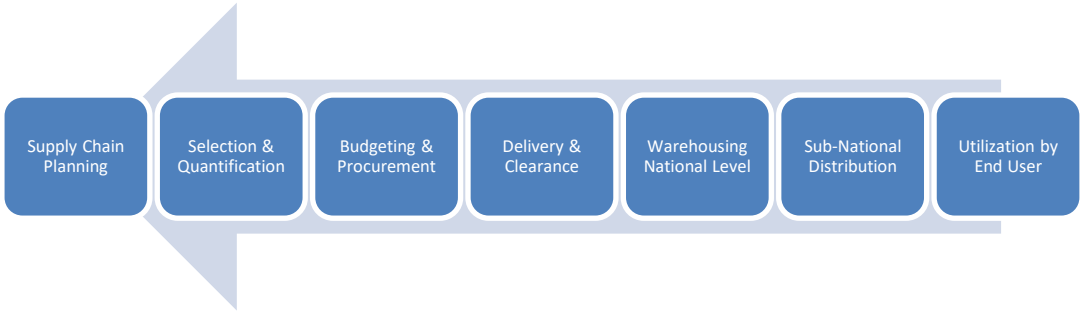


FIGURE 1 TYPICAL PHARMACEUTICAL SUPPLY CHAIN

Public health supply chains are under increasing pressure to operate efficiently. With large-scale investments in health programs, a widening portfolio and volume of commodities, and expansion of services to new populations, supply chains must be flexible and responsive in a changing global environment. Increasingly, donors and policymakers look for accountability from each link in the supply chain and improvements that can be sustained without indefinite external funding.

1.2 The Supply Chain Workforce

The Public Health Supply Chain requires a mix of professional expertise. The workforce usually consists of pharmacists, logisticians, supply chain managers, data managers, warehouse and transport personnel – all of whom collectively are tasked with ensuring the appropriate commodity selection, forecasting, procurement, storage, distribution and use of health commodities. Key personnel such as doctors, nurses, and other clinical and administrative staff also contribute a portion of their time and function within the system to provide the appropriate medicines and commodities to improve health. Health SC workers typically are designated to one of these levels of the SC:

National Level	>	Planners, Managers, Administrators
Central Store	>	Manager, Store Workers, Drivers
Intermediate Stores	>	Manager, Store Workers, Drivers
Health Facility	>	Pharmacists, Nurses
Service Point	>	Nurses, Community Health Workers

The lack of suitably qualified human resources in adequate numbers is often quoted as being one of the root causes of poor performance of the health supply chain.

1.3 The Role of Training

Effective human resources management results in higher productivity. Studies of companies and organizations have consistently found a strong correlation between structured training and organizational results. But even though the development of human resources represents a major operational cost component, it is often the most misunderstood and underutilized asset. Within the PHSC it is recognized that training and development is an important investment and a key building block to increasing the performance of the health sector. Continuous assessment and monitoring is required to measure its true impact.

Training is the process of enhancing the skills, capabilities, and knowledge of staff. The thinking and behavior of staff is molded by the training process. One of the most important things that can be done to ensure that the supply chain is operating at its peak, is to train staff in all aspects of the supply chain. There is often a feeling that staff involved in the supply chain only need to know the exact duties that they need to perform. Rather, staff need to be trained to see the 'bigger picture'.

A structured training program, designed with clear objectives in mind, provides staff with opportunities to develop holistically, preparing the way for an improvement in their performance. With a proper training and development program in place, in line with internal strategies of the organization, staff will be tuned into overall organizational objectives, thus ensuring optimum productivity.

2 THEORY OF CHANGE

2.1 Pathway of Change

The term Theory of Change (TOC) finds it origins in a considerable body of theoretical and applied development in the evaluation field. Its development has been influenced by Freirean thinking on how to create social change by empowering individuals. TOC may be seen as a way to describe the set of assumptions that explain both the mini-steps that lead to the long-term goal and the connections between program activities and outcomes that occur at each step of the way (Weiss, 1995). The application of TOC principles will help us understand and assess impact in hard-to-measure areas, such as capacity strengthening and institutional development.

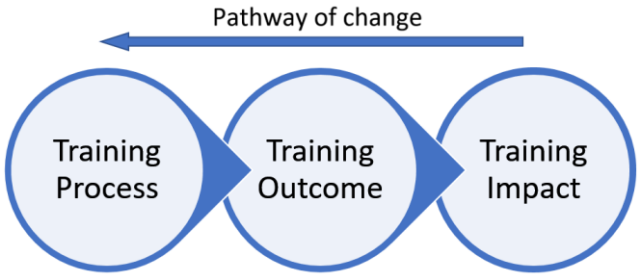


FIGURE 2 IMPACT OF TRAINING: PATHWAY OF CHANGE

TOC uses *backwards mapping* requiring planners to think in backwards steps from a long-term goal (impact) to the intermediate (outcome) and early-term changes (outputs) that are required to cause the desired change (impact). This creates a set of connected entities, referred to as *pathway of change*. The pathway of change graphically represents the desired change process.

2.2 SC Training

TOC principles may be applied to training interventions for capacitating the workforce of the Health Supply Chain, mapping out the pathway of change through six discrete stages:

1. Define basic assumptions about the context (which preconditions need to be in place)
2. Define the desired long-term impact of the training intervention(s)
3. Define indicators to measure the impact
4. Backwards mapping to determine intermediate outcome indicators
5. Backwards mapping to determine the required training outputs
6. Backwards mapping to determine the appropriate training process (methodology, etc.)

2.3 The PtD Approach

The People that Deliver (PtD) Initiative aims at developing a holistic and practical approach to formulating strategies for strengthening public health supply chain systems in a sustainable manner. PtD is in the process of developing a TOC framework that will enable supply chain practitioners to capture and understand the pathway of change that connects investment in human resources to public health supply chain performance improvements and ultimately to improved health outcomes. Skills development is a key element contributing to optimizing workforce performance.

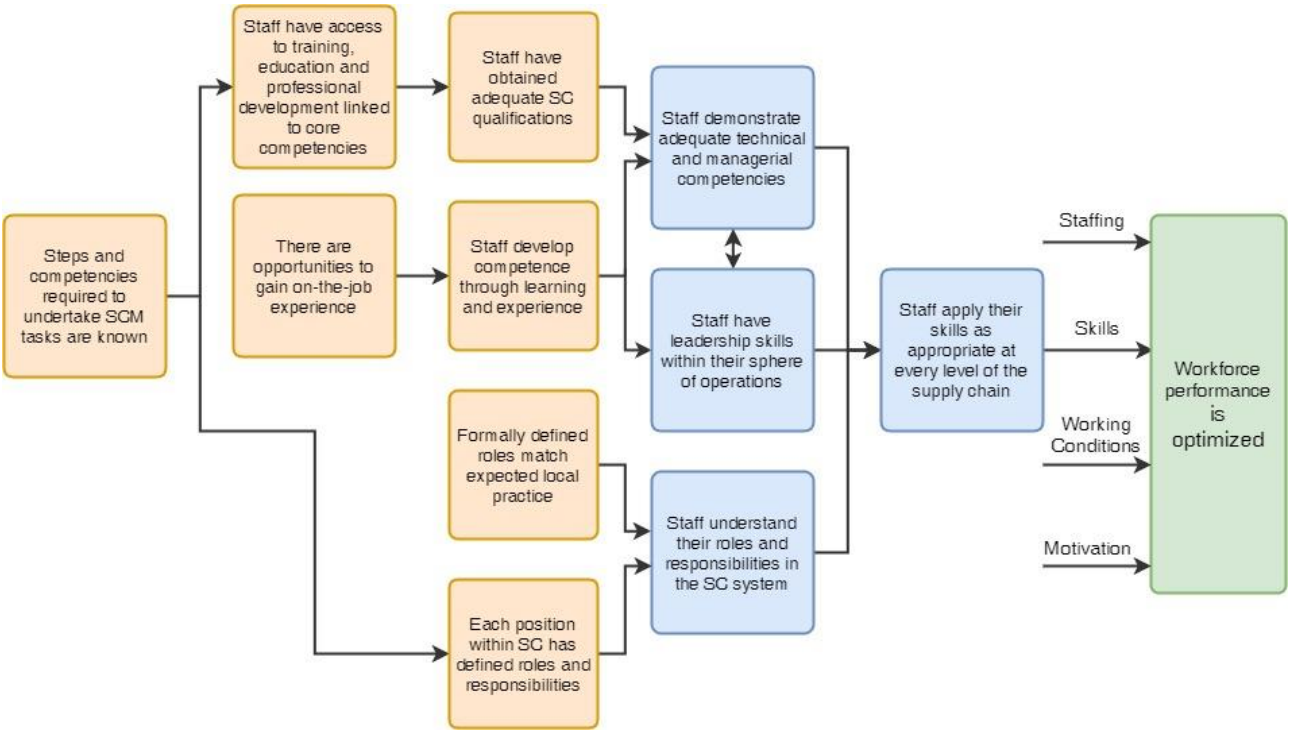


FIGURE 3 PTD HR FOR SCM THEORY OF CHANGE (OUTCOMES FRAMEWORK)

It is envisaged that this tool will guide and monitor future investments and will be used as the basis for developing a business case for investing in human resources for supply chain management.

