Ex-Post Project Evaluation 2010: Package III-1

(Tonga, Samoa)

November 2011

JAPAN INTERNATIONAL COOPERATION AGENCY

Ernst & Young Advisory Co., Ltd.

EVD
JR
11-35

Preface

Ex-post evaluation of ODA projects has been in place since 1975 and since then the coverage of evaluation has expanded. Japan's ODA charter revised in 2003 shows Japan's commitment to ODA evaluation, clearly stating under the section "Enhancement of Evaluation" that in order to measure, analyze and objectively evaluate the outcome of ODA, third-party evaluations conducted by experts will be enhanced.

This volume shows the results of the ex-post evaluation of ODA Loan projects that were mainly completed in fiscal year 2008, and Technical Cooperation projects and Grant Aid projects, most of which project cost exceeds 1 billion JPY, that were mainly completed in fiscal year 2007. The ex-post evaluation was entrusted to external evaluators to ensure objective analysis of the projects' effects and to draw lessons and recommendations to be utilized in similar projects.

The lessons and recommendations drawn from these evaluations will be shared with JICA's stakeholders in order to improve the quality of ODA projects.

Lastly, deep appreciation is given to those who have cooperated and supported the creation of this volume of evaluations.

November 2011
Masato Watanabe
Vice President
Japan International Cooperation Agency (JICA)

Disclaimer

This volume of evaluations, the English translation of the original Japanese version, shows the result of objective ex-post evaluations made by external evaluators. The views and recommendations herein do not necessarily reflect the official views and opinions of JICA. JICA is not responsible for the accuracy of English translation, and the Japanese version shall prevail in the event of any inconsistency with the English version.

Minor amendments may be made when the contents of this volume is posted on JICA's website.

JICA's comments may be added at the end of each report when the views held by the operations departments do not match those of the external evaluator.

Tonga

Ex-Post Evaluation of Japanese ODA Grant Aid Project
"The Project for Upgrading and Refurbishment of Vaiola Hospital"

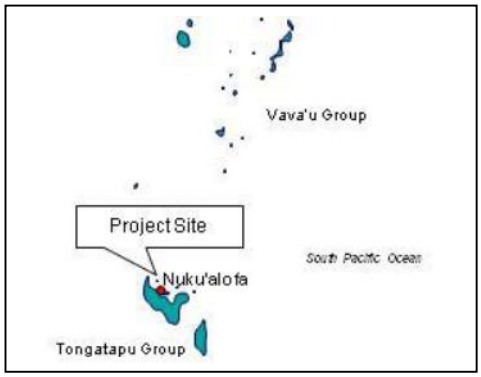
External Evaluator: Keisuke Nishikawa
Ernst & Young Advisory Co., Ltd.

0. Summary

The Government of Tonga is aiming to improve medical care services in the country as a national policy. This project to support the upgrading and refurbishment of Vaiola Hospital, the only hospital providing advanced medical care services in the Kingdom of Tonga, is consistent with such policy. As for project implementation, in spite of slight changes, the outputs, the cost and the period of the project were in line with the original plan. Although the achievement levels were lower than initially targeted figures, domestic demand for medical care services was fully met and these services generally became more effective and safer, resulting in improved credibility and higher satisfaction in regard to the hospital. With respect to sustainability, while steady progress has been made in institutional strengthening and the operation & maintenance (O&M) budget, there are still some issues to be tackled in terms of technical skill levels and human resources in the maintenance division.

In light of the above, this project is evaluated to be highly satisfactory.

1. Project Description



Project Location

Hospital Building Developed by the Project

1.1 Background

Vaiola Hospital is the only hospital providing advanced medical care services in Tonga. It is the top referral hospital and provides primary health services to the residents of Tongatapu Island, the largest island of the country.

However, the following issues were recognised as negatively impacting the provision of medical

care services at the hospital due to the aging of facilities since its establishment in 1971.

- Departments related to the Clinical Service Building (CSB) were dispersed, resulting in inefficient operations.
- Shortage of operating theatres and ambiguity in demarcation between clean operating theatres and dirty zones increased the risk of infection.
- Recovery beds for post-operative patients or patients in the Intensive Care Unit (ICU) were insufficient.
- Sterilisers in the Central Sterile Supply Department (CSSD) were often not functioning, and the capacity of sterilising equipment was insufficient.
- The X-ray unit often broke down hindering proper diagnoses.
- The existence of open-type septic tanks without lids having insufficient capacity, and related environmental issues, such as the spreading of pollutants.

Due to such conditions, the Kingdom of Tonga, with the support of the World Bank, developed the "Master Plan for the Redevelopment of Vaiola Hospital" with the goal of comprehensive hospital improvement. The master plan proposed the implementation of a six-phase redevelopment plan involving new construction and refurbishing activity with support from donors. This project was implemented in consideration of the importance of the environment surrounding the medical care services of Vaiola Hospital to enable provisions of standard medical care services by addressing the aforementioned problems.

1.2 Project Outline

The objective of this project is to improve Vaiola Hospital's medical care services by upgrading and refurbishing its medical facilities and equipment, thereby contributing to the overall improvement of medical care services in the Kingdom of Tonga.

Grant Limit / Actual Grant Amount	1,030 million yen / 1,027 million yen
Exchange of Notes Date	August 31, 2004
Implementing Agency	Ministry of Health The Kingdom of Tonga
Project Completion Date	February 21, 2006
Main Contractor(s)	Fujita Corporation (Construction) NBK Corporation (Procurement)
Main Consultant(s)	Kume Sekkei Co., Ltd.
Basic Design	October 2003 – March 2004
Related Projects	[Technical cooperation] Tonga, Japan/WHO Joint Health Laboratory Project (1981-1986)

	[Grassroots Grant Aid] Vaiola Hospital Public Health Laboratory Building Project (1983) Vaiola Hospital Ultrasound and Blood Bank Building Project (1995) [Other Donors] World Bank: Health Sector Support Project (2003-2008) AusAID: Tonga Health Sector Planning & Management Project (1999-2007), etc.

2. Outline of the Evaluation Study

2.1 External Evaluator

Keisuke Nishikawa (Ernst & Young Advisory Co., Ltd.)

2.2 Duration of Evaluation Study

Duration of the Study: November, 2010 – November 2011

Duration of the Field Study: March 28 – April 9, 2011, and June 14 – June 18, 2011

3. Results of the Evaluation (Overall Rating: A[1])

3.1 Relevance (Rating: ③[2])

3.1.1 Relevance with the Development Plan of the Kingdom of Tonga

At the time of project planning, Tonga set forth "the achievement of the improvement of quality of life" as a long-term objective for 2025 in its "Seventh National Development Plan." As shown by the following slogan expressing the explicit goal, "the establishment of a health system which Tongans can be proud of by 2020," the Tongan government aimed to provide sufficient and qualified health care services. Also, as part of a policy outline for the health sector, it prepared guidelines for nine areas including efficiency improvements in operational management of the Ministry of Health, strengthening and improvement of staff management of the Ministry, upgrading of medical facilities and equipment, and better O&M of facilities and equipment to promote the development of the appropriate environment for health care services. As part of these efforts, "the Master Plan for the Redevelopment of Vaiola Hospital" was developed in 2002 with the support from the World Bank (WB), and subsequently all upgrading and refurbishing phases were to be completed by 2011.

[1] A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

[2] ③: High, ②: Fair, ①: Low

Tonga's active efforts to improve the indicators of the Millennium Development Goals (MDGs) have brought certain progress, such as greater capabilities to control infectious diseases. With the increasing trend of lifestyle-related diseases such as diabetes, hypertension, and obesity considered, the current "National Strategic Planning Framework" announced in 2010 sets forth the improvement of Tongans' health through minimizing non-infectious diseases as the basic objective. In addition, "Ministry of Health Corporate Plan 2008/09 – 2011/12," the implementation plan for the framework, sets forth the continuation of upgrading of facilities and IT system of the Ministry as one of the six major output areas. As one of the specific strategies, completion of all phases of upgrading and refurbishing of Vaiola hospital is clearly indicated.

Therefore, further development of health care services is regarded as important in securing Tongan's quality of life through the improvement of the health of these citizens, and the master plan for this purpose has been developed and implemented. This project was developed to contribute to the realisation of a part of the master plan, and was consistent with the development policy and programmes of the Government of Tonga.

3.1.2 Relevance with the Development Needs of the Kingdom of Tonga

Vaiola Hospital has been the top referral[3] hospital in the country serving more than 100,000 people as well as the primary health services provider for the residents on Tongatapu Island, in which approximately 70% of the population reside. Currently, community-based medical care services are provided through improved Health Centres located in various places. Many people, however, use Vaiola Hospital – located in the capital of Nuku'alofa – to seek primary health care services due to its easy access. While the quality of the services is improving, non-infectious lifestyle diseases such as diabetes, hypertension, and obesity have also been increasing in recent years. Thus, the hospital is now required to address these needs.

However, because of aging facilities, various problems had been identified at the hospital, including:

- CSB-related departments placed in inconvenient locations
- Lack of operating theatres
- Greater risks of infection due to ambiguity in the demarcation between clean and contaminated zones
- Shortage of beds for post-operative patients or patients in ICU
- Lack of sterilising capacity in CSSD due to repeated equipment break-downs
- Problems with X-ray equipment that affected proper diagnoses
- Lack of septic tank capacity and related pollution risks due to design of septic tanks

Urgent action was required to solve these problems as Vaiola Hospital was positioned as the top referral hospital in Tonga.

[3] Referral: A system in which regional health centres introduce their patients to advanced medical institutions according to the disease conditions of the patients

A number of hospital functions have been improved by this project, but because of its continued significance as the provider of primary health care services and the top referral hospital, other remaining facilities and equipment, which were not within the scope of this project, were also in need of further improvement. To address this, the WB implemented a subsequent phase to the project. Currently, Japan International Cooperation Agency (JICA) is undertaking Phase 2 of the Project for Upgrading and Refurbishment of Vaiola Hospital[4] as the final phase of the entire project.

3.1.3 Relevance with Japan's ODA Policy

In "The Okinawa Initiative: Regional Development Strategy for a More Prosperous and Safer Pacific" adopted in the Third Japan-PIF Summit Meeting (PALM 2003) in May 2003, Japan announced that enhanced security, a safer and more sustainable development, improved education and human resources development, better health, and more robust and sustained trade and economic growth were the priority policy objectives for Pacific Island countries. Japan, accordingly, prioritised the following 5 areas for Tonga: 1) human resource development, 2) local health improvement and national health promotion, 3) rationalization and improvement of public services, 4) sustainable use of resources and environmental conservation and 5) economic growth. This project falls under "2) local health improvement and national health promotion" and is consistent with the aid policy of Japan of the time.

This project was also consistent with the master plan for the overall improvement of Vaiola Hospital as previously mentioned. Thus, it can be said that this project was aligned with the overall policy directions for government aid and was complementary with other projects.

This project has been highly relevant with Tonga's development plan, development needs, as well as Japan's ODA policy, therefore its relevance is high.

