

Ministry of Health

Kingdom of Cambodia

**Collaboration Program with the Private
Sector for Disseminating Japanese
Technology for Digital X-ray System and
Radiation Management
in Cambodia**

**Final Report
[Summary]**

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KONICA MINOLTA, INC.

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1. BACKGROUND

In Kingdom of Cambodia, respiratory diseases such as tuberculosis, pneumonia and influenza are still one of the top causes of death. However, chest radiography which is the first step to diagnose respiratory diseases, has not been properly conducted at many hospitals to obtain adequate quality of X-ray images. There are two main causes: first, analogue method is still dominant, which requires diagnosticians to process a film with chemicals more carefully handled than digital method. A hot and humid environment in the country adds difficulty in the procedure. Second, training program specialized for X-ray diagnostician is limited. Many nurses take X-ray and process films without such training throughout the country. In addition, leakage radiation dose is not properly managed at many hospitals as it is often the case that radiation dose of patients and medical professionals are not closely monitored.

In such circumstances, this program was designed to install digital radiography system at Technical School for Medical Care (TSMC) and support updating curriculum, syllabus and teaching manuals corresponding to digitization. Digital system would contribute to ensure the accuracy of X-ray diagnosis through higher quality of X-ray images. National Maternal and Child Health Center (NMCHC) was already equipped with digital system through grant support by Japan. This program further installed the database with archiving system which would also enable diagnosticians to detect diseases more accurately and easily by comparing past X-ray images on the screen. Dosimeters were also provided at Department of Hospital Services at Ministry of Health (DHS/MOH) so as to strengthen the management of leakage radiation dose, which would contribute to protect medical professionals as well as patients from unnecessary exposure to radiation.

Through these activities, this program overall aimed to lead radiology in Kingdom of Cambodia to be more advanced in technology and reliable to both medical professionals and patients.

2. CURRENT SITUATION

Following challenges were observed as the reasons why quality of images were yet to be assured for accurate diagnosis.

(1) Challenge in quality of images

Although analog radiography system is still dominant in Cambodia, it requires higher skills to develop images with assured quality because it is more difficult to control

the environment when using several chemicals in dark rooms in such a country with hot temperature and high humidity all through year. Hence the most images developed in the majority of hospitals are not clear enough for reliable diagnosis.

Due to short of radiological technologists, many hospitals are forced in a situation where nurses operate X-ray machines and develop images. Analog system requires higher skills yet the nurses without proper training on radiography are the ones taking images in many cases. Hence the only limited numbers of doctors are provided with quality images for reliable diagnosis.

(2) Challenge in management of radiation dose

As long as it is properly monitored and controlled, exposure to radiation through X-ray machines does not affect human body. However, management of radiation dose is not yet standardized in Cambodia. There is no sufficient data available in public that proves medical professionals and patients are not affected by radiation. As a result, applicants for radiology department at TSMC are reducing year by year regardless of the shortage in the number of radiological technologists. This simply implies that the above mentioned situations where nurses take X-ray images would continue as TSMC is the only national institution offering education for radiological technologists.

Installing digital radiography system through this program would contribute: To provide stable quality images even at the less controlled environment, to reduce fear of radiation exposure for those who are less knowledgeable, and to avoid unnecessary radiation exposure from retaking X-ray when the first taken are not clear enough for diagnosis.

3. TECHNOLOGY / ASSISTANCE PROVIDED

(1) Digital Radiography System

- Computed Radiography (CR) system (REGIUS MODEL 110)
- Digital Radiography (DR) system (AeroDR2 1417S)
- Controller (CS-7)
- Dry Imager (DRYPRO MODEL 832)

(2) Picture Archiving and Communication System (PACS)

- Controller and simplified multi-functional PACS (IMAGE PILOT)

(3) Radiation Dosemeter

- Pocket dosimeter (PDM-127B-SH)
- Survey meter (ICS-331B)

(4) Support in education

- Supporting in updating current curriculum, syllabus and teaching manuals at TSMC corresponding to digitization.
- Conducting Training of Trainers (TOT) targeting lecturers and teachers at TSMC. Clinical images for image reading trainings can be obtained from PACS installed at NMCHC.

(5) Support in management of radiation dose

- Creating opportunities to raise awareness on radiation dose control at hospitals by conducting survey at several sample hospitals.
- Reporting the survey results to MOH to support analyzing the current situation in Cambodia.