3 MAPPING THE TRAINING PROCESS

3.1 A Systematic Approach

Training is commonly defined as an organized activity aimed at imparting information and/or instructions to improve the recipient's performance or to help him or her attain a required level of competence. Without a systematic approach to training, supply chain workers will be trained arbitrarily and haphazardly. Mapping the training process is a methodology for managing workforce development through training. It is a systematic approach to determining the training needs of individuals with the objective of ensuring that these individuals are equipped to carry out their duties effectively by having the necessary knowledge, skills, and attitudes to perform.

The training process begins with identifying people's work-related needs. Critical questions need to be asked, such as what are the performance gaps of the organization and can these gaps be addressed by training? Is poor performance caused by people not having the necessary skills, or is there a lack of equipment or are there no set procedures for staff to adhere to? Analysis and design are the decision-making phase. What must be learned? What will we teach? These are critical questions. In reality, these questions are not always asked, and the assumption is made that training is a panacea for poor organizational performance.

FIGURE 4 MAPPING THE TRAINING PROCESS

Once the decision has been made that training is indeed appropriate, individuals need to be evaluated as to which competency areas need to be addressed. This is best done by way of a training needs assessment, the content of which is based on a relevant health supply chain competency framework.

Following the design phase is the development and implementation, or delivery, of training content. There are many training delivery methodologies to choose from (Annex 1). Depending on whether the predominant objective of the training concerns ‘knowledge’, ‘attitudes’, or ‘skills’, a suitable training method will be selected.

Evaluation tends to be the weakest link in the chain, i.e. the one given the least attention to. Training is usually followed immediately by a test. Such a test measures immediate outcome of the training. What that does not tell us is whether the trainee will be able to perform his tasks better, so that organizational performance will improve and be impacted.

3.2 Training Needs Analysis (TNA)

Outcomes from formal and informal training activities are enhanced by first assessing the needs and the level of competence of trainees. Knowing the principle job responsibilities and functional tasks of individual staff facilitates tailoring training activities to the needs of the individual trainees. Furthermore, it will be easier for the training provider to identify who should participate in specific training interventions (and who should not).

The absence of a proper staff structure, such as commonly exists for doctors, nurses and engineers, makes the application of a TNA rather difficult. As mentioned above, a TNA requires a clear definition of functional or operational job areas for which specific health workers with a specific job title are responsible. In the absence of such a structure we will need to define a generic set of functional areas that can be applied to any given country situation. Health workers within the SC need to decide for which SC functional area(s) they are responsible, regardless of their actual job title. Ideally the TNA should be reviewed or undertaken annually at individual level. n organizational level this should be kept relevant on an ongoing basis as organizations adopt new innovations resulting in the changing of skills/knowledge and processes. The timeframe will vary according to the organizations strategy.

3.3 Training Methodologies

Depending on whether the predominant objective of the training concerns '**knowledge**', '**attitudes**', or '**skills**', a suitable training method must be selected.

These methodologies are suitable for teaching '**knowledge**':

a. Formal lecture (unidirectional monologue)
b. Mini lecture
c. Interactive lecture with active breaks (bilateral exchange)
d. Reading
e. Audiovisual materials (e.g. online videos)
f. Case studies
g. Individual research (e.g. internet libraries, literature review)
h. Group discussion
i. Field work (observations, discussions, etc.)

These are suitable for teaching '**skills**':

a. Simulations (role plays, games, etc.)
b. Practical exercises with evaluation
c. Study guidelines for good practice (including check lists and handouts)
d. Group discussion
e. Field work (observations, discussions with experts, etc.)

These are suitable for learning about '**attitudes**':

a. Group discussion
b. Exploration of personal attitudes
c. Focus groups
d. Promotion of attitudes such as 'openness' and 'introspection'
e. Field work (observations, discussions, etc.)

3.4 Training Methods

3.4.1 Pre-service Training

The entry process of health workers to the PHSC is highly dependent on education and training at different levels. Many components comprise this process and includes:

(i) the pool of eligible candidates for health education; (ii) recruitment and selection of students to health education programs; (iii) accreditation of health education institutions; (iv) capacity and output of health education institutions; and (v) certification and licensing of health service training providers (nationally or internationally trained.

3.4.2 External Training

Training of supply chain workers should be two-pronged, whereby the workforce is developed through short term training courses, while some individuals will benefit more from long-term training for re-professionalization. Short term training is typically up to one month in length, while long term training has a minimum duration of three months.

3.4.3 In-Service Training

Training staff in-house has distinct advantages. Technically, in-house training is any training that is held within the agencies' premises to educate, develop or improve staff' competence. Internal training uses real life examples, problems and challenges that trainees encounter every day at work. Successful internal training identifies the exact skills and knowledge that trainees need to succeed in their jobs. A distinction is made between mentoring and coaching (Heathfield, 2016).

3.4.4 Mentoring and Coaching

Mentoring requires a trusted environment where the mentee shares whatever issues affect his or her professional and personal success. Although specific learning goals or competencies may be used as a basis for creating the relationship, its focus goes beyond these areas to include work/life balance, self-confidence, self-perception, and how personal well-being influences professional performance. Mentoring is typically long term.

Coaching focuses on concrete issues, such as managing more effectively, speaking more articulately, and learning how to think strategically. This requires a content expert (coach) who is capable of teaching the coachee how to develop these skills. Coaching is typically short term. A coach can successfully be involved with a coachee for a short period of time, even just a few sessions. The coaching lasts for as long as is needed, depending on the purpose of the coaching relationship.

3.4.5 Online e-Learning

E-learning comprises learning activities based on any electronic format. E-learning is a flexible process for professional development, whereby the learner makes use of Information Communication Technology (ICT) as a real-time, offline or blended learning methodology. An example of an e-Learning application is the recording of key work situations. These recordings can be used as a teaching tool and is especially good for stimulating dialogue about good and bad practices.

Continuous Professional Development and Professionalization

Evidence shows that the profession of "supply chain manager" (SCM) often does not exist in many countries. The requirement to support the role of SCM within organizations, clarifying their position in

coordination with health and medical authorities, and introducing the proper HR training through supportive internal and external partnerships is becoming more critical and it is recognized that SCM's professionalization are key to improving health systems. Professional associations can be great vehicles for promoting professionalization of public sector health supply chain managers and building their professional capacity through continuous professional development to improve supply chain performance in their countries.

3.5 Training Delivery

3.5.1 Competency-Based Training

A competency is defined as being the blend of knowledge, skills and abilities, needed to perform a specific task. Worldwide, the traditional approach to training has been for trainers to determine what content needs to be learned, teach it, and then test to see whether the content was learned. Traditional teaching and training methods usually rely on passive memorization from lectures as the dominant learning method for trainees. This approach, though long established, does not guarantee sustainable learning outcomes. Educational reforms support the application of competency-based approaches, i.e. defining, teaching, and assessing competencies and subsequently evaluating trainee performance in relation to these, focusing on the outcome of the training, rather than on the process (i.e. applying knowledge and skills rather than merely gaining knowledge).

3.5.2 The PtD Competency Compendium

The PtD Competency Compendium is a comprehensive catalogue of competency areas with associated behavioral competencies compiled from several frameworks. The term 'competency' may be defined as a cluster of related knowledge, skills and abilities that affects a major part of one's job. The PtD Competency Framework for Managers and Leaders distinguishes between technical and managerial competencies.