3.2 Efficiency (Rating: ③)

3.2.1 Project Outputs

As part of the overall improvement of Vaiola Hospital, a CSB including operating theatres and an X-ray room, obstetrics and surgical wards, and septic tanks were constructed, and associated equipment and materials were procured for this project.

Tables 1 and 2 show comparisons of the final outputs and the original plan.

[4] The second phase project includes construction of an outpatient building and an annex and a dental ward (outpatient and special outpatient departments; a pharmacy; pre-delivery check, ophthalmology, diabetes, physiotherapy and dental departments; an education and seminar department; administrative department; a school of nursing; a mortuary; a wastewater treatment plant (septic tank machine room), water and rainwater tanks) and procurement of equipment and materials for newly added and existing facilities. Scheduled to be completed in March 2012 (Total project cost: 2.128 billion yen, of which Japan's contribution: 1.998 billion yen).

Table 1: Comparison of the Original Plan and the Actual Outputs (Building)

Department	Original Plan		Actual Outputs	
	Floor Area (planned m2)	Description of Facilities	Floor Area (actual m2)	Description of Facilities
CSB	GF (918.0)	Radiology; Blood Bank; Laboratories; Biomedical Equipment Workshop; Inpatient Pharmacy	GF (918.0)	Radiology; Blood Bank; Laboratories; Biomedical Equipment Workshop; Inpatient Pharmacy
	1F (864.0)	ICU (2 beds), Recovery Beds (3 beds); Operating Theatres (2 rooms); Day Surgery Reception (1 room), Central Sterile and Supply	1F (864.0)	ICU (2 beds), Recovery Beds (3 beds); Operating Theatres (2 rooms); Day Surgery Reception (1 room), Central Sterile and Supply
Ward Building	GF （992.3）	Obstetrics Ward (34 beds + SCN 6 cots), Delivery Suites (6 beds)	GF （992.3）	Obstetrics Ward (34 beds + SCN 6 cots), Delivery Suites (6 beds)
	1F (748.1)	Surgical Ward (40 beds)	1F (748.1)	Surgical Ward (40 beds)
Covered Corridor	GF, 1F 234.1 m2		GF, 1F 232.9 m2	
Septic Tanks	Sufficient capacity to deal with the existing facilities (600 persons x 3)		Sufficient capacity to deal with the existing facilities (600 persons x 3)	

Table 2: Comparison of the Original Plan and the Actual Outputs (Equipment)

Department	Original Plan	Actual Outputs
Operating Theatre	Operating Light, Operating Table, Anaesthesia Apparatus with Ventilator, Electrosurgical unit, Patient Monitor, Surgical Scrub Station, Operating Microscope for ENT, Defibrillator, Ophthalmic Surgical Equipment	Operating Light, Operating Table, Anaesthesia Apparatus with Ventilator, Electrosurgical unit, Patient Monitor, Surgical Scrub Station, Operating Microscope for ENT, Defibrillator, Ophthalmic Surgical Equipment
CSSD	High Pressure Steam Steriliser, Table-Top Ultrasonic Washer	High Pressure Steam Steriliser, Table-Top Ultrasonic Washer
ICU	Ventilator for Adult and Paediatric, Patient Monitor	Ventilator for Adult and Paediatric, Patient Monitor
Laboratories	Blood Cell Counter, Safety Cabinet	Blood Cell Counter, Safety Cabinet
Blood Bank	Blood Bank Refrigerator	Blood Bank Refrigerator
Inpatient Pharmacy	Medical Refrigerator, Distilled Water Unit	Medical Refrigerator, Distilled Water Unit
Biomedical Equipment Workshop	Maintenance set	Maintenance set
Radiology & Ultrasound	X-Ray Unit, Automatic Film Processor, Ultrasound Scanner B/W	X-Ray Unit, Automatic Film Processor, Ultrasound Scanner B/W
Obstetric Ward	Doppler Fetal Heart Rate Detector, Bedpan Sanitiser	Doppler Fetal Heart Rate Detector, Bedpan Sanitiser
Delivery Room	Fetal Monitor (CTG), Delivery Table, Delivery Light	Fetal Monitor (CTG), Delivery Table, Delivery Light
Special Care Nursery	Baby Resuscitation Trolley, Infant Incubator	Baby Resuscitation Trolley, Infant Incubator
Surgical Ward	Traction Apparatus with Bed, Pulse Oximeter	Traction Apparatus with Bed , Pulse Oximeter
Other (equipment)	Oxygen Condensing System	Oxygen Condensing System

As is shown in the above tables, the project was implemented mostly in accordance with the

original plan. As for the facilities, although the area of the covered corridor turned out to be slightly smaller than the originally planned figure, there seemed to be no problems arising from this modification. According to the implementing agency, equipment was procured as planned, and its existence was confirmed during the field study visits.

Changes not shown in the above tables include the installation of fire doors and emergency stairs, and the widening of the doors of patient rooms. There were also minor works such as the installation of a door between laboratories and the blood bank, and a window to the wall of the inpatient pharmacy. These changes were added to fully comply with the building code[5] or the comprehensive design; no negative impacts on the overall plan were found and, in terms of the fire prevention measures, the changes brought additional benefits. As for the septic tanks, the bottom slab was set higher than the original design as groundwater flowed out during the excavating work, and the length and the width of the slab was increased to adequately secure the intended capacity.

Inputs by Tonga, including the upgrading of electric power receiving facilities, installation of a telephone trunk line, developments of roads and a parking lot on the premises, connecting the sewage pipes, transferring of the existing medical equipment, procurement of furniture and furnishings, and gardening and planting work, were all delivered as planned.

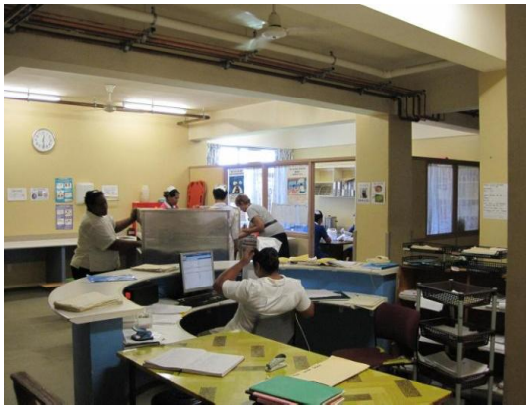


Photo 1: Nurse Station in Obstetrics Ward

Photo 2: Surgical Ward

3.2.2 Project Inputs

3.2.2.1 Project Cost

Originally the project was expected to cost 1,030 million yen (JICA's component). The actual amount spent was 1,027 million yen (99.7% compared to the original amount), slightly lower than planned. Plans were for the total project cost to be 1,137 million yen, including a Tongan component of 107 million yen. The actual total project cost, however, was not determined due to the lack of information on the actual spending by Tonga. Thus, a comparison of the originally

[5] The Building Code and the Regulations were officially approved in Tonga in 2002 and July 2007, respectively.

planned total cost and the actual total cost was not possible. However, it can be estimated that the planned amount was disbursed as all the planned inputs from Tonga were delivered as mentioned above.

3.2.2.2 Project Period

Although the project period[6] was estimated to be 20 months in total (5 months for design and 15 months for construction), the project was completed in 18 months (3 months (September to November 2004) for design and 15 months (December 2004 to February 2006) for construction), shorter than the planned period (90%). A highly efficient design phase contributed to the early completion of the project.

Both the project cost and the project period were as planned, therefore efficiency of the project is high.

3.3 Effectiveness[7] (Rating: ③)

3.3.1 Quantitative Effects

The project was expected to result in increases in the number of operations, X-ray examinations, higher sterilisation volumes, and the realisation of in-house ophthalmic operations. The following table compares the effects expected at the time of planning and the actual effects in post-project years.

Table 3: Changes in Quantitative Indicators

Indicators (Annual)	Original Plan		Actual Output			
	Base year (2002)	3 years after completion (2009)	2006 (Completion year)	2007	2008	2009
Number of Operations	2,985	3,300	1,921	1,868	2,763	2,702
Number of Ophthalmic Operation (Cataracts)	0 (unable to conduct)	104	84	No record	No record	45
Number of X-ray Exams	9,504	10,500	8,223	8,608	8,827	9,456
Sterilisation volume (litres/day)	1,760	2,640 or more	2,711	2,605	2,418	2,512

Source: Data provided by the Ministry of Health (extracted from Health Information System etc.)

In 2009, all indicators were below what had originally been anticipated; numbers of operations and X-ray examinations, in particular, were even lower than the data of 2002. On the other hand,

[6] The project period is defined as "design period + construction period."
[7] The evaluation result of the project impacts is incorporated into the Effectiveness rating.

the annual changes of these indicators have shown an increasing trend in subsequent years. At the time of project completion, it seemed that some non-urgent operations had been postponed as the hospital needed a lot of time to move the equipment from the old facilities and to consolidate the new operational structure. As can be seen in Table 4, there has been considerable fluctuation in the numbers of outpatients at Vaiola Hospital and in the Tongan population in recent years; no significant increases have been noted. Thus, it can be said that Vaiola Hospital has not had any major problems in providing medical care services and that the patients' needs were satisfactorily met[8]. Although the actual data have not reflected the figures expected at the time of planning, the project can be judged as sufficiently effective.

Table 4: Number of Outpatients at Vaiola Hospital and the Total Population of Tonga

	2006	2007	2008	2009
Number of outpatient of Vaiola Hospital (person)	53,839	45,667	66,625	52,209
Population of Tonga (thousand persons)	102.4	103.3	102.3	103.1

Source: Data provided by the Ministry of Health (the number of outpatients) and the Annual Report (population)

As for the sterilisation volumes, a slight delay in treatment was discovered since one of the two large sterilisers procured in the project was not working properly. Despite this breakdown, the hospital has not faced any major troubles. Vaiola Hospital intends to replace the broken steriliser with a new one in FY2011 to avoid any situations where operations cannot be conducted due to a breakdown or malfunction of the other/remaining steriliser.

3.3.2 Qualitative Effects

The following points were listed as qualitative effects of the project.

(1) Pregnant women can be hospitalised prior to delivery, which was previously impossible due to the shortage of beds.
(2) Integration of scattered CSB functions improves the efficiency of medical care services.
(3) Installation of radiation-proof wall to the radiology room decreases the technicians' level of exposure to radioactive substances; upgrading of X-ray equipment enables more efficient and precise diagnoses.
(4) Clear distinction between contaminated and non-contaminated areas decreases the risk of infections in the hospital.

The number of beds in the obstetrics ward increased from 26 to 34, which enabled pregnant women to be hospitalised before the delivery according to their needs, but it still seemed that the number of beds was still not sufficient. The bed occupancy rate in the year of 2009 was 84%, four

[8] Numbers of patients with untreatable symptoms at Vaiola Hospital and transferred to other hospitals overseas were 36 in FY2007/08, 47 in FY2008/09, and 25 in FY2009/2010. Various medical care services are now being provided in Tonga.

months of which utilisation was over 100%. One of the reasons was the fact that 98% of pregnant women delivered their babies at hospitals in that year, which was the result of Tongan government's health policy to encourage hospital deliveries. In addition, there was an increase in the rate of pre-delivery health checks of pregnant women, which might be considered as a sign of improvement in the hospital's credibility and greater awareness of the importance of getting treatment at medical institutions.