4. PURPOSE AND GOAL

(1) Purpose

- Current and future radiological technologists would fully understand advantage of digital radiography system and more hospitals would be able to provide digital radiography services.
- Digital radiography system would improve quality of X-ray images and database with archiving system would contribute to enable diagnosticians to access higher quality of images easily and enhance accuracy of diagnosis by comparing past X-ray images on the screen.
- Dosimeters and radiation dose survey at sample hospitals would contribute to improve management of radiation dose in accordance with the established national standard and raise awareness on importance to control radiation dose among medical professionals.

(2) Goal

- Through installing digital radiography system at TSMC and supporting in updating curriculum corresponding to digitization, the program would improve the school environment to educate and train future radiological technologists in digital system.
- Through workshops and trainings on digital radiography system, the program would expand knowledge of hospital and clinic owners, radiologists and radiological technologists in advantages of digital technology and cost efficiency as well as

management of radiation dose.

- Through overall activities, more digital radiography system would be installed in Cambodia.

5. PROGRAM IMPLEMENTATION

The program consists of three main activities:

- To install digital radiography system at TSMC and support updating curriculum, syllabus, and teaching manuals of TSMC,
- To install PACS system at NMCHC and support learning advantages of digital technology through hands-on experience, and
- To provide dosimeters and conduct radiation dose survey so that medical professionals would be able to apply the management method at their own hospitals.

6. IMPLEMENTED SCHEDULE

(1) 1st Dispatch to Cambodia (December 2016)

- Installed digital radiography system at TSMC and NMCHC.
- Conducted TOT on how to teach digital radiography system targeting lecturers and teachers at TSMC.
- Provided dosimeters and survey meters to MOH.

(2) 2nd Dispatch to Cambodia (May 2017)

- Conducted 1st workshop on digitization and management of radiation dose, targeting hospital and clinic owners who play main roles in improving technology and safety management at their hospitals.
- Conducted a maintenance training on digital system, targeting National Workshop members who were appointed by DHS/MOH.
- Started individual consulting sessions for private hospital and clinic owners to suggest the most efficient system for each case.
- Suggested budget estimation of the next fiscal year to public hospitals.

(3) Training program in Japan (July 2017)

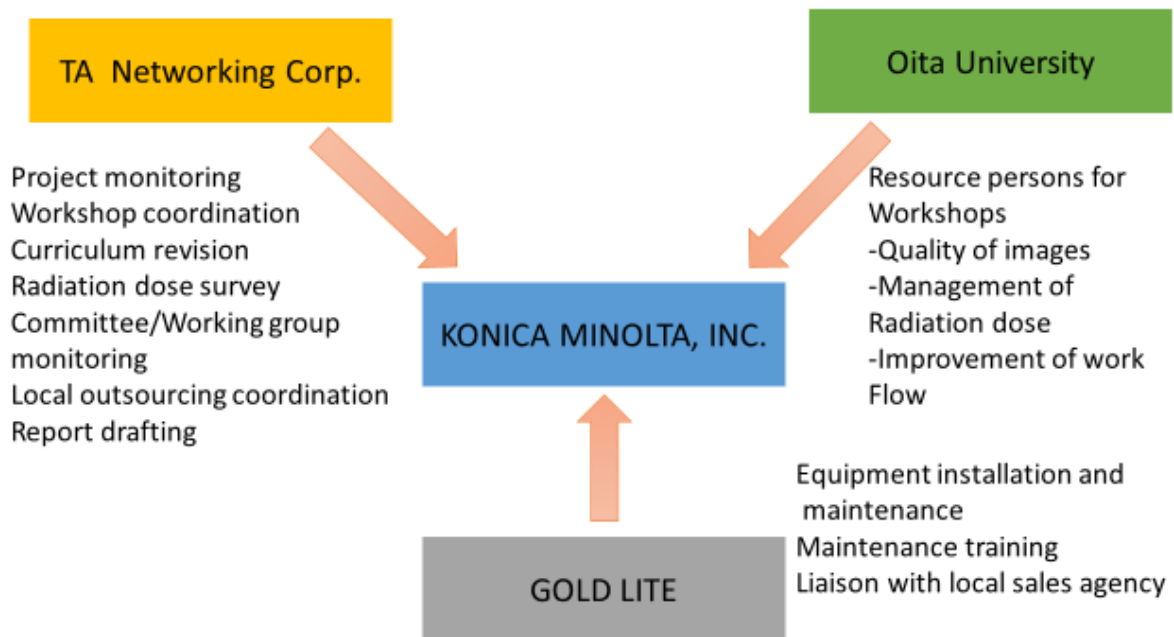
- Invited interested hospital and clinic owners to Japan and conducted seminars on the latest digital products.
- Started negotiation mainly with those invited hospital and clinic owners in October 2017.