TABLE 1 THE PTD COMPETENCY COMPENDIUM

	Domain	Competencies
Technical Domains	Selection & Quantification	Select and quantify the correct supplies
	Procurement	Procure supplies
	Storage & Distribution	Store and distribute supplies
	Use	Using the supplies
Managerial Domains	Resource Management	Manage money, people, etc.
	Professional & Personal	Manage day-to-day responsibilities, career development

With reference to this framework, developed by PtD in 2015, competency areas are not outlined by particular cadres or job titles (i.e. warehouse manager, dispensing officer, etc.), but rather they are listed by particular supply chain functions. This enables users of this framework to consider job functions, rather than job titles or professional titles. Functional areas typically reflect a defined task or set of tasks for either one person or a dedicated team of persons. Increasingly, within the public health sector, stakeholders are beginning to focus on workload modelling to determine the number of staff required within a system design approach (Village Reach, 2014). This approach can lead to a rethinking of the types and numbers of staff needed to manage logistics tasks.

4 TRAINING OUTCOMES

4.1 Transfer of Learning to the Workplace

One of the objectives of training interventions is to support enhanced individual through the application of new skills in their roles. It is critical therefore that the organization encourages a supportive environment to enable newly acquired skills to be nurtured and to enable the transfer of learning to the workplace. This could include mentoring and coaching arrangements as part of the managers' normal responsibilities. Staff should be encouraged by providing opportunities for them to test and develop new skill while reinforcing or clarifying any learnings that are critical to the organization's performance. Critical to this process is the allocation of suitable tasks relevant to the training intervention while providing regular timely informal feedback to staff, as well as formal when required through the organization's performance management system.

4.2 Evaluating Training Results

Training is key to achieving the goal of the organization as it increases the efficiency and effectiveness of staff and thus adds value in terms of organizational performance. The question arises as to how we can reliably measure the contribution that training makes to improved organizational performance. This question will be addressed in section 6.

5 OUTSOURCING SUPPLY CHAIN FUNCTIONS

5.1 Supply Chain Models

There is a wide array of structural and institutional variations in how supply chains for health commodities can be organized. While the exact structure of pharmaceutical distribution varies from one country to another, some structural commonalities exist (Yadav, 2015). One variable is the number of intermediate storage points for commodities between the central or national level and service delivery points. Another important characteristic is the type of ownership and management structure of the supply chain organization, whether this is publicly or privately owned, or a combination of public and private, i.e. semi-autonomous or parastatal. The management of a national supply chain is also influenced by the type of health financing and the structure of pharmaceutical regulation in a particular country. Eligible countries derive part-funding for procurement of pharmaceuticals from international donor agencies (e.g. Global Fund, PEPFAR) in which case procurement is typically done through the agency concerned or through a specialized agency (e.g. UNICEF).

Many low- and middle-income countries opt for a supply chain model whereby the government procures pharmaceuticals, stores them nationally and distributes them to health facilities at community level, usually through intermediate storage points. Governments in more advanced economies often outsource many of the supply chain functions to specialized for-profit agencies.

5.2 Outsourcing Options

One important parameter in determining training needs is the degree to which elements of the supply chain are sub-contracted or outsourced to partner agencies or the private sector. Due to rising costs in the healthcare sector, governments are experiencing increasing political pressure to control costs and improve efficiency, making the need for optimization of supply chains more urgent. There is also increasing political pressure for improving quality of care and patient safety. Outsourcing supply chain functions is seen by many as a possible venue towards achieving some of these objectives.

Outsourcing allows the Ministry of Health to redirect its attention to its own competencies and hire outside resources or assign a specialized agency to handle other tasks. Options for outsourcing are many, for example: human resource management, facilities management, accounting, customer support and service, IT services, research and legal documentation. There are potential benefits associated with outsourcing (PATH, 2012):

- Increased efficiency: If a specialized agency is contracted to perform specified tasks, managerial efficiency can be improved.
- Focused specialization: By transferring responsibility for specified tasks, the MoH can better focus on defining policies and strategies to provide high-quality health services.
- Reduced costs: Cost savings may be achieved when the outsourcing contract is properly managed.

TABLE 2 REQUIRED COMPETENCIES BY DEGREE OF OUTSOURCING

Level of outsourcing	Key competencies of outsourcing agency
No outsourcing/Government	Emphasis on the entire range of technical competencies, from acquisition of commodities to use at service level
Partial outsourcing	Competencies needed in all managerial and technical areas

Fully outsourced/Parastatal	Emphasis on managerial competencies, including contract management and relationship with suppliers and contractors

There are various functions that lend themselves for outsourcing, depending on individual country contexts, including:

- Procurement
- Importation and clearance
- Storage and transport
- Maintenance of Cold Chain equipment
- Waste collection and disposal

In Ethiopia, for example, the parastatal PFSA increasingly takes overall responsibility for the procurement, storage and distribution of pharmaceuticals, including immunization supplies. One of the reasons behind this development is that the Federal Ministry of Health will be able to focus more on their core business, which is delivering health care to the people.

5.3 Implications for Training

The type of supply chain model that a country adopts and the degree of outsourcing of supply chain functions does affect the staffing structure but does not affect the need for and the importance of training of supply chain staff. What will vary are the *competencies required* and thus the *training content* that applies to staff in the different functional areas of the supply chain.

The reality of having many supply chain models highlights the importance of adopting a competency framework for the supply chain workforce that is comprehensive in that it encompasses all managerial, technical, administrative and personal competencies that may apply in any given situation.

6 TRAINING EVALUATION MODELS

6.1 Purpose

- Provide a recommended model for evaluating training within the public health supply chain sector in low and middle-income countries.
- Develop and provide a set of evaluation indicators with focus on assessing the impact of training on organizational performance.

6.2 Key Developments in Training

Training is a critical process for enhancing productivity and organizational performance. The management of these training processes is central to their effectiveness. Research shows high-performing organizations share certain features in relation to training as follows:

- They align and integrate their training initiatives with organizational planning by reviewing existing activities and initiating new training programs to support strategic outcomes.
- Their managers invest in, and are accountable for, training.
- They focus on the organizational application of training rather than the type of training, and they consider appropriate learning options – de-emphasizing classroom training and allowing staff time to process what they have learned on-the-job consistent with adult learning principles.
- There is increased emphasis on performance improvement and accountability for the effectiveness of training outcomes and expenditure
- They evaluate training formally, systematically and rigorously.

Although organizations particularly in the private sector has focused on evaluation, the scope and emphasis of evaluation has shifted significantly from the evaluation of training programs to the impact of those programs. Many organizations now take a more systematic, logical, and strategic approach to their evaluation processes. Before closing its operations in 2009, Nortel, a large global telecommunications company developed a comprehensive evaluation process. Every program included a plan to determine a specific level of evaluation. Routine impact analysis was undertaken on important and critical programs and the results were reported regularly to senior managers. All training staff members were trained in the evaluation process. Line managers were included in all phases of the process, beginning with the needs assessment and concluding with review of the impact analysis.

6.3 Training Evaluation in the Public Health Supply Chain Sector

Training is a key strategic approach to address the shortage of public health supply chain workers in many countries, however there is a lack of evidence linking these interventions to improved organizational performance. Given the importance of in-country supply chains to public health system, assessing the contribution of training to overall supply chain performance is critical.

6.3.1 Challenges

The outcomes framework in the PtD TOC is designed to ensure that that staff apply their skills at every level of the supply chain resulting in the optimization of the workforce and as such training encompasses a wide range of activities designed to improve the capabilities of people. Although public health supply organizations have made significant efforts to ensure that their training strategies are aligned with

organization performance and improved health outcomes, they are still unable to demonstrate the efficiency and cost-effectiveness of their investment in training and its contribution to organizational outcomes. In particular, there is a lack of supporting management information and performance measures. Where performance indicators do exist, they are generally measures of training activity (i.e. the number of training days per staff member) rather than effectiveness. Therefore, public health supply organizations are not evaluating training strategies, in part because of the lack of appropriate performance targets and data.

In the publication, Linking Human Resource Investments to the Global Health Supply Chain: Lessons from the USAID|DELIVER Project and Other USAID Investments. 2016, training is acknowledged as a key aspect of all of DELIVER's projects when it comes to health systems strengthening and making supply chain improvements. The report noted however that there is a need to establish a link between capacity development interventions and supply chain system performance such as commodity availability. Within the public health supply chain, addressing the question of how far training has achieved its objectives is difficult because it is often hard to set measurable objectives. In addition, many organizations are challenged to collect the information on the results or to decide on the level at which the evaluation should be made. Therefore, training evaluation is the weakest and most under developed aspect of training.