As for the improved efficiency of medical services, positive comments from stakeholders were obtained: the integration of the inspection room, the radiology unit, and the operating theatres, which used to be in different buildings, into CSB promoted the operational efficiency; the radiology unit was widened with a newly-installed wall so that the safety of technicians is seen as having significantly improved. The beneficiary survey[9] showed that 72% of the respondents, comprised of doctors, nurses, and other staff felt that the treatment and X-ray inspections at the hospital were more effective.

Table 5: Change in the Effectiveness of Medical Services by Integrating Several Functions into One Building

[Question] Have medical treatments and X-ray inspections become more effective than before? (73 respondents)	Much more effective	More effective	Same	Not really improved	Worse
	13.7%	57.5%	23.3%	2.7%	2.7%

In order to reduce in-hospital infection risks, clean and contaminated zones are now clearly indicated, and the Infection Control Team was established internally to raise awareness of the relevant hospital staff. The beneficiary survey with the hospital staff has shown that 78% of the respondents recognised the reduction of such risks after the project. It should be stressed that it is not only the new facilities but also the establishment of Infection Control Team that contributed to the improvement of separating clean and dirty zones.

Photo 3: Signboard clearly indicating dirty and clean zones

Table 6: Change in the Awareness of the In-hospital Infection Risks

[Question] Has the reduction of the risk of 'in-hospital infection' been achieved through the separation of clean and contaminated zones in the operating theatre & CSSD? (77 respondents)	Achieved significantly	Achieved	Same	Not really achieved	Worse
	23.4%	54.5%	16.9%	3.9%	1.3%

[9] The beneficiary survey was conducted through questionnaires/interviews with doctors, nurses, and staff of the hospital, 79 in total, and 22 patients hospitalised both in the old and new wards. These individuals were asked about the facilities and equipment, improvement of medical services, utilization and maintenance of facilities and equipment, but some questions differed between hospital staff and ex-inpatients.

Based on the above results, this project has largely achieved its objectives, therefore its effectiveness is high.

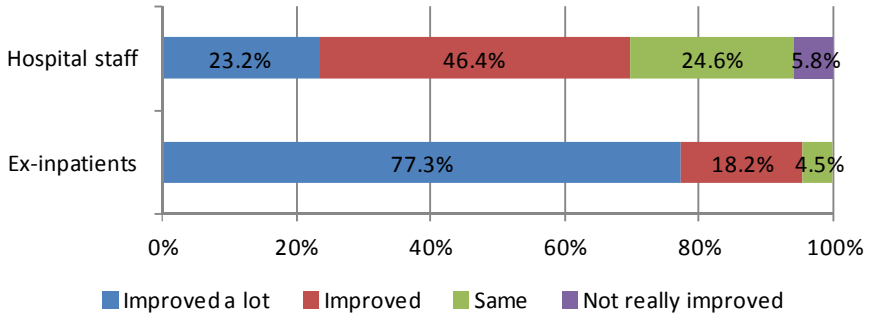
3.4 Impact

3.4.1 Intended Impacts

The improvement of facilities and equipment of Vaiola Hospital through this project was expected to contribute to an improvement of the hospital's credibility by reducing the risks of in-hospital infection, and a decrease in the infant and maternal mortality rates was also expected.

3.4.1.1 Improvement of the Hospital's Credibility

According to the interviews with the hospital staff, the credibility of the hospital seemed to have improved as a result of the awareness raising activities: the majority of the visitors are now visiting the inpatients during designated hours; they have also refrained from bringing in food for inpatients from outside the hospital. To the questions in the beneficiary survey on the credibility of Vaiola Hospital as the top referral hospital, 70% of hospital staff and 95% of ex-inpatients recognised the improvement. In comparison, while the hospital staff had a rather harsher overall evaluation, ex-inpatients showed greater trust of the hospital.



Note: Number of respondents: 69 hospital staff; 22 ex-inpatients.

Figure 1: Credibility of Vaiola Hospital

Furthermore, the patient satisfaction survey in 2009 (680 respondents) conducted by the hospital revealed that 94% of the respondents answered either "highly satisfied (84%)" or "satisfied (10%)" to the question on the degree of cleanliness and comfort at Vaiola Hospital. Almost all the patients indicated they approved of service quality, with 96% of respondents saying that they were "highly satisfied" and 2% saying "satisfied" to the question on the quality of the services received. Thus, it can be said that Vaiola Hospital has been evaluated very highly by patients.

3.4.1.2 Changes in Health Indicators

When this project was under planning, infant and maternal mortality rates were 9.8/1,000 and 78.2/100,000 people, respectively. These figures were expected to decrease as an indirect effect of the project. Table 7 summarises the changes of these indicators after the completion of the project, showing no improvement since the project planning period. The main reasons for this could be: 1) the original hygiene conditions may not have been serious enough to threaten human life; and 2) in a country with a small population size like Tonga, a small change in numbers can result in a large percentage-wise change (e.g. the actual number of maternal deaths annually since 2006 was 3, 1, 2, and 3).

Table 7: Changes in Infant and Maternal Mortality Rates and Peri-Natal Mortality Rate

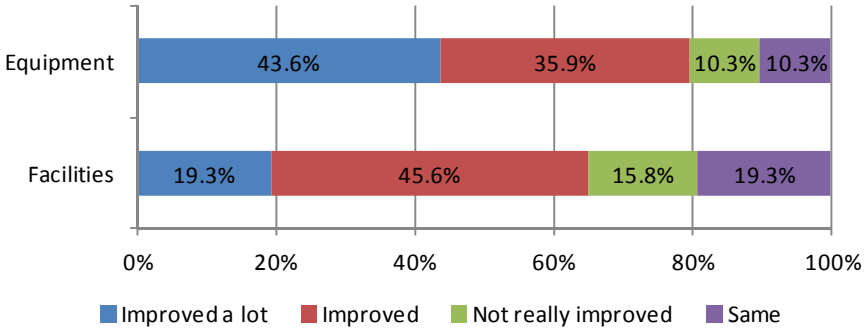
	2006	2007	2008	2009
Infant mortality rate (per 1,000 persons)	10.7	11.7	16.4	14.5
Maternal mortality rate (per 100,000 persons)	110.5	36.5	76.1	114.4
Peri-natal mortality rate (per 1,000 deliveries)	13.1	12.9	19.4	11.1

Source: Information provided by the Ministry of Health

The Ministry of Health places a greater value on the "peri-natal mortality rate (PNMR)," which measures the rate of any death of a fetus after 20 weeks of gestation and any death of a live-born baby within the first seven days of life, instead of the infant mortality rate, maintaining that the infant mortality rate measures the mortality of newborn babies up to one year old and it is not necessarily an appropriate index to measure the degree of improvement of obstetrical care. The PNMR was 24.0 in 1999, 16.9 in 2000, 18.5 in 2001, and 15.8 in 2002, but in recent years, it has been generally lower as shown in Table 7. Although there were annual fluctuations, this decrease has been realised by the improved medical care services and this project has been underpinning such improvement.

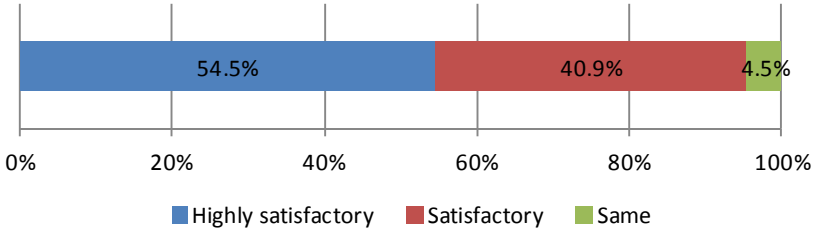
3.4.1.3 Evaluation of Upgrading of Facilities, Equipment and Medical Care Services

The beneficiary survey revealed that this project, with an aim of upgrading the facilities and equipment of Vaiola Hospital, was highly seen by the hospital staff as well as ex-inpatients. The major results are shown in the following graphs.



Note: Number of respondents: 78 for facilities; 57 for equipment

Figure 2: Level of Improvement of Facilities and Equipment (Hospital Staff)



Note: Number of respondents: 22

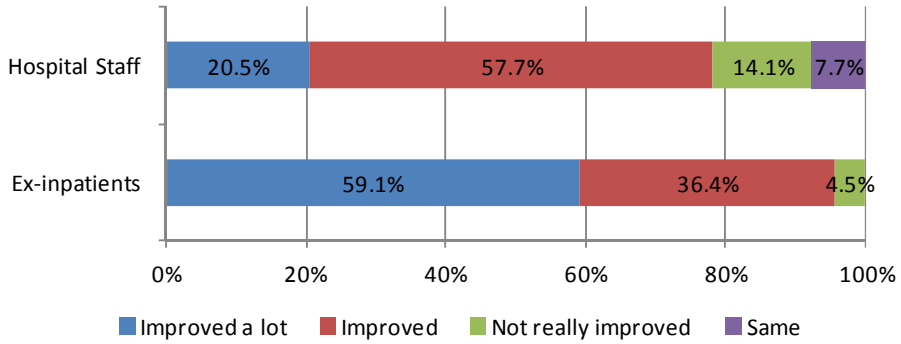
Figure 3: Satisfaction with the Improvement of Facilities and Equipment (Ex-inpatient)

While 79% and 65% of the hospital staff responded with "improved a lot" or "improved," for facilities and equipment, respectively, some indicated "same as before" or "not really improved." There were also some comments and requests for improvements related to functional failures of some facilities and poor maintenance of equipment. The primary reason for these harsher comments could be because of the amount of time hospital staff spend using the facilities and equipment.

On the other hand, ex-patients who were hospitalised or underwent operations in both the old and new facilities evaluated project changes more positively than the hospital staff. 95% of the respondents were satisfied with the improvement of the facilities and equipment, and 91% felt that the environments of the patient rooms, including cleanliness and hygiene conditions of the facilities, became better. All respondents stated that the medical equipment also had improved. Additional requests were often heard for improvements in air-circulation and cleaning of wet areas such as shower rooms and toilets.

Changes in the quality of medical care services were rated as "highly improved" or "improved" by 78% of hospital staff and 95% of patients. Additionally, "Project for Strengthening the Need-Based In-Service Training for Community Health Nurses," a technical

cooperation project of JICA, started in October 2010, is expected to contribute to further improvement of medical care services, in addition to infrastructure development.



Note: Number of respondents: 78 hospital staff; 22 ex-inpatients

Figure 4: Change in the Quality of Medical Care Services

3.4.2 Other Impacts

3.4.2.1 Impacts on the Natural Environment

During the planning of the project, the need for implementing an environmental impact assessment and getting an approval from the Ministry of Environment was pointed out; it was confirmed that such assessment was conducted and approved as planned. During the construction period, the Ministry staff regularly checked the waste disposal conditions as well as the impacts on the surrounding areas, and found no issues. At the ex-post evaluation, it was noted that hospital wastes were treated with sterilisers and taken to a waste disposal site by a waste transport vehicle owned by the hospital.