(4) 3rd Dispatch to Cambodia (November 2017)

- Conducted 2nd workshop on cost efficiency through comparison with other makers, targeting hospital and clinic owners.

7. IMPLEMENTATION STRUCTURE

KONICA MINOLTA, INC. spearheaded the program with support by TA Networking Corp., Oita University and GOLD LITE as described below.



8. RESULTS AND OUTPUTS

Goals of the program were most likely achieved through three dispatches to Cambodia and one training program in Japan. All the planned equipment was successfully installed at respective institutions in December 2016 and no single problem has been reported as of May 2018. Committee and working group for spearheading the revision of curriculum, syllabus and teaching manuals were officially organized and focal members completed the draft with technical support from the program. Attendance of each workshop and training was constantly as high as 90% and the discussions followed by each session were always full of questions from those interested hospital and clinic owners. Two clinic owners and one public delegate were invited to the training program in Japan in July 2017 and the two clinic owners decided to install digital radiography system at their

own clinics. There was another clinic owner who closed a negotiation to install digital system at her clinic. Hence, the program was able to achieve the overall purpose, to increase hospitals and clinics equipped with digital radiography system.

9. EXPECTED BUSINESS EXPANSION (As of March 2018)

Although KONICA MINOLTA, INC. used to be almost unknown in Cambodia, workshops and trainings conducted through this program created significant opportunities to directly communicate with hospital and clinic owners and made them aware of advantages and cost efficiency of digitization. As a result, latent needs for purchasing digital radiography system were discovered and several negotiations were closed timely. Nevertheless, analog system is still dominant all over Cambodia and rapid digitization is inevitable future. It is necessary to find and set the appropriate market price in order to continue supplying digital radiography system in Cambodia. It is, therefore, urged that KONICAMINOLTA, INC. should make the best efforts to reduce the cost so as to offer competitive market price in Cambodia.

As there are several closed and unclosed negotiations through the program, further business expansion should move on to the next step or the regular business phase, which is to utilize the local sales agency in order to conduct promotions, to discover clients, to receive orders, to install equipment and to provide aftersales services. It requires daily communications with the local agency for exchanging information and regular seminars to provide sufficient knowledge on the products. Low market price at the moment is also a great risk for a company to take, yet it should be possible to reassess the components of products and combine with more reasonable parts to meet the market price in Cambodia, which may require to use parts made in other countries than Japan that are more competitive in the market.

It has also been considered to develop a new business model to meet the market price in Cambodia as it seemed that the initially estimated price was too expensive for the majority of hospitals and clinics.

10. BUSINESS EXPANSION PLAN

Although advantages and cost efficiency of digital radiography system seemed fully understood by radiologists and radiological technologists, public medical institutions are more difficult to secure the budget even at Calmette Hospital, the flagship of all public hospitals. Supporting in applying for the budget at public hospitals will be necessary while

developing a new business model for private clinics. The list below shows the specific target in each phase.

Phase 1: About 3,690 Private Clinics

Phase 2: About 90 Referral Hospitals (Province and District)

Phase 3: About 900 Health Centers (with in-patient beds)

11. POSSIBLE IMPROVEMENT OF HEALTH SYSTEM IN CAMBODIA

In the current health system in Cambodia, public hospitals are not supposed to earn from medical treatment. Large public hospitals would not be able to develop digital radiography system out of their income. It would be most feasible if referral hospitals such as Calmette Hospital, Kosmak Hospital and Soviet Friendship Hospital get supported by overseas.

Digitization of radiography system does not require to replace the whole X-ray machine but to partially replace the analog film developing device into digital device. Estimated budget for one health facility to install digital system would be in the range of 2,000,000 yen to 5,000,000 yen. KONICA MINOLTA, INC. has installed DR system at Pearaing Hospital as the pilot case for enhancing tuberculosis diagnosis. At this referral hospital in the remote area, two nurses trained in radiography are able to take quality X-ray images for reliable diagnosis. If 46 CPA3 and CPA2 hospitals are to be digitized, approximately 180,000,000 yen would be required (4,000,000/ facility). Grant aid projects would be considered the most feasible and efficient in this case.

Japanese ODA projects have supported NMCHC and Svay Rieng Provincial Referral Hospital and these are other sites where digital radiography system of KONICA MINOLTA, INC. was installed. It is expected to make these hospitals accessible for observations as reference sites and to exchange skills and knowledge between the two hospitals so that users would be able to learn from each other.