A rapid exploration of some of the literature on this topic confirms that assessing the impact of training is no easy task:

- There is a general assumption that, after a training program, there is usually a boost in trainees' work performance. But how much of the improvement is a direct result of training?
- It is difficult to show a cause-and-effect relationship between training and performance.
- Performance improvements may be linked to training, but usually non-training factors have also contributed.
- Training evaluation is seen by most training practitioners and HRD managers as the most difficult part of their job.
- Many trainers see the development and delivery of training as their primary concern, and evaluation something of an afterthought.
- Evaluation is poorly defined, having different meanings for different people in different contexts.

In a study commissioned by the World Bank - Logistics Competencies, Skills, and Training, A Global Overview, 2017 authored by Alan McKinnon, Christoph Flöthmann, Kai Hoberg, and Christina Busch., light was shed on the state of training, recruitment and retention in logistics and supply chain management highlighting a tendency for some organizations to see training as a cost rather than investment, partly because they have difficulty in quantifying the returns.

However, an online survey of logistics companies worldwide was carried out with the results showing "that investment in training capacity is regarded as being both managerially and economically beneficial. The vast majority of respondents answered that training activities ultimately lead to moderate-to-strong improvements in their company's logistics and SCM performance. A larger proportion of respondents in emerging (developing) regions (19 percent) believe that training can lead to major performance improvement".

6.4 Benefits

Notwithstanding the challenges associated with impact measurement, a well-defined evaluation process within the health supply chain serves two important purposes. Firstly, it is an assessment of whether funds have been appropriately spent, and secondly it is also part of the ongoing process of refining strategies and improving organizational performance.

Key considerations within the training evaluation process include:

- Assessing how well proposed training interventions address organizational needs, capability needs, and individual needs within the organization.
- Assessing the extent to which the training activity is aligned with priorities that are identified in the organization's strategic plan, workforce planning and performance management systems.
- Assessing the extent to which it addresses current and future capabilities.

6.5 Process indicators

Most organizations use input, output, efficiency or process indicators as a starting point in tracking training, however they are less vital from the organizational point of view but can be helpful from the training manager perspective.

A comprehensive study in 2017, sponsored by PtD reviewed the capacity development practices in the Sudan National Medical Supplies Funds (NMSF). The study identified the use of a broad range of training indicators including:

- **Training days per staff.** Total number of training days of all staff combined, divided by the total number of staff, gives average number of training days per staff.
- **Internal training ratio.** The total number of internal training courses relative to the total number of training courses (internal plus external).
- **Training implementation rate**. Number of training events implemented divided by total number of training courses planned.
- **Trainees committed**. Total number of trainees trained, divided by total number of trainees planned to be trained.
- **Continuous Professional Development activity**. Number of active accounts, divided by total number of accounts (active plus non-active combined).
- **Training budget of total budget**. Percentage of total budget allocated to training.
- **Training cost per day**. The total annual training budget divided by the total number of training days (of all trainees combined), gives the average cost of training per day of training.

However, to assess whether workforce performance is being optimized, measurements of the outcomes and impact or effectiveness of training are more relevant. These range from indicators that measure the extent to which staff are applying their learning in the workplace through to the more valuable, and harder to measure, impact on organizational performance.

6.6 Evaluation Models

Although there is general recognition in the literature that training improves a firm's performance, training does not actually have a direct effect on performance but rather an indirect effect by improving intermediate organizational outcomes (Aragon, 2013). Birdi proposes a training evaluation model, Taxonomy of Training and Development Outcomes (TOTADO), which attempts to give a broader perspective on types of outcomes beyond individual learning of knowledge and skills, work evaluation approaches (Birdi, 2010).

Donald Kirkpatrick (1994) developed his Training Evaluation Model during the 1950s. The model, last updated in 1994, is today the most recognized and established method of evaluating the effectiveness of training programs. According to a survey by the American Society for training and development (ASTD), the Kirkpatrick four level evaluation approach is still the most commonly used evaluation framework among Benchmarking Forum Companies (Bassi & Cheney, 1997). The main strength of the Kirkpatrick evaluation approach is the focus on behavioral outcomes of the learners involved in the training (Mann & Robertson, 1996).

His model consists of four levels: (1) Reaction, (2) Learning, (3) Behavior, and (4) Results. The highest level (results evaluation), appraises the impact of training on an organization. The 'result level' of Kirkpatrick's model seeks to determine the tangible results of the training such as: reduced cost, improved quality and efficiency, increased productivity, staff retention and higher staff morale.

The weakness with the model, which Kirkpatrick himself acknowledged, is that 'there are so many complicating factors that it is extremely difficult, if not impossible, to evaluate certain kinds of programs in terms of results'. The literature review provided no evidence of widespread use of any other models, which suggests that both researchers and organizations believe that Kirkpatrick's work remains relevant particularly where the potential limitations are understood and acknowledged within the evaluation design process.

These limitations, however were addressed in a model developed by Dr Jack Phillips, referred to as Return on Investment (ROI), in he adds a 5th level of evaluation to Kirkpatrick's model. Dr. Phillips outlines his approach in his book Return on Investment in Training and Performance Improvement Programs (1997). His methodology is designed to evaluate training and to calculate its ROI, in doing so Phillips pioneered efforts to develop, systematize, and improve the practical evaluation methods used by training professionals and managers in the field. The methodology applies a range of unique tools and techniques that enable the practitioner to identify business results of training and then convert them into monetary values. This enables the isolation of the effects of the training from other factors that could have contributed to the results and identifying intangible benefits.

That is done through a lengthy evaluation process, such that before the final calculation of ROI, the impact of learning is isolated from gains in revenue, performance or productivity that might have accrued because of outside circumstances such as seasonal sales variation, for instance. Phillips established a set of guidelines so that results are standardized, and these formulas are used extensively in private and public-sector organizations globally.

In recent years, organizations have developed approaches to isolate the effects of training from other variables when considering organizational performance. The studies demonstrate that where the correct information is identified, gathered and analyzed that a link between training and organizational performance can be established.

This model was tested by Skills nets in 2004, Measuring the Impact of Training and Development in the Workplace. A pilot project was established involving 18 companies to determine whether the Kirkpatrick/Phillips models were applicable and readily usable in Irish enterprises. The participating companies worked through the process with the support of consultants to establish that a specific training event "caused" a specific organizational result.

The pilot project demonstrated that:

- The isolation of the effects of training based on before-and-after comparison was not possible without the availability of accurate baseline data
- Depending on which performance variable one decides to measure - improvements in work output, sales turnaround, costs savings, increases in sales, quality and so on - evaluating results can be time consuming
- Returns to training are dependent upon several important factors and that training is best understood in the larger context of a firm's entire set of managerial and production strategies, functions and practices
- The models are usable, given the right training and support

In a commercial setting, the ROI is intended to assess whether the training was worth doing financially – i.e. did it lead to savings or additional income that are greater than the cost of the training? However, in the public health supply chain these factors are not relevant unless an outsourced supply chain model is applicable. Achieving public health supply chain goals such as increasing the availability of essential health supplies in this context represents a return on investment. Additional indicators that may be useful for the health supply chain include other quantifiable aspects of organizational performance, such as: number of complaints, staff turnover and wastage of commodities.

While it is recognized that these indicators are influenced by a wide range of factors and measuring the specific contribution of training to the public health supply chain goals is difficult, the intention of this report is to develop and provide a set of evaluation indicators in which practitioners are more readily able to isolate the effects of training from other variables when considering organizational performance.

6.7 Proposed Evaluation Model

Figure 5 below outlines a model for evaluating training. It covers evaluation before, during, and after an intervention and can also be used to evaluate the overall training strategy within the organization. The model can be applied to formal classroom training or to less formal on-the-job training, rotations, project work, conferences etc. The model reflects aspects of the training evaluation model developed by Dr. Donald Kirkpatrick and Jack Phillips which identifies five levels at which trainings could be evaluated: Reaction, Learning, Behavior, Results and Return on Investment.

It also draws on the following publications:

- Training Evaluation Framework and Tools (TEFT) developed by Human Resources for Health in 2013 which provides a set of resources designed to help evaluators, implementers, and program managers at all levels plan successful evaluations of in-service training program outcomes.

- Evaluating Training in the World Health Organization (WHO), 2010 which provides a comprehensive approach to evaluating training using Kirkpatrick's model of four levels of evaluation.

- Glossary of Key Terms in Evaluations and Results Based Management. OECD, 2002, re-printed in 2010.