Waste water treatment had also improved by the introduction of closed septic tanks that prevented emissions of evaporated waste water into the air. After treatment, waste water was appropriately permeated into the ground. Overall, there has been a significant improvement in this area.

3.4.2.2 Land Acquisition and Resettlement

Vaiola Hospital's overall upgrading project including this project was supposed to build all facilities within the existing premises, and the facilities in this project were all constructed on the premises. Thus, there was no land acquisition or resettlement observed in the project.

3.4.2.3 Other Indirect Impacts

As stated above, Vaiola Hospital's entire upgrading and refurbishment project was divided

into four phases[10], based on the master plan developed with the WB's support. The first phase was implemented by the WB, followed by this JICA project as the second phase of the overall upgrading project. This project was implemented almost at the same time as WB's first phase project. As this project was the first one to concentrate on the clinical service building and ward buildings (WB's first phase was for surrounding facilities), design of the facilities under this project was taken over to the third phase (WB component)[11] and the fourth phase (currently being implemented as part of the second phase of the JICA project)[12]. During this process, measures including the upgrading of the piping network, renovation of window frames, and the installation of a wall protection material were taken to solve the minor issues carried over from the previous phases. The final fourth phase was ongoing at the time of ex-post evaluation and scheduled to be completed in March 2012.

Based on the above, this project has significantly improved medical care services provided by Vaiola Hospital as well as their environmental impacts, and also underpinned an improvement in the peri-natal mortality rate. Consequently, the improvement of Vaiola Hospital as the top referral hospital has been contributing to the enhancement of the health services environment in Tonga.

3.5 Sustainability (Rating:②)

3.5.1 Structural Aspects of Operation and Maintenance

The implementing agency of this project is the Ministry of Health. However, the Ministry of Health and Vaiola Hospital are not clearly divided; the heads of the diagnostic departments are doctors and nurses. At the time of ex-post evaluation, the hospital had 44 doctors, 328 nurses, 104 engineers, and 204 administration staff (680 in total).

[10] During the development phase of the master plan, the project was divided into six phases, but the construction work was divided into four phases.
[11] Construction of medical, paediatric, and psychiatric wards
[12] Construction of outpatient's ward, dental ward, and nurse school building etc. and procurement of medical equipment (see p.4 for details)

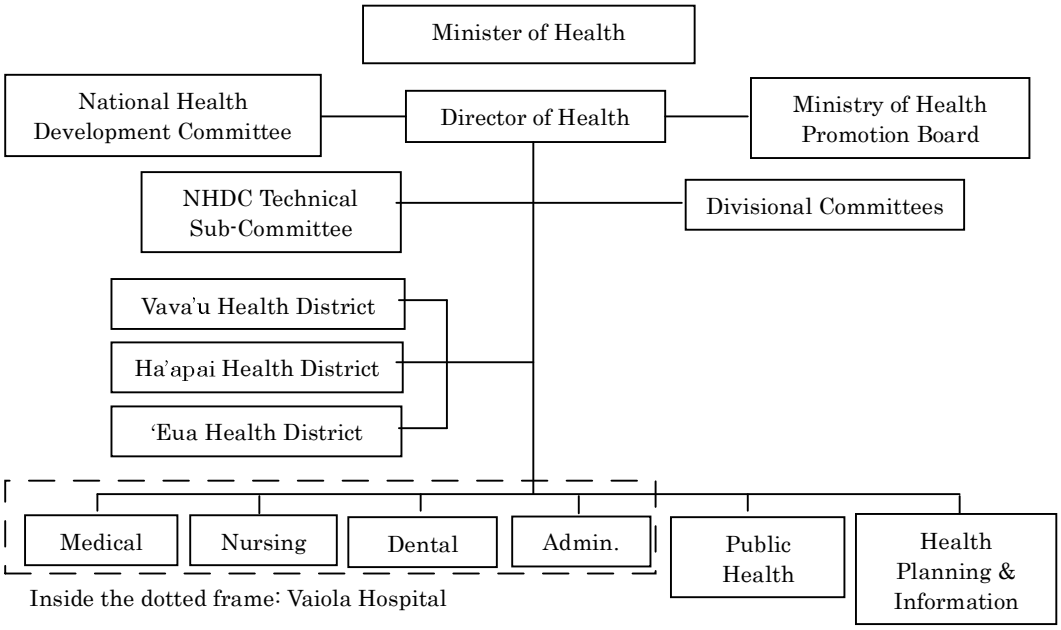


Figure 5: Organisational Structures of the Ministry of Health and Vaiola Hospital

Operation and maintenance of facilities and equipment are managed by the Maintenance Division (Biomedical, Electrical, Plumbing, Carpentry and Oxygen Plant) of the Administrative Department of Vaiola Hospital. This division is also in charge of the repairs of "Health Centres" located in various regions of the country. The basic role of this division has not changed since the planning phase till the ex-post evaluation period, but the number of staff has decreased from 18 during the planning phase to 9 at the time of ex-post evaluation. On the other hand, an asset management position was newly established and the Facilities and Equipment Committee, comprised of Director of Health and 13 other officials, was also established in March 2011 to appropriately manage the asset of the Ministry of Health through holding monthly meetings.

The number of staff in charge of operation and maintenance of the facilities has been continuously decreasing, and, in fact, the existing needs of diagnostic divisions have not been fully satisfied. Capacity development and securing enough human resources are considered to be the important factors. Simple tasks including cleaning are outsourced to private companies. The Committee is going to consider appropriate task allocations and the optimal number of staff.

3.5.2 Technical Aspects of Operation and Maintenance

There was no technical issue in operation and maintenance of the facilities in general. The elevator in CSB is regularly maintained by an outsourced company. As to the equipment, the know-how of the staff is not sufficient, particularly in that much time seemed to be needed to learn how to properly maintain biomedical equipment requiring special technical abilities or knowledge.

But, training or seminars on operation and maintenance have not been provided in a systematic way. In order to deal with the lack of skills, a JICA volunteer with expertise on biomedical equipment maintenance has been stationed at the hospital. Also, under the support of the Australian Agency for International Development (AusAID), an expert on biomedical equipment maintenance regularly visits Vaiola Hospital to instruct on how to repair the equipment and to introduce a maintenance management software.

3.5.3 Financial Aspects of Operation and Maintenance

Revenues from fees collected for hospitalisation or examination contribute to the budget of the Ministry of Health, but basically, as medical care and medicines have been traditionally free of charge, the majority of the budget is allocated by the government. Vaiola Hospital's recent expenses have been 76% to 95% of the total budget of the Ministry, representing the significance of the hospital in Tonga. The government enacted the following rules, "Health Services (Fees and Charges) (Amendment) Regulations 2008," which define health service charges. The Tongan government, however, is planning to collect medical charges for outpatient treatment and for medicines from individual patients to reduce the financial burden after the overall project for upgrading Vaiola Hospital is completed.

Table 8: Total Budget and Maintenance Budget of the Ministry of Health

(Unit: 1,000 Tongan Pa`anga)

Fiscal Year (Jul.-Jun.)	2006/07	2007/08	2008/09	2009/10
Budget of the Ministry of Health	20,170	17,761	21,580	21,375
(of which Vaiola Hospital's revenue)	(331)	(506)	(506)	(1,000)
(Health budget per person)	(0.196)	(0.174)	(0.210)	(0.207)
Maintenance budget	620	632	1,321	1,500
% of the total budget	3.1%	3.6%	6.1%	7.0%
Expenditure of Vaiola Hospital	17,909	16,873	18,408	16,313
% of the total budget	88.7%	95.0%	85.3%	76.3%

Source: Ministry of Health Annual Report and Information provided by Ministry of Health

When the overall support for the redevelopment of Vaiola Hospital was determined, there was an agreement with the WB to set the maintenance budget at 7% of the total health sector budget. As shown in Table 8, this level was achieved in the 2009/10 Budget. However, while the total amount is 7%, it also includes expenses for cleaning, etc. and the amount allocated to the maintenance division still remains less than 1%. When the fourth phase (the second JICA project) is completed, the number of facilities and equipment will increase and the importance of maintenance will be even higher. Thus, the maintenance budget should be appropriately secured and allocated. As stated above, the individual payment system of medical expenses is planned to be introduced. Therefore, it is important for the Facilities and Equipment Committee to develop a maintenance plan; based on this plan, the budget will need to be secured and allocated appropriately, and the spending process

will also need to be streamlined.

3.5.4 Current Status of Operation and Maintenance

During the field study visits for the ex-post evaluation survey, it was found that the environment and functions of the surgical ward, obstetrics ward, and CSB were improved and generally maintained in good condition. Major equipment checked during the limited time was also well utilised; some of the equipment that had broken down, such as air-conditioners, were replaced.

On the other hand, the following major issues were found.

- Large steriliser: One of the two large sterilisers provided under this project was not working and the remaining machine was being overused. The broken steriliser will be replaced under JICA's follow-up scheme in FY2011.
- Special Care Nursery: The nursery environment had degraded because of plumping troubles. These troubles were scheduled to be repaired also under JICA's follow-up project in FY2011.
- Rainwater gutters: Gutters and fixings were rusty because different metal materials were used. Regular repainting to prevent rust is necessary.

The replacement of the large steriliser and the repair of Special Care Nursery will be properly handled under consultations between the Ministry of Health and JICA.

Some equipment seemed poorly utilised because of the delays in parts procurement or the lack of skills to repair them internally, resulting in waits for visits by an external expert in fixing biomedical equipment. From the viewpoints of the limitations and the effective use of the budget, orders cannot be placed in advance as the parts are different for each type of equipment. And, in particular, the shipping time is longer when these parts need to be ordered from Japan.

In order to solve these problems, it is important to develop a maintenance plan at an early stage, to check or repair equipment in a preventive manner based on the plan, to secure a flexible budget to enable repairs in a short time, and to develop human resources to identify the problems internally. The Facilities and Equipment Committee, comprised of high-ranked officials including Director of Health, is expected to play an important role in the development and effective implementation of the maintenance plan.

Based on the above, some problems have been observed in terms of maintenance techniques and conditions, therefore sustainability of the project effect is fair.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

The Government of Tonga is aiming to improve medical care services in the country as a national policy. This project to support the upgrading and refurbishment of Vaiola Hospital, the only hospital

providing advanced medical care services in the Kingdom of Tonga, is consistent with such policy. As for project implementation, in spite of slight changes, the outputs, the cost and the period of the project were in line with the original plan. Although the achievement levels were lower than initially targeted figures, domestic demand for medical care services was fully met and these services generally became more effective and safer, resulting in improved credibility and higher satisfaction in regard to the hospital. With respect to sustainability, while steady progress has been made in institutional strengthening and the O&M budget, there are still some issues to be tackled in terms of technical skill levels and human resources in the maintenance division.

In light of the above, this project is evaluated to be highly satisfactory.