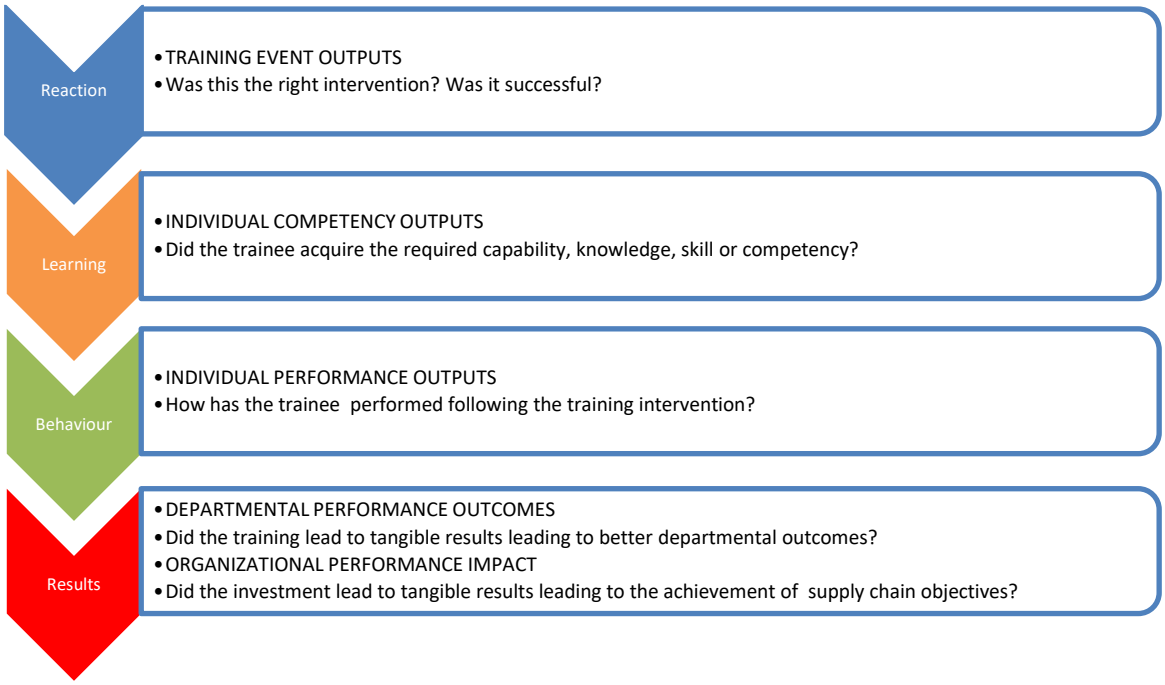


FIGURE 5 MODEL FOR EVALUATING TRAINING

- The first blue arrow on the model relates to the training intervention (the activity that we be assessed), followed by the outputs that are possible at the individual level.
- The orange arrow shows that providing training to staff leads to improvements in their content knowledge, skills, and abilities.
- The next output would be that the trainee applies their new learning on the job; these are individual performance outputs. In this framework, performance outputs are shown in green.
- Finally, the red arrow shows improvements at 2 levels, firstly in the departmental outcomes resulting from the improved performance of the newly-trained staff member and secondly in impact on organizational or overall supply chain performance.

The five levels of evaluation are:

(1) the reaction of the individual and their thoughts about the training experience;
(2) the trainee's resulting learning and increase in knowledge and competency from the training experience;

(3) the individuals' behavioral change and performance improvement after applying the skills on the job; (4) the results or effects that the individual's performance has on the department; and
(5) the results or effects on organizational performance.

Within this model, measurement at every level is necessary since the likelihood of seeing change is more realistic at levels 1 to 4 and proving changes at these levels will make a strong case that changes seen at level 5 are attributable to training. Consequently levels 1 to 4 is where the organization will first see positive results.

6.8 Link between Evaluation Levels and Outputs, Outcomes and Impact

The evaluation model refers to outputs, outcomes and impact and these have been taken from program management results chains which provides a breakdown of terms that are used to describe changes at different levels from the delivery of goods and services to long-term, sustainable change in people's lives. Whilst the terminology is in common use, there is great inconsistency in how the terms are interpreted. The definitions for outputs, outcomes and impact differ across organizations as such there is little consistency. For this report, the authors have chosen to use the definitions originally developed by OECD in 2010.

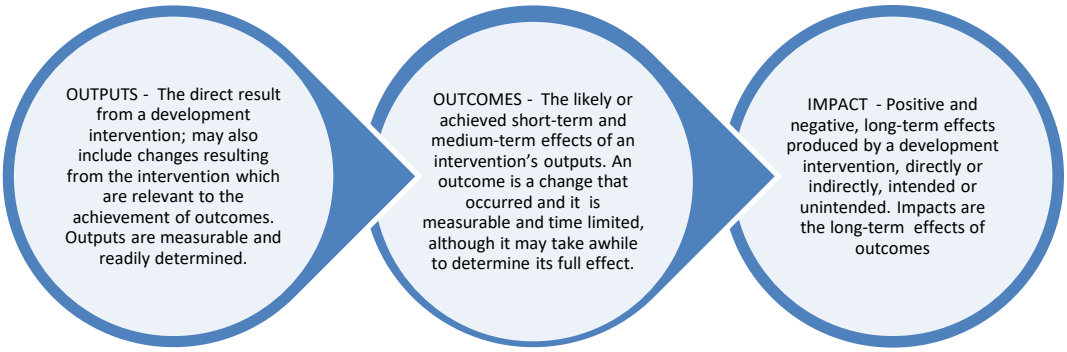


FIGURE 6 LINK EVALUATION LEVELS AND OUTPUTS, OUTCOMES AND IMPACT

Organizations can examine its outputs and seek to trace changes from these outputs into the outcomes, and from there to the impact. In this model the outcomes or impact identified are clearly related to the outputs delivered and therefore easier to assess.

Example: Warehousing Training

- (# of trainees undertaking activities according to set standards or processes / total # of trainees tested) x 100(output)
- Cold storage carried out to standard and Improved warehousing operations (outcome)
- Improved quality of commodity (impact)

6.9 Evaluation Levels

6.9.1 Level 1 - Reaction

The main purpose of reaction evaluation is to enhance the quality of training programs, which in turn leads to improved performance by measuring the trainee's reactions to training program. This level therefore, assesses the reaction of trainee and measure the immediate reaction to aspects of the intervention such as topic, speakers, format, schedule, relevance, appropriateness of placement. Typical questions concern the degree to which the experience was valuable (satisfaction), whether they felt engaged, and whether they felt the training was relevant. Did the trainees feel that the training was worth their time? Did they think that it was successful? What were the biggest strengths of the training, and the biggest weaknesses? Did they like the venue and presentation style? The reaction of facilitator is also assessed and considers the quality and value of the intervention (include attendance, trainees' commitment, format, learning transfer). Questions for the facilitator concern whether they felt the training went well. Training departments and organizations use that feedback to evaluate the effectiveness of the training, students' perceptions, potential future improvements, and justification for the training expense.

An example of such an evaluation supply chain management program designed and implemented by HELP Logistics and Argusi started in 2015. Three workshops were organized in Malaysia, Rwanda and Myanmar, with 40 participants representing several UN agencies, international NGO's and the Ministries of Health from participating countries. Following the workshops, the program was evaluated thoroughly with the goal to optimize the program based on participant's needs and expectations. All participant and facilitator feedback were processed and developed into an improvement plan for the program.

6.9.2 Level 2 - Learning

Evaluation at this level differentiates between what trainees already knew prior to training and what they learned during the training program. It measures the degree to which trainees acquired the intended knowledge, skills and abilities as a result of the training in the short term. This level is used by facilitators and training managers to determine if training objectives are being met. Only by determining what trainees are learning, and what they are not, can organizations make necessary improvements. Level 2 can be completed as a pre- and post-event evaluation, or only as a post-evaluation.

A study, at London Business School, was designed to assess the impact of interpersonal skills training on senior managers. The evaluation of training was based on subordinate feedback conducted before, and six months after training program took place. The result indicates significant impact on some but not all the competencies and skill under study. Hunt & Baruch (2003).

6.9.3 Level 3 - Behavior

Behavior evaluation measures the degree to which trainees' behaviors change because of the training – and assesses individual performance on the job, immediately and several months following training interventions and is a medium-term measure. Level 3 evaluation involves both pre- and post-event measurement of the trainee's behavior. These processes include supportive supervision and coaching and formal performance management processes. The performance management process acts as a regular

benchmarking exercise and aids in focusing managers on the effective management of training in the organization, and of the contribution training makes to the achievement of supply chain outcomes.

In the publication, Linking Human Resource Investments to the Global Health Supply Chain: Lessons from the USAID|DELIVER Project and Other USAID Investments. 2016, it was noted that routine practices like monitoring of stock and scheduled supervisory visits and performance management initiatives are necessary to increase the effectiveness of training along the various levels of the supply chain.

6.9.4 Level 4 - Departmental Results

Evaluation at this level assesses the effect of the training on the team or department and therefore assesses how the training affects the trainees' broader area of work. This assessment determines the tangible results of the training in the medium term at an operational level such as: improved efficiency, increased productivity and increased customer satisfaction. The appropriate KPI's to measure will be based on the training intervention.

The following case study is an example of results evaluation at a departmental/outcomes level and is specifically linked to improvements in Pharmaceutical practices.

VillageReach Pharmacy Assistant Training Program in Malawi

Malawi, like many low- and middle-income countries, has a critical shortage of pharmacy personnel. Currently government health centers have no trained pharmacy personnel on staff. This leads to unqualified personnel managing medicines and supply chain and dispensing to patients, which impacts patient care and medicine availability.

In 2012, in collaboration with our partners, and with support from the Barr Foundation, USAID | DELIVER PROJECT, and Vitol Foundation, VillageReach launched a two-year Pharmacy Assistant Training Program at the Malawi College of Health Sciences with a strong emphasis on supply chain management and hands-on, experiential learning designed to:

- Provide immediate benefit to the hospitals and health centers to address imminent human resource constraints and
- Prepare students for the reality of the environments in which they will work after completing their training

The intervention is the 2-year certificate program to train and deploy a new cadre of PAs established in 2012. A partnership between the Malawi College of Health Sciences (MCHS), Malawi Ministry of Health (MoH), and the VillageReach, with technical assistance provided by the University of Washington, the program seeks to train and deploy at least 150 PAs to improve pharmaceutical management in rural HCs in Malawi. The intervention is being implemented in 18 districts selected from the three regions of the country where a motivated and knowledgeable pharmacy technician at the district hospital indicated a willingness to provide mentorship and technical support to PA trainees during their training at hospitals and at the HC.

During the first year of training, students undergo 10 weeks of class-based instruction at MCHS. At the end of this time period, half the students are deployed to district hospitals for a 5-month period of field training supervised by a pharmacy technician, and the other half of the students remain at the MCHS for additional didactic training; the students then change places for another 5 months. In the second year, half of the

trainees are deployed to HCs in the intervention districts for 5 months while the other half will remain at the MCHS for class-based instruction; the students then change places for another 5 months. Therefore, during the second year, HCs in intervention districts have a trainee PA on-site for 10 of 12 months. Members of the teaching staff from MCHS conduct routine supervisory visits at both district hospitals and HCs to provide on-site mentorship and assess student progress.
Baseline surveys were conducted in March 2014 prior to PA deployment to HCs. Additional surveys are planned at 12 and 24 months after PA trainee deployment to the intervention sites. The post-intervention surveys are timed to occur after a PA trainee has been consistently available at the HC for at least 6 months. We assume that over this period, the trainee will have had sufficient time to settle into a working routine and will have had an impact on routine functioning of the logistics system and dispensing practices, and hence an impact on availability and use of medicines at the HC.

Results

The following data represents preliminary results based on M & E data collected on a monthly basis.

- **Pharmaceutical Practice**: The average score for appropriate dispensing—including giving proper instructions on how to take medication and possible side effects—increased by 19 percentage points (from 41% to 60%).
- **Data Quality**: The accuracy of stock on hand and consumption data reported increased by 17 percentage points (from 55% percent report accuracy to 73%).
- **Storeroom Management**: The average score for appropriate health center storeroom management – including organizing medicines by "First to Expire, First Out" – increased by 7 percentage points (from 72% to 79%).
- **Time Spent on Logistics**: Clinical staff time at health centers spent on logistics tasks decreased by an average of 39 hours per month (from 48 hours to 9).

6.9.5 Level 5 - Organizational Results

Result level evaluation is the effect on the business or environment resulting from the improved performance of the trainee and determines the tangible results of the training in the long term, such as: reduced cost, improved quality and efficiency, increased productivity, staff retention, increased customer satisfaction and higher morale. It is universally agreed that these benchmarks are not always easy to quantify, however doing so is the only way organizations can determine the critical return on investment of their training expenditures.

An example of level 5 evaluation is provided by Bosman A, Schimmer B, Coulombier D in 2009 which showed the results of an analysis of the activities and outputs of fellows of the European Programme for Intervention Epidemiology Training (EPIET). The study measured the effect on this training on the public health workforce in the European Union and Norway resulting in high levels of staff retention. 90% of the fellows took up positions and remained employed in public health organizations.

Although as mentioned previously, it is difficult to identify whether specific outcomes are truly the result of the training, this report will focus on identifying the public health supply chain performance indicators that are most closely impacted by training and individual performance improvement.
Possibly consider ROI which may be captured in terms of cost savings e.g. as a result of reduced wastage/expires or reduction in time (lead time or order fill rate)

7 RESULTS INDICATORS - ORGANIZATIONAL

7.1 Data Collection and Analysis

This report draws primarily on two sources: a) notes from a limited number of key informant interviews with both supply chain and monitoring and evaluation experts conducted in summer 2017 and b) a desk review of literature on training evaluation and indicators. This approach enabled the identification of several indicators that can be applied universally across all public health supply chain models outlined in section 5 whether government run, partly outsourced or fully outsourced. These indicators were shared with a wide group of supply chain capacity development and monitoring and evaluation experts for analysis and feedback. The resulting high level organizational indicators therefore reflects the input of this wider community and the sample of participants included:

- Researchers and consultants working in the fields of logistics and SCM
- Representatives of professional transportation bodies
- Senior supply chain and monitoring and evaluation managers at multi-national logistics service providers (3PL)
- Representatives of organizations engaged in humanitarian and public health supply chain management and training.

7.2 Supply Chain KPI's

Many supply chain organizations assess their performance based on several defined key performance indicators with the level of sophistication varying depending on the supply chain model adopted. These supply chain indicators measure the performance of a health supply chain at both the outcome or process levels, addressing overarching performance and the performance of specific functional areas. For example, NMSF which is a as a semi-autonomous organization tasked with the selection, procurement, storage and distribution of medical supplies for the public sector in Sudan. For the purposes of this report NMSF's supply chain model is described as fully outsourced/parastatal as it functions as a specialized agency with responsibility for managing the supply chain on behalf of the MoH.

Consistent with the guidelines provided by USAID|DELIVER Project in the publication Measuring Supply Chain Performance: Guide to Key Performance Indicators for Public Health Managers, May 2010, NMSF has identified several key performance indicators which guide their supply chain strategy as demonstrated below.

Indicator Domain	**Description of Indicator**	**Target**
Selection	% of items received that are on the national essential medicines list	100%
Availability	# of items available/total number of items on the national essential medicines list x100	95%
Procurement	Ratio between median price of commodities procured and the international median reference value	100%

Emergency Procurement	% of emergency orders issued in the past 12 months	Less than 5%
Clearance	% of orders cleared from the port before the deadline	100%
Supplier	% of orders received in full and on time from total no of orders in a defined period	100%
Expiration	Total value of expired items/average inventory value x 100	3 to 5%
Quality	# of medicines that meet the national quality control standards/number of items procured on a defined period x 100	100%
Shelf life	% of medicines received with a shelf life of less than 75% at the time of arrival	0%
Inventory control	% of quantities of each product lost per total quantities available for use in the past year	Less than 1%
Service	% of treatment sites that received all orders on time and in full during a defined period	100%

FIGURE 7 NMSF KEY PERFORMANCE INDICATORS

7.3 Insights from Research and Key Informants

Within the public health supply chain, commodity availability and patient coverage are the key goals. This was highlighted in the publication Measuring Supply Chain Performance: Guide to Key Performance Indicators for Public Health Managers USAID|DELIVER Project, 2010. "Positive health outcomes are highly dependent on how well the health delivery system, that is health information, financing, personnel and supply chain is performing. The importance of having medicines and other supplies available at the health facility cannot be overstated and their availability often depends on how well or how poorly the supply chain is performing."

In the publication, Linking Human Resource Investments to the Global Health Supply Chain: Lessons from the USAID|DELIVER Project and Other USAID Investments. 2016, it was noted that the areas that HR for SCM interventions targeted most directly were forecasting and supply planning, procurement, inventory management, LMIS and risk management.