4.2 Recommendations

4.2.1 Recommendations to the Implementing Agency

The Ministry of Health / Vaiola Hospital has been trying to improve its facilities and equipment maintenance through institutional strengthening by establishing a post in charge of asset management and the Facilities and Equipment Committee, and increasing in the maintenance budget to 7% of the Ministry's budget. The maintenance division itself, however, still seemed to be lacking in the necessary number of workers and relevant skills. In particular, no staff members with high skills or advanced knowledge on biomedical equipment have been assigned. Inappropriate repairs may threaten human lives; if no qualified agents exist within the country, it would be necessary to secure a technician with specialised knowledge of biomedical equipment and the ability to make appropriate judgements in identifying the statuses of break-downs and sending such equipment out to the original manufacturers for repair. While there is an issue that people tend to emigrate overseas when they get skills, continuous development of human resources is needed.

Specific actions are being taken for this purpose like the starting of a programme for inviting a biomedical engineer to Tonga for two years, and dispatching Tongans to a biomedical engineering institute in Australia for long-term training in order to develop an O&M system with support from Australia. As these programmes can be of great value in increasing the effectiveness of this project, it is hoped that they will be carried out as planned.

4.2.2 Recommendations to JICA

The Vaiola Hospital is the only hospital capable of providing advanced medical care services in Tonga. Therefore, preserving the level of its medical care services is a very fundamental challenge for the country. Accordingly, appropriate maintenance of facilities and equipment upgraded under this project and continuous cooperation are very important. At present, cooperation by an expert on the management of biomedical equipment is ongoing with AusAID's support, and is expected to continue for some time. On the other hand, staff training on how to handle/maintain facility-related equipment including biomedical devices is needed. Therefore, further technical assistance in cooperation with qualified experts will be beneficial.

4.3 Lessons Learned

4.3.1 Development and Implementation of Maintenance Plan

In the middle of 2000s, when a senior volunteer expert on biomedical equipment was dispatched from Japan, Vaiola Hospital was regularly holding meetings on the maintenance of facilities and equipment. Such meetings are thought to be effective in preventing equipment malfunction to a certain extent through the creation a maintenance plan, checking the equipment regularly, and training for nurses on how to handle the equipment. When implementing similar projects, it may be useful to put intensive efforts in conducting trainings on equipment maintenance to all staff members, along with the provision of equipment.

4.3.2 Coordination Among Each Phase of the Overall Project

This project constitutes a part (the second phase) of the master plan for upgrading the entire Vaiola Hospital.

Major development partners are the WB and JICA who undertook each phase in turn, and issues identified in previous phases were considered in the following phases. Some examples include an improvement in the plumbing network, remodelling of the window frames, and the installation of protective materials on the wall of the corridor. These outcomes are the fruits of efforts made by the Ministry of Health. Even though this project involved multiple support organizations, consultants, and contractors over a long period of time, the implementing agency coordinated each phase, and realised the actualisation of comfortable, effective, and durable facilities. In the final phase, which was under implementation at the time of ex-post evaluation, issues found in the previous phases were being considered and solutions put into action.

Samoa

Ex-Post Evaluation of Japanese ODA Grant Aid Project

"The Project for Upgrading and Extension of Samoa Polytechnic"

External Evaluator: Keisuke Nishikawa

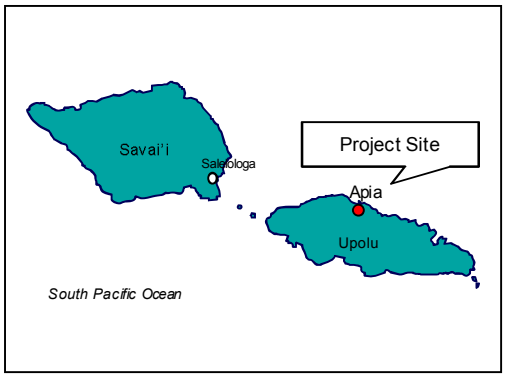
Ernst & Young Advisory Co., Ltd.

0. Summary

The Institute of Technology (IoT) of the National University of Samoa (NUS), formerly known as Samoa Polytechnic (SP) and whose facilities were upgraded under this project, plays an important role in producing graduates necessary for the development of the Samoan economy as this country's only tertiary level technical & vocational education and training institute. This project supported the improvement of deteriorating facilities and replacement of equipment and was consistent with the country's policy to develop human resources equipped with vocational skills capable of meeting the demands of the business community. While the project output changed slightly from its original scope, both project cost and period were within the original plan. With regard to the effectiveness of the project, some improvement is desirable in terms of reversing the decline in student enrolment in some programmes of the School of Engineering and also in encouraging greater cooperation and interaction with the private sector. However, it was also observed that the staff and students of NUS are largely satisfied with the quality of facilities and equipment as well as that of the education provided. Regarding sustainability of the project, while there are no issues on the organisational structure and technical skills, a lack of maintenance management plan and a shortage of funds to fully support an operation and maintenance budget due to the university's operating deficit could be a future concern.

In light of the above, this project is evaluated to be satisfactory.

1. Project Description



Project Location

Workshop – School of Engineering

1.1 Background

Samoa Polytechnic[1], the only tertiary technical & vocational education and training (TVET) institute in Samoa, consisted of the following three schools: Technology, Commerce & General Studies,[2] and Maritime. There were approximately 500 students enrolled and it was producing some 260 specialists and technicians annually to the public and private sectors in the country. Also, SP had established the Industry Advisory Panel (IAP) in order to incorporate the needs of businesses into their training courses, and was trying to modernise the contents of those courses by soliciting expert advice as necessary. However, as it had been 30 years since the SP facilities were first built, they had deteriorated and school's equipment had also become obsolete and was insufficient, making it difficult to provide an education and training appropriate for meeting the demands of the country's industries.

Moreover, an upgrading of SP was urgently needed in light of the planned merger between SP and the former NUS as part of the consolidation of Samoa's tertiary educational institutes led by the Government of Samoa.

Under these circumstances, developing the training facilities of the Schools of Technology, and Commerce & General Studies (located adjacent to the NUS Campus), in addition to an administration building in consideration of the planned merger with NUS, was viewed as necessary, as well as procuring the proper equipment needed for these facilities.

1.2 Project Outline

The objective of this project was to develop and strengthen human resources both qualitatively and quantitatively by newly constructing and rehabilitating TVET facilities as well as procuring training equipment at Samoa Polytechnic.

Grant Limit / Actual Grant Amount	1,625 million yen / 1,625 million yen (902 million yen (Phase I), 723 million yen (Phase II)
Exchange of Notes Date	11 August, 2004 (Phase I) 14 July, 2005 (Phase II)
Implementing Agency	Ministry of Education, Sports & Culture and Samoa Polytechnic
Project Completion Date	17 February, 2006 (Phase I)

[1] It became part of the university after the merger with NUS, and the name was also changed to National University of Samoa – Institute of Technology (NUS-IoT).
[2] School of Technology has been renamed as School of Engineering, and School of Commerce & General Studies is now called School of Business & General Studies.

		27 October, 2006 (Phase II)
Main Contractor	Construction	Kitano Construction Corp.
	Procurement	NBK Corporation
Main Consultant		Yamashita Sekkei Inc.
Basic Design Study		November, 2003 – May, 2004
Related Projects		[Technical Cooperation[3]] Strengthening Technical and Vocational Education Development in Samoa (2006 – 2008) Follow-up Project for S-TVET (2010) [Projects by Other Organisations] AusAID (Australia): Australia-Pacific Technical College Project (2007 – 2011 (Phase I), 2011 – 2015 (Phase II)), etc.

2. Outline of the Evaluation Study

2.1 External Evaluator

Keisuke Nishikawa (Ernst & Young Advisory Co., Ltd.)

2.2 Duration of Evaluation Study

Duration of the Study: November, 2010 – November, 2011

Duration of the Field Study: 9 – 21 April, 2011, and 19 – 23 June, 2011

3. Results of the Evaluation (Overall Rating: B[4])

3.1 Relevance (Rating: ③[5])

3.1.1 Relevance with the Development Plan of Samoa

At the time of project planning, "Strategy for the Development of Samoa 2002-2004", the country's development plan, spelled out nine strategic outcomes to improve its economy and social wellbeing, in which the second outcome was to 'Improve Education Standards'. Key strategies under this outcome had the focus on improving:

i) Teacher training standards and quality of teachers

[3] With the need to increase the number of highly-skilled workers in Samoan industries, these technical cooperation projects aimed at strengthening the management system of NUS-IoT so that graduates with skills matching the needs of the industries will be produced. The project was implemented for two years from 2006 to 2008 with the objectives of enhancing cooperation with businesses, strengthening capacity of NUS-IoT and SATVETI (Samoa Association of Technical and Vocational Education and Training Institutes), and properly managing and maintaining facilities and machinery. Also, a short-term expert was dispatched in 2010 (March – November) in its follow-up project.

[4] A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

[5] ③: High, ②: Fair, ①Low

ii) Curriculum and teaching materials
iii) Educational facilities
iv) Coordination between private and public stakeholders
v) Department of Education (DOE) management

In the third strategy, 'to improve education facilities', it was clearly stated that assistance was being sought for the upgrade of Samoa Polytechnic campus. During the same period, a merger of SP and NUS was being planned in 2006 in order to rationalise and enhance Samoa's tertiary education institutes, to establish an effective teaching environment, and to facilitate interaction with the private sector. As a result of this merger, SP was to become part of NUS and to be named NUS-IoT (National University of Samoa – Institute of Technology).

Under the current national development strategy "Strategy for the Development of Samoa 2008-2012", the 'Priority Area 2: Social Policies' also recognises the importance of improving education outcomes as one of the goals. In the sectoral policy of "Strategic Policies and Plan: July 2006 – June 2015', an improvement of adult literacy and access to the skills and continuing education for adults and youth is deemed essential and one of the visions shows the need of quality technical, vocational and applied educational programmes to enable people to be gainfully employed in order to meet the skills requirements of industry and commerce in Samoa. NUS-IoT is positioned as the main technical and vocational institute for this purpose.

In this context, the importance of education, including vocational education, has been high in Samoa's development strategies. Policies have clearly stated the necessity for the improvement of facilities at SP as the only tertiary TVET institute at the time of project planning. Policies at the time of ex-post evaluation also recognise NUS-IoT as the institute playing a central role in Samoa's vocational education. Therefore, it can be concluded that this project has been consistent with the national policies as it contributed to the improvement of facilities that have a key role in the country's technical and vocational education and training.

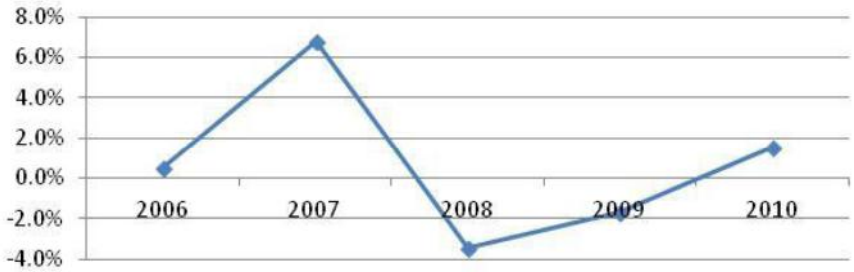
3.1.2 Relevance with the Development Needs of Samoa

SP had been producing specialists and technicians, trained in the respective programmes at School of Technology, School of Commerce and General Studies and School of Maritime, to the public and private sectors in the country. While SP had a crucial role for the economic development of Samoa, most of the facilities had deteriorated as they were more than 30 years old and equipment was also lacking, leading to difficulties in educating and training students effectively.

While the Samoan economy temporarily recorded negative growth due to the global

financial crisis in 2008 and also to tsunami damage in 2009, it was basically growing steadily in the 2000s, which contributed to the steady demand for technicians who could support economic activities. Also, a strong demand for skilled labour was observed due to social factors, e.g., an increase in the number of tradesmen needed during the reconstruction period after the tsunami, and for preparation after the traffic law was changed from driving on the right-hand side to driving on the left.

Tourism is identified as a priority development area by the government. NUS-IoT is playing a vital role in this regard as the students trained at NUS-IoT have acquired basic knowledge to support the tourism and hospitality industry when they graduate, and this should be a big advantage for potential employers. In addition, some of the hotels are training their staff at NUS-IoT to help brush up their skills.



Source: Samoa Bureau of Statistics

Figure 1: GDP Growth Rate

Therefore, with the growing economic activities centred around the tourism industry, etc., needs for skilled labour with vocational training are generally seen as high both during the project implementation phase and the post-project period. It can be said that NUS-IoT has played a big role both at the time of project planning and also at the time of ex-post evaluation.

3.1.3 Relevance with Japan's ODA Policy

In "The Okinawa Initiative: Regional Development Strategy for a More Prosperous and Safer Pacific" adopted at the Third Pacific Leaders Summit Between Japan and Member of the Pacific Island Forum held in May 2003, Japan expressed five priority policy targets for cooperation in the Pacific – Enhanced Security in the Pacific Region, A Safer and More Sustainable Environment, Improved Education and Human Resources Development, Better Health, and More Robust and Sustained Trade and Economic Growth. Based on these policy targets, Japan identified priorities for Samoa in the following five areas: (1) Human Resource Development (with reference to the

TVET institute), (2) Environment Conservation, (3) Development of Economic Infrastructure, (4) Healthcare Improvement and (5) Promotion of Agriculture and Fisheries. Consistency with Japan's assistance policy at that time can be observed as this project corresponds to target area (1).

Also, the development of facilities and equipment in tertiary education is an area in which only Japan was providing cooperation[6] and no duplication with other development partners was observed.

This project has been highly relevant with the country's development plan, development needs, as well as Japan's ODA policy, therefore its relevance is high.

3.2 Efficiency (Rating: ③)

3.2.1 Project Outputs

This project involved the construction of new facilities for the School of Technology and the School of Commerce & General Studies, and an administration building for the entire post-merger NUS, in addition to the renovation of existing facilities. The project period was divided into Phase I (August 2004 – February 2006) and Phase II (July 2005 – October 2006). A comparison of items to be developed and the final output is shown in Tables 1 and 2 below.

Table 1: Comparison of Original Plan and Actual Output (Facilities)

Main Facility	Area Planned (m^2)	Actual Output		Remarks
		Area Constructed (m^2)	Details of Construction	
School of Technology	3,513	3,069	Workshop B, C, D, E	In addition, a pump house, corridors (outside) and a guard room, etc. were constructed as planned. A design change with a reduction of 445.89m^2 was made to the Workshops.
School of Commerce & General Studies	1,567	1,565	LL/PC Labs, Lecture Rooms, Drawing Room, Tourism & Hospitality Building	
Administration	840	840		
Renovation of Existing Buildings	1,627	1,627	Including a demolition work of 484.58m^2	
TOTAL	**7,547**	**7,101**		

[6] Development of the campus of the former NUS, which merged with SP and is now called NUS-IHE: Institute of Higher Education, was implemented as 'The Project for Upgrading of the National University of Samoa (Grant Aid project)' in 1995-1996.

Table 2: Comparison of Original Plan and Actual Output (Equipment)

Facility	Original Plan	Actual Output
School of Technology	Brake speedometer tester, MIG/MAG welder, Thickness planer, Wood lathe, Electronic block system, Kit cool/freeze room, Tractor & trailer, Lathe machine, Universal milling machine, Profile cutting machine, Cut-off machine, Logic analyser, Digital oscilloscope	Brake speedometer tester, MIG/MAG welder, Thickness planer, Wood lathe, Electronic block system, Kit cool/freeze room, Tractor & trailer, Lathe machine, Universal milling machine, Profile cutting machine, Cut-off machine, Logic analyser, Digital oscilloscope
School of Commerce & General Studies	Desktop computer, Laptop computer, Desks & chairs for training, Electric typewriter, Drawing board set with drafter, LL control station, Overhead projector, Iron press machine	Desktop computer, Laptop computer, Desks & chairs for training, Electric typewriter, Drawing board set with drafter, LL control station, Overhead projector, Iron press machine
Administration	Photocopier machine, Shredder, Desktop computer, Filing cabinet, Meeting desks & chairs, Guillotine, Binding machine	Photocopier machine, Shredder, Desktop computer, Filing cabinet, Meeting desks & chairs, Guillotine, Binding machine

The facilities were generally developed as planned, except the buildings for the School of Technology. In order to avoid excessive heat, these facilities were designed to ensure improved heat insulation capacity, deeper eaves, higher floor height, adjusted incident sunlight, and better ventilation. After the detailed design survey, there was a design change for these buildings, and their floor area was reduced by 13%. This change was discussed and approved among the people concerned and interviews with the implementing agency have revealed that the reduction has not caused any operational problems.

With regard to the equipment, it was confirmed in the survey that the major machines called for in the basic design study were actually procured during the project. All major equipment was confirmed as shown in Table 2 and in operation, including some machines whose parts were replaced after breakdowns.

In this project, in addition to the development of facilities and the procurement of equipment, technical assistance (86 days) by two experts was provided in order to improve the capabilities and standard techniques for maintaining the equipment. As a result of this technical assistance, a codebook that could also be used as an inventory book was created through the use of an asset management software called Catsoft. In 2010, this codebook was integrated with the asset management software of NUS-IHE into a new management software, called Attache.

Planning also called for the Government of Samoa to undertake outdoor works such as gardening and fencing, and provide facilities for distribution of electricity, telephone line, water supply, and so on. These works were all implemented as planned and an environmental impact assessment for this project was also conducted, in which no environmental issues were identified.

Photo 1: Automotive Programme Workshop

Photo 2: PC Laboratory

3.2.2 Project Inputs

3.2.2.1 Project Cost

The maximum project cost in the Exchange of Notes was set at 1,625 million yen and the actual project cost totalled 1,625 million yen (100% of the original plan). The cost of the entire project including that incurred by the Samoan government was estimated at 1,657 million yen, but it was difficult to compare the total project costs as the actual disbursement record of the Samoan government was not available. By considering the outdoor works and the installation of electricity, telephone line and water supply implemented, it is estimated that the Samoan side also disbursed its portion of the planned project cost.

3.2.2.2 Project Period

The period of this project[7] comprised of two phases. As Phase I included the detailed designing of Phase II components, Phase II involved only the tendering and construction processes. Therefore the original and actual periods can be compared as shown in Table 3 below.

Table 3: Comparison of Original and Actual Project Periods

		Original	Actual
Phase I	Detailed Design (Phase I + Phase II) Tendering	} 7 months	3 months (Sep. to Dec. 2004) 3 months (Jan. to Mar. 2005)
	Construction	12 months	11 months (Mar. 2005 to Feb. 2006)
Phase II	Tendering Construction	3 months 12 months	3 months (Aug. to Nov. 2005) 11 months (Dec. 2005 to Oct. 2006)
	Technical Assistance	1.5 months	1.5 months (Apr. to Jun. 2006) * Implemented in parallel with Phase II

[7] The project period can be defined as "Detailed Design and Tendering + Construction" period.

Phase I was completed in 17 months, 89% of the original plan of 19 months, and Phase II was completed in 14 months, 93% of the original plan of 15 months. As a result, the entire project period was 31 months, 91% of the period originally planned.

The technical assistance component, implemented in parallel with the construction of Phase II components, was conducted in 1.5 months as planned. Seen by sub-phases, there were no delays in either of the design or tendering processes, and also the construction periods were one month shorter in their respective phases, contributing to the punctual implementation of the entire project.

Both the project cost and project period were within the plan, therefore efficiency of the project is high.

3.3 Effectiveness[8] (Rating:②)

3.3.1 Quantitative Effects

At the time of planning, it was anticipated that the number of students graduating with certificates and diplomas from the School of Technology and the School of Commerce & General Studies would increase as a result of the project.

Table 4: Quantitative Indicators Before and After the Project

(Unit: Person)

	Original Plan		Actual Figures (At Ex-Post Evaluation)				
	Actual (2003)	Target (2010)	2006 (Completed)	2007	2008	2009	2010
School of Technology (School of Engineering at present)	106	225	272	256	224	161	198
School of Commerce & General Studies (School of Business & General Studies at present)	107	180	262	267	270	310	338

Source: Data provided by NUS

The School of Business & General Studies steadily increased the number of graduates to 188% of the target in 2010, particularly due to the increasing number of students in the tourism & hospitality programme backed by the growth of the tourism industry. On the other hand, while the number at the School of Engineering was already larger than the target figure when the project was completed in 2006, it dropped significantly after that to 59% of the 2006 level in 2009. In 2010 (target year), the number stood at 88% of the

[8] The evaluation result of the project impacts is incorporated into the Effectiveness rating.

original target. One of the major factors for this recent decrease was identified in the follow-up project (implemented in 2010), the "Strengthening Technical and Vocational Education Development Project". It found that secondary school students have a negative image of engineering subjects. Another factor could be a lack of secondary school visits by NUS-IoT in recent years (to introduce the programmes by visiting each school in person) though this activity had been done before SP merged with NUS. A closer look into the School of Engineering indicates that the number of students has decreased remarkably in some of the programmes such as Welding & Fabrication and Plumbing & Sheetmetal, leading to the overall decrease. As the related industrial sectors do not have attractive employment prospects and job opportunities are scarce, students are seen as being reluctant to enter programmes catering to these sectors. By contrast, some other programmes such as the Automotive Engineering, Construction & Joinery and Radio & Electronics have sufficient student numbers due to the robust demand in the private sector.

In the beneficiary survey[9] with the NUS-IoT students, a question was asked on whether they thought it would be easier for them to find jobs after completing their programmes. 23% of the students were negative and 43% replied they were uncertain. The main reasons for such answers are that few job opportunities exist in the small market except for some industries and there is strong competition among graduates. Judging from these answers by the students, prospects for job opportunities available after studying at NUS-IoT are ambiguous, which implies some difficulties in securing sufficient number of students for academic areas related to stagnant industrial sectors.