In order to ensure applicability across all supply chain models the core supply chain processes underpinning this research are linked to the three objectives of the GAVI Supply Chain Strategy, i.e. availability, quality and efficiency:

Using these core processes and SCM objectives as a guide, emergent themes were then categorized around the interrelated research questions:

- What are the organizational indicators used to determine Supply Chain performance?
- In which areas can training and skills development activity directly impact on Supply Chain performance?
- Which measurable indicators relate to public health outcomes?

The interview participants highlighted with some level of consistency that the core areas that senior managers in the private, public and parastatal sectors use to determine achievement of the goals and therefore effectiveness in the supply chain as:

- Commodity Availability
- Quality
- Operating Efficiency and Costs

In this context many other performance indicators impact on and therefore form a subset of these 3 core indicators and for the purposes of this report these 3 areas were selected as a basis for assessing the link between supply chain performance and skills development. The areas are discussed in detail below.

7.3.1 Commodity Availability

Core Supply Chain process area: Product Selection/Forecasting/Procurement

PtD's TOC framework connects investment in human resources to public health supply chain performance improvements, commodity availability and ultimately to improved health outcomes. Skills development is therefore a key element contributing to optimizing workforce performance impacting on commodity availability as shown in the figure below.

FIGURE 8 LINK BETWEEN SKILLS DEVELOPMENT AND COMMODITY AVAILABILITY

This indicator measures the percentage of those products that listed on a National Essential Medicines List (NEML), or other approved product list, or standard treatment guidelines (STG), using the following formula:

Percentage of items available /total number of all items on national essential medicines list (NEML)

Many factors or sub indicators such as forecasting, stocks outs, order fill rates, overstocking and inventory practices impact on commodity availability. These are referred to as departmental outcome indicators and are more easily measured in the context of skills development. This presents level 4 assessment where the focus is on training staff to correctly adhere to supply chain processes and implementing these changes in day to day work practices. It should be noted that this is where a corresponding increase in work performance and organizational performance can be measured. The link between the purpose or use of the indicators and focus of corresponding training programs to improve performance are shown below.

Using this framework training and skills development interventions should lead to measurable improvements in product selection, inventory accuracy rate, stock out rate, order fill rate and forecasting accuracy. In theory, this should lead to improvements in commodity availability and ultimately better health outcomes.

These sub indicators focus on outcomes rather than impact and are highly dependent on inventory practices.

Sub Indicator	**Purpose and Use**	**Focus of Training Intervention**
Commodity Selection Based on the Essential Medicines List	Establishes whether commodities that are regularly procured are essential products	Maintaining up to date EML lists
Inventory Accuracy Rate	Measures the accuracy of data on commodity stock levels and provides information on how accurately inventory is tracked Provides a tally between physical inventory and ledger balance	Correct recording of stock received, picked and issued
Stock Out Rate	Measures commodity availability/or absence over a period of time; it represents the overall ability to supply a full range of products	Maintaining accurate stock records
Order Fill Rate	Determine how effective a distribution facility is in satisfying customer orders.	Inventory management, picking and shipping procedures
Forecasting Accuracy	Accurate forecasting helps reduce the likelihood of wastage or shortage, and increasing the likelihood of meeting customer needs with available commodities	Analyzing historical consumption data, estimating future trends Maintain accurate consumption data
Stocked According to Plan	Measures whether stock levels are adequate at a point in time and helps to reveal overstock situations that could lead to product expiration and wastage	Maintaining accurate stock records

FIGURE 9 LINK BETWEEN COMMODITY AVAILABILITY SUB INDICATORS AND TRAINING INTERVENTION

7.3.2 Quality

Core Supply Chain process area: Procurement/Warehousing/Storage/Inventory Management

The focus is to identify broader supply chain processes such as procurement, inventory and more specifically the storage and retrieval of goods, which if not undertaken correctly has a negative impact on the final quality of the commodity delivered to the health facility.

Since no one indicator applies to this factor several related sub indicators have been identified and the working practices associated with them impact on the quality of commodities. These practices can be improved as a result of specific training activities as indicated in the table below.

Indicator	Purpose and Use	Focus of Training Intervention
Percentage of Products that Undergo Quality Testing	Provides insight into quality testing and indicates whether quality control measures are taken on products entering the country	Adherence to quality testing requirements
Percentage of procured commodities that meet stringent regulatory authority (SRA) or WHO standards	Determines whether products being purchased meet international quality standards	Adherence to SRA and WHO standards
Value of commodities damaged in the warehouse	Measures the value of damaged commodities due to inappropriate warehousing conditions or handling	Warehousing storage practices including temperature and cold chain practices
Value of product damaged in transportation	Measures the value of damaged commodities due to inappropriate transport conditions or handling	Compliance to regulations requiring temperature-controlled distribution and transportation practices

FIGURE 10 LINK BETWEEN QUALITY INDICATORS AND TRAINING INTERVENTIONS

7.3.3 Operating Efficiency and Costs

Core Supply Chain process area: Warehousing/Inventory/Distribution/Transportation

The focus is on efficiencies in the supply chain process leading to the supply chain of commodities to the health facility and the overall cost of delivery.

Supply chains are dependent on effective supply chain creating efficiencies which directly affect operating costs**.** These include all departmental costs including distribution costs, procurement costs, warehousing costs and transportation costs. In this context a reduction in operating costs due to optimization of delivery loads and the management of inventory wastage can in theory be achieved through improved adherence to supply chain processes and individual performance levels. The link between training interventions and service delivery can be established since improvements in workforce performance through adherence to supply chain processes should potentially result in a reduction in operating costs. Understanding the value of stock in inventory and having an effective stock location system should result in efficiency in stock management and lower operational costs. Likewise, the efficiency in picking of stock for orders to health facilities, when warehousing stock management is clear will result in further reduction in cost of stock processing.

Since no one indicator applies to this factor several related sub indicators have been identified as shown below.

Indicators	Purpose and Use	Focus of Training Intervention
On time delivery and in full	Measures the percentage of shipments arriving on time for a set delivery date during a defined period of time.	Vehicle maintenance Vehicle log keeping Distribution scheduling
Adequate shelf life	Measures how long it takes for a commodity to reach a facility and tracks the shelf life of commodities highlighting delays which could lead to expiries and wastage.	Inventory management and distribution processes
Stock wastage due to expiration	Measures the ability of staff to practice first to expire, first out (FEFO) methods and properly manage commodities. This will result in reduced wastage	Warehousing practices including FEFO.
Stock wastage due to damage	Measures the ability of staff to practice warehouse safety practices. This will result in reduced wastage	Warehousing safety practices
Picking accuracy rate	Measures whether items are accurately selected from storage and placed into a container to be transported	Reducing picking error rate
Over stocking	Measures waste that consists of excess inventory over & above that which is necessary	Maintaining accurate stock records

FIGURE 11 LINK BETWEEN OPERATING EFFICIENCY/COSTS INDICATORS AND TRAINING INTERVENTIONS

7.4 High Level Organizational Results Indicators

Given the analysis above the objective of this research is to identify the core organizational indicators to be used in the evaluation of training, thereby establishing the broad areas with the greatest link to organizational outcomes and impact.

However organizational results rely on the institution having firm quality assurance policy that underpin all its operations and services. At departmental level, standard operating policies must be in place that translate institutional policies into departmental actions that are measurable and auditable. These indicators therefore are intended to provide a measure of internal efficiency of the supply chain system aligned to the strategy of the organization and as such it will take time to see the full impact.

This analysis aims to select indicators at the right level to make them relevant and applicable across all supply chain models. Each indicator and related sub- indicator are important and interrelated elements that can be evaluated as a part of a comprehensive activity, or independently based on the following criteria:

- Link directly to health outcomes
- Are recognized as meaningful and relevant
- Can be tracked and understood across the organization
- Focus on and drive performance improvement

This analysis is not intended to result in the selection of the correct definition of the recommended indicators as definitions differ across organizations. The indicators should therefore be tailored to the specific training and organizational context and reviewed on a regular basis.

As mentioned earlier in this report, these high level organizational indicators are dependent on measurement taking place at every level since the likelihood of seeing change is more realistic at levels 1 to 4 (reaction, learning, behavior and departmental results). Proving changes at these earlier levels will make a strong case that changes seen at organizational level 5 are attributable to training. It is in these previous levels that the organization will first see positive results.

Therefore, other things being constant (i.e. funding, available skilled human resources, and appropriate operational tools being available), the following potential high level organizational indicators are listed below and require further inputs and debate within the supply chain, capacity development and monitoring and evaluation communities.