Table 5: Employability Survey

[Question] Do you think that the graduates from NUS-IoT will find it easier 'than the past students) to get jobs in the local economy? (79 respondents)	Yes	No	Not Sure
	34.2%	22.8%	43.0%

⇩ Reasons

Strong competition among graduates	Few job opportunities in a small market	Skills not matching market needs	Many students being attracted to go overseas	Other
25.7%	37.1%	11.4%	14.3%	14.3%

3.3.2 Qualitative Effects

At the time of planning, the following points were expected as qualitative effects of the project.

[9] The beneficiary survey was conducted through questionnaires with 79 students and 50 staff of NUS-IoT. These individuals were asked about the improvement and utilisation of facilities and equipment, improvement in the quality of education, maintenance of facilities and equipment, and the levels of satisfaction. Some questions differed between the students and the staff.

(1) Replacement or renovation of training facilities and equipment at SP, which will improve the training environments
(2) Possible to offer training curricula matching the needs of the local businesses
(3) Training of professionals and experts required in the private sector and governmental organisations will be possible
(4) Provision of barrier-free facilities will create an environment whereby the disabled can participate in vocational training courses and use the facilities

It was observed that formerly deteriorated facilities were now larger and sturdier, and that the workshop equipment was also appropriately located. These improvements are welcomed by the staff and the students, as shown in the beneficiary survey where nearly 90% of the staff reported that the facilities 'Improved a lot' or 'Improved', and approximately 80% of the staff feel the same in regard to the equipment. In addition, more than 70% of the students responded that the facilities and equipment were 'Very good' or 'Good'. Therefore, it can be concluded that the training environments have been improved and currently enjoy generally good reputations.

Table 6: Assessment of Improvement in Facilities and Equipment (Staff)

[Question] What do you think about the facilities and equipment built and installed under the project, compared to what they were like before the project?		Improved a lot	Improved	Same	Worse	A lot worse
	Facilities (49 respondents)	38.8%	49.0%	8.2%	4.1%	0.0%
	Equipment (36 respondents)	11.1%	69.4%	13.9%	5.6%	0.0%

Table 7: Assessment of Facilities (Student)

[Question] What do you think about the NUS-IoT facilities built under the project? (76 respondents)	Very good	Good	Same	Bad	Very bad
	21.1%	52.6%	13.2%	5.3%	7.9%

With regard to the development of human resources that would contribute to the private and public sectors, industry bodies such as the Samoa Chamber of Commerce & Industry and the Samoa Association of Manufacturers and Exporters are positive in their evaluation of the basic knowledge and skills possessed by NUS-IoT graduates and also with the overall contribution of NUS-IoT to business development as graduates are now working for a number of companies including Yazaki EDS Samoa, the country's largest employer in the private sector. Further, there is an apprenticeship scheme

promoted by the Ministry of Commerce, Industry and Labour, to enable workers with several years' private sector experience to study at NUS-IoT to get a theory-based education. This can be regarded as an effort to develop overall human resources. On the other hand, however, insufficient aspects were also observed in terms of regular cooperation with the business community. After the activities of the Industry Advisory Panel (IAP)[10], strengthened in JICA's technical cooperation project "Strengthening Technical and Vocational Education Development in Samoa (2006 – 2008)" and the subsequent follow-up project in 2010, were completed, there has not been any major progress made on those activities. They appeared stagnant at the time of ex-post evaluation. Both groups of stakeholders recognise that, in addition to information exchanges and cooperation, industrial technical standards have yet to be introduced, which would help with identifying technical training needs. Therefore, it is desirable that efforts made during the technical cooperation projects are pursued further by these parties.

With regard to the realisation of barrier-free environment, there did not seem to have been any students experiencing difficulties moving around the campus. But, it is beneficial to have incorporated designs making it easier to move between the facilities, which are built on a sloping land, should there be any person requiring such barrier-free facilities.

Based on the above results, this project has somewhat achieved its objectives, therefore its effectiveness is fair.

3.4 Impact

3.4.1 Intended Impacts

An indirect effect of this project was expected to be the industrial development by qualitatively and quantitatively improving vocational education and training at SP through the development of facilities and equipment.

It was revealed through the beneficiary survey of the students that the quality of education and training is evaluated fairly highly. Three quarters of students answered 'Highly adequate' or 'Adequate' to the question on whether the quality of education/training is adequate with the new facilities and equipment (Figure 1), and also 80% of them offered positive feedback regarding the direct application of the subjects learned at NUS-IoT to their actual work conditions (Figure 2).

[10] A committee, established during the SP period, to exchange information between SP and the industry groups so that the needs of the private sector can be reflected in the curriculum

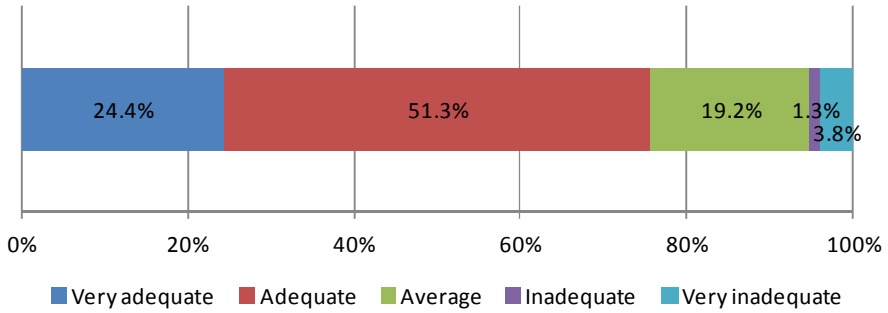


Figure 1: Adequacy of the Quality of Education after the Project (78 responses)

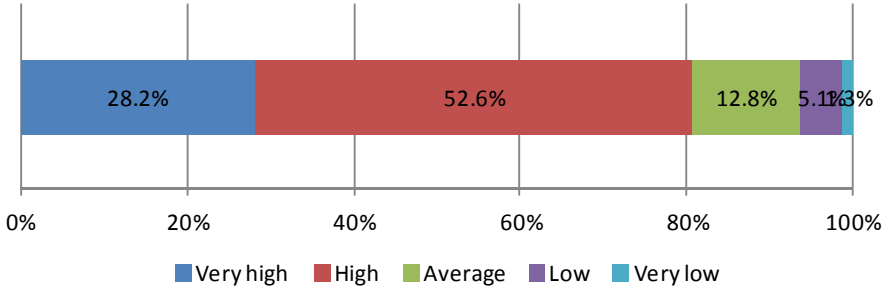


Figure 2: Direct Applicability of the Subjects Learned at NUS-IoT (78 responses)

Seen on a macro-level perspective, industrial sectors closely related to NUS-IoT are construction, electricity and water, and hotels and restaurants, etc., representing 12.4%, 5.1% and 3.2% of GDP (2010), respectively. These industries led the recent growth of the Samoan economy, as shown in Table 8. While there are no data exhibiting the extent of the contribution that graduates are making to the economy, it is presumed that the graduates from NUS-IoT, the top-level TVET institute in Samoa, have underpinned part of the growth of these industries as a significant number of technicians and experts are needed.

The tracer survey of the 2002-2006 graduates, conducted under JICA's technical cooperation project mentioned above, the only survey of this kind, showed that the employment rate of those graduates was as high as 87.2%.

Table 8: GDP Growth by Industry (2006 to 2010)

Industry	Construction	Electricity/Water	Hotel/Restaurant	All Industries
GDP Growth Rate (%)	11.6	14.9	4.3	2.5

Source: Samoa Bureau of Statistics

3.4.2 Other Impacts

3.4.2.1 Impacts on the Natural Environment

During the planning phase, no problems were anticipated as no hazardous wastes would be produced and the discharged water would be permeated into the ground after treatment. No negative impacts on the natural environment were observed in the ex-post evaluation survey.

As to the classrooms and workshops of each programme, it was seen necessary to dispose waste oil such as engine oil from the Automotive programme. Appropriate treatment / disposal by putting it into drums was confirmed. However, in the Panel Beating & Spray Painting programme, painting work was being conducted with the shutters and doors open without any special measures – there were no special facilities such as a closed spray room. An immediate measure seems urgent as not only the impacts around the building but also the long-term health effects on the operators are thought to be major concerns.

3.4.2.2 Land Acquisition and Resettlement

All the facilities were built within the existing premises and neither resettlement nor land acquisition was observed in this project.

3.4.2.3 Other Indirect Impacts

After the implementation of this project, two projects on human resource development on TVET in Samoa were carried out at NUS-IoT. One is aforementioned technical cooperation project "Strengthening Technical and Vocational Education Development in Samoa (2006 – 2008)" by JICA, and the other is an AusAID project "Australia – Pacific Technical College Project (2007 – 2011 (Phase I), 2011 – 2015 (Phase II))". The JICA-assisted project was implemented between 2006 and 2008 with an aim to strengthen cooperation with the business community, to enhance the capabilities of the staff of NUS-IoT and the members of the Samoa Association of Technical-Vocational Education and Training Institutions (SATVETI), as well as to better manage and maintain facilities and equipment. Under the last aim, efforts were made in improving the asset management system. Furthermore, the Follow-up Project for the above technical cooperation project was also implemented, leading to the integration of the asset management systems of NUS-IHE and NUS-IoT.

One aspect of the technical cooperation project was establishing the effective use of facilities and equipment, and the proper operation and maintenance structure. In this sense, the grant aid and the technical cooperation projects have a certain level of

synergetic effects through a series of implementations. Nevertheless, as mentioned above, cooperation with the industries through IAP activities has been weak and, as mentioned later, the asset management system has been insufficient in terms of actual operation. It is therefore necessary to reinforce self-help efforts on a continuous basis.

In addition to the cooperation by JICA, the Australian government has been implementing a TVET programme at a tertiary level since 2007 by setting up the Australia-Pacific Technical College (APTC) in four countries in the Pacific including Samoa[11]. This programme makes the best use of the NUS-IoT facilities and has also constructed two additional buildings of their own (administrative and training buildings) on campus, where they are running the courses similar to those of NUS-IoT. The main difference is that the curricula offered at APTC are higher than the ones at NUS-IoT, and the qualifications given upon completion can also be recognised in Australia[12].

A number of NUS-IoT graduates and staff members are taking APTC programmes. It is expected that their skills will be improved by taking the lectures and practical training at a higher level, and the programmes will become highly effective for the industries in the long run. In many of the Pacific Island states, emigration of highly skilled workers is often seen as a problem, but according to the manager at APTC Samoa, there is little evidence of skilled workers who completed the APTC programmes migrating overseas for employment by utilising their newly acquired skills and qualifications. It will be important to continuously generate employment in Samoa so that an optimal number of skilled persons will stay in the country.

In operating the APTC programmes, while there was a period when APTC and NUS needed to adjust the allocation of time slots for using the facilities, APTC has financially been contributing to NUS through the payment of facility usage fees since 2008. Additionally, some items such as kitchen instruments in the Tourism & Hospitality building have been renewed with APTC funding, representing indirect effects even in terms of equipment.