7.4.1 Commodity Availability

This is a measurable indicator and therefore be used independently recognizing that the sub indicators all contribute to the achievement of commodity availability. This indicator can be measured at a high level organizationally and the following sub indicators: commodity selection; inventory accuracy rate; stock out rate; order fill rate and forecasting accuracy can be measured departmentally.

- **Commodity Availability** - Percentage of items available /total number of all items on national essential medicines list (NEML) or EML or restricted procurement list based on national procurement plans

7.4.2 Quality

The impact of quality is critical within the supply chain and has 2 important components: the cost of good quality and the effects on poor quality on health outcomes. The public health supply chain must ensure good quality is consistent through quality inspection activities, prevention mechanisms, and other quality control vehicles.

Two high level indicators are proposed organizationally recognizing that other indicators can be assessed at departmental level:

- **Percentage of Commodities that Undergo Quality Testing -** Number of commodities or shipments tested for quality/total number of commodities or shipments received in country x 100

- **Percentage of Procured Commodities that meet Stringent Regulatory Authority (SRA) or WHO standards -** Number of commodities procured that meet SRA or WHO standards/total number of commodities procured x 100

7.4.3 Operating Efficiency and Costs

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These indicators help to improve operating efficiencies and the cost of the supply chain due to reduced lead times, improved service levels, and increased commodity quality and aims to calculate the total delivered cost. Elements of cost includes costs for warehouse space and management, receiving inventory and stocking, processing orders, inventory in stock costs, picking and transportation.

There is a is a concern, however that trained employees may not have the authority to makes changes need to improve transportation indicators. Given that too many individuals are involved in the process. i.e. different person in charge of filling orders than is responsible for timely delivery. It is recognized that very few individuals have the ability to change vehicle capacity as changing delivery routes, delivery frequency and which commodities can be delivered together as these decisions are generally taken at a senior level. This further demonstrates that training alone therefore cannot impact organizational success.

Three high level indicators are proposed organizationally which comprise of total delivered cost:

- **Total Warehousing Cost -** Sum (labor, space, utilities, material, equipment, eLMIS etc.)/quantities of stocked units

- **Inventory Holding Cost -** Annual inventory holding cost/sum of all capital and non-capital costs

- **Total Transportation Cost -** Sum of all transportation costs during a specified period.

It is acknowledged that some countries may have difficulty finding the data to measure operating efficiency and costs, they do provide a useful benchmark of performance.
This analysis considers the amount of effort required in collecting, reporting and analyzing the data particularly in low-resource contexts where KPI's are not well reported on. Therefore, the proposed indicators intend to balance the value of the data in terms of it tells the organization about the training outcomes with the amount of effort required to collect it.
It is recommended therefore that the PHSC focus primarily on Commodity Availability and Quality indicators. The review of the proposed Operating Efficiency and Cost indicators is only recommended where data is available.

7.5 Conclusions and Recommendations

7.5.1 Further Research, Validation and Evidence

Currently little empirical data or evidence exists in this field and the results of this research are expected to contribute to a wider debate and the design of an evaluation methodology for public health supply chains. This represents the first step towards quantifying the return on investment or impact of training activities on supply chain improvements.

Thereafter, it is intended that this will lead to the generation of new evidence supporting the application of the proposed indicators across the different supply chain models. Proving this concept will involve research in countries that have near robust systems where all elements in the research can be tested. Countries should be identified based on their commitment to investing in their national health systems (e.g. established multi- year National Health Strategic Plan, National Supply Chain Strategy, National Quality Assurance Policy for pharmaceutical and other health products) and regulatory services for pharmaceutical and other health products. In addition, they are likely to, possess strong eLMIS, meet WHO standards with focus on strengthening the human resources for logistics capacity at all levels to ensure compliance with effective vaccine and cold chain management policies and practices as evidenced by comprehensive improvements in EVM.

In addition, by identifying countries that have some or all their public health outsourced/parastatal, and those that have non-outsourced and partially outsources, this will provide benchmarking opportunity for performance comparison. However, it will be important to highlight the role of culture on the practicability of the indicators by also identifying countries from different parts of the world with a balance of weak and strong countries in terms of size, logistics infrastructure and level of development.

The following countries have been proposed for inclusion in the research:

- Kenya
- Rwanda
- Sudan
- Botswana
- Swaziland
- Mauritius
- Madagascar
- Ghana
- Zambia
- Indonesia
- Malaysia
- Nigeria
- Malawi
- Tanzania
- DRC
- East Timor
- Samoa

In addition to a selection from South America and the Middle East.

7.5.2 Evaluation Methods and Indicators

The objectives of this report are to:

- Define these indicators in an effort to enhance the consistent use of terms across public health supply organizations
- To promote the evaluation of training by making indicators readily available to organizations

A comprehensive listing of the most widely used evaluation methods and indicators. (Levels 1, 2, 3 and 5) for evaluating training in public health supply chain organizations is provided in Annex 1 and draws on best practice. This listing will be updated at the conclusion of the validation process.

It is not intended to replicate the myriad of supply chain indicators used globally. Therefore, examples of relevant level 4 indicators can be found in USAID | DELIVER (2010). Measuring Supply Chain Performance: Guide to Key Performance Indicators for Public Health Managers. Task Order 1.

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ANNEXES

Annex 1: Training Evaluation Methods and Indicators

The most widely used evaluation methods and indicators for evaluating training in public health supply chain organizations.

Evaluation Level	Methods	Indicators Guidelines	Proposed Indicators
Reaction	• Completed trainee feedback questionnaire • Informal comments from trainees • Focus group sessions with trainees • Feedback from facilitator	• What satisfaction rating do trainees give to aspects of the intervention such as relevance, suitability of delivery method and quality of the presenter? • To what extent do trainees believe the objectives of the intervention were achieved? • What satisfaction rating do trainees and line managers give to the timing of the intervention and the suitability of information provided? • How highly does the facilitator rate participation and engagement?	• # of courses that achieve outlined objectives / Total # of courses evaluated) x 100 • % of programs that match organizational requirement • % trainees receiving manager briefing prior to attendance • % of staff satisfied with training
Learning	• Pre- and post-test scores • On-the-job assessments • Supervisor reports	• To what extent are the acquired capabilities demonstrated by trainees to the identified standard after the intervention and an appropriate period after the intervention?	• (# of trainees that have mastered knowledge / total # of trainees tested) x 100 • (# of managers who communicate with the trainee at specified periods post-training (e.g., six months, one year) x 100
Behavior	• Completed self-assessment questionnaire • On-the-job/supportive supervision observation • 360-degree feedback/reports from customers,	• What is the level of opportunity to apply capability in the workplace, as perceived by an individual and line managers? • To what extent do trainees demonstrate the acquired capability in the workplace, as	• (# of trainees undertaking activities according to set standards or processes / total # of trainees tested) x 100 • (# of trainees in positions where their training is applied in the

Evaluation Level	Methods	Indicators Guidelines	Proposed Indicators
	peers and trainee's manager • Job records and checklists indicating adherence to processes • Staff satisfaction surveys and retention levels • Performance review scores and assessments	perceived by themselves, colleagues, line managers and customers? • To what extent are mentoring and coaching seen as a regular part of managers' responsibilities and are reinforced through the performance management process? • To what extent are managers providing a supportive environment that allows staff to practice new skills?	performance of their duties / total # of trainees) x 100 • % of workers who received supportive supervision in the past six months • # of staff who have completed their annual performance reviews with their supervisors for the last performance period / Total number of staff eligible for an annual performance review) x 100 • # of individuals applying for membership of professional supply chain networks and bodies • # of staff who vacated their positions / # of staff employed by the organization) x 100
Organizational Results	• Organizational performance data (KPIs) • Financial reports • Quality inspections • Interview with departmental managers	• What is the level of satisfaction with improvement/ achievement of desired supply organizational outcomes? • What is the level of contribution of training interventions to the achievement of supply chain performance indicators?	• % of items available /total number of all items on national essential medicines list (NEML) or EML or restricted procurement list based on national procurement plans • # of commodities or shipments tested for quality/total number of commodities or shipments received in country x 100 • # of commodities procured that meet SRA or WHO standards/total number of commodities procured x 100

Evaluation Level	Methods	Indicators Guidelines	Proposed Indicators
			• Total warehousing cost = sum (labor, space, utilities, material, equipment, eLMIS etc.)/quantities of stocked units • Annual inventory holding cost/sum of all capital and non-capital costs • Sum of all transportation costs during a specified period.