As described above, NUS-IoT as the only tertiary TVET institute in Samoa has been underpinning the country's economic growth by giving students a level of skills and knowledge required by the industries. In addition, some other projects were/have been implemented, leading to the enhancement of the effects of this project. Despite the need for strengthening cooperation with the private sector, NUS-IoT is

[11] The Phase I ended in June 2006 and the Phase II, scheduled for four years, was commenced from the following month. The website is http://www.aptc.edu.au/

[12] Qualifications obtained at APTC are regarded as Level 3 or 4 (lower than bachelor's degree) in the Australian qualification framework, but are higher than the Levels 1 and 2 programmes offered at NUS-IoT.

considered to be contributing to the development of human resources in TVET in Samoa.

3.5 Sustainability (Rating:②)

3.5.1 Structural Aspects of Operation and Maintenance

The implementing agency of this project was to be the Ministry of Education, Sports & Culture, but the routine administration and facilities maintenance have been undertaken by NUS.

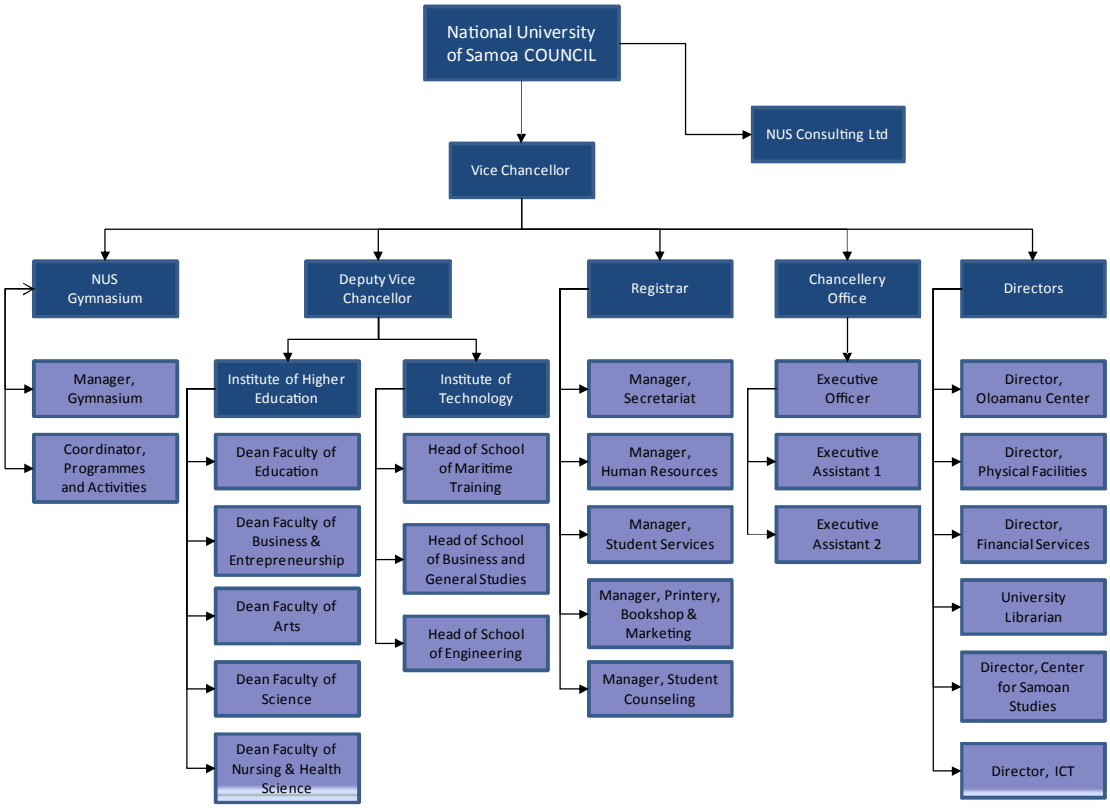


Figure 3: Organisation Chart of NUS

NUS-IoT is a faculty positioned in parallel with NUS-IHE under Deputy Vice Chancellor, and has three Heads of Schools. There were no problems observed with the administrative and implementing structures. In the two schools improved under this project, nine programmes in School of Business & General Studies and ten programmes in School of Engineering were being offered at the time of ex-post evaluation. The academic staff members at NUS-IoT are in charge of the maintenance of equipment for each programme, in addition to conducting lectures and practical training.

The Physical Facilities division, positioned as a division directly under the control of

Vice Chancellor, has approximately 50 members maintaining the facilities and equipment for the entire university. However, 80% of the division members are cleaners, security guards or groundsmen. From the viewpoint of cost reduction, it was thought possible to outsource some of the activities, but the university had found through experience that this would be more costly as the small private sector did not have a competitive market.

Maintenance of NUS facilities is now integrated without any demarcation between the facilities that used to belong to the former NUS or former SP.

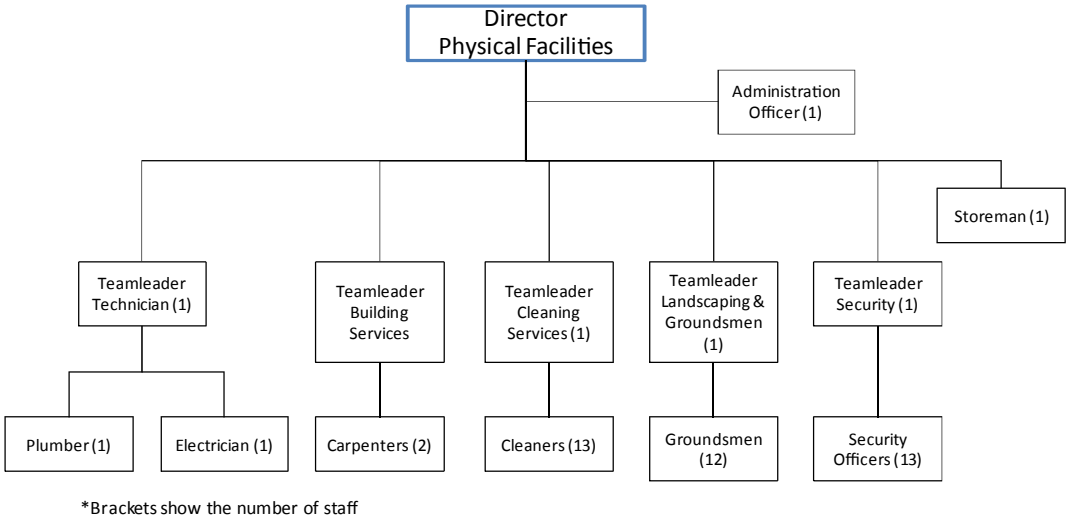


Figure 4: Organisation Chart of Physical Facilities

3.5.2 Technical Aspects of Operation and Maintenance

No technical problems were identified in running the normal education and training programmes at NUS-IoT. As the opportunities to improve their technical capabilities are limited for lecturers in Samoa, some of them take APTC courses to deepen their knowledge and skills.

No advanced techniques are required for the maintenance of the facilities; hence there were no problems observed as indicated by the implementing agency.

With regard to the lift that requires specialised management, a private sector company is to do the repair work in case of any problems. Other equipment is operated and maintained by specific academic staff members using their expertise, as mentioned above, so it can be said that no technical problems were apparent.

3.5.3 Financial Aspects of Operation and Maintenance

The largest source of income for NUS-IoT is a government subsidy, representing

more than 60% of the total revenue. While tuition fees and student numbers are gradually increasing every year, this represents only some 20% of the total. Tuition fees are kept low because of the government policy, but the payroll costs have been rising sharply, becoming a major factor for the deficit of university administration.

NUS received 11,000 Tala in 2007, 165,000 Tala in 2008, 296,000 Tala in 2009 and 269,000 Tala in 2010 from APTC as rental incomes. These incomes are solid financial contributions and are also a valuable source of income that can be directed to O&M.

Table 9: NUS Statement of Income

(Unit: 1,000 Tala)

	2004/05	2005/06	2006/07	2007/08	2008/09
Income					
Operating grant	5,000.0	6,194.6	8,583.2	8,000.0	10,000.0
Course fees	2,114.3	2,579.0	3,242.3	3,239.3	3,421.4
Rental income	48.6	179.8	88.6	304.5	328.5
Amortisation of deferred income	40.9	70.6	1,201.2	1,534.8	1,552.3
Other income	345.8	472.1	432.2	224.3	269.1
Total income	7,549.6	9,496.1	13,547.6	13,302.9	15,571.4
Expenses					
Administration	2,654.8	2,665.8	2,853.3	2,854.8	2,870.1
Depreciation	1,719.1	1,440.2	1,820.0	2,467.0	2,273.8
Personnel costs	4,531.7	5,484.2	8,911.4	10,468.1	10,257.0
Other expenses	307.3	309.0	237.1	189.2	270.4
Total	9,212.9	9,899.2	13,821.9	15,979.0	15,672.0
Interest / Bank charges			-114.3	-57.4	-92.8
Net non-recurring costs					-2,431.0
Excess of expenditure over Income	**-1,663.2**	**-403.1**	**-388.6**	**-2,733.4**	**-2,624.4**

Source: NUS Annual Report (various years)

The O&M budget after the completion of this project has not reached the expected level as shown in Table 10. The main factor is that the O&M cost for facilities and equipment is far below the amount anticipated[13] while the electricity and water costs, directly related to daily operations, are above the expected operating costs.

According to the university, a large amount of O&M cost for facilities and equipment was not deemed necessary as they were still new. However, a lack of maintenance of some locations was noted, such as the painting of exterior wall, and a reasonable

[13] It was proposed at the time of planning that the amount required for equipment renewal five, ten and twenty years later should be put aside , but the accumulation has practically been difficult as the proportion of government grant in the total university budget is large.

budget is clearly necessary.

The actual budget allocated for O&M has been gradually increasing although it is substantially smaller than expected at this moment, but it is anticipated to keep increasing to some extent. However, an increased budget may be required particularly for repairing certain machines that have been left unusable without the necessary parts being ordered.

As the amount of O&M cost expected at the time of planning includes the budget for cleaning the buildings, attention needs to be paid when making a comparison with the actual values excluding such expenses. While it was not possible to determine the NUS-IoT specific routine maintenance cost, such as cleaning, nearly half of the entire NUS budget for this purpose is presumed to be directed to NUS-IoT.

Table 10: O&M Cost for NUS-IoT

(Unit: Tala)

	Amount expected at planning	2006/07	2007/08	2008/09	2009/10
Electricity	230,400	187,500	235,000	252,000	275,000
Phone	54,000	21,800	22,800	27,570	28,600
Water	39,000	No record	42,000	48,500	52,000
Gas & Fuel	96,000	17,520	18,000	28,000	35,000
Facilities Maintenance	130,000	0	5,000	15,000	32,000
Equipment Maintenance	75,000	0	0	8,000	15,000
Other	21,960	-	-	-	-
Total	646,360		322,800	379,070	437,600
[Ref: Daily maintenance cost for the whole NUS]		107,674	104,739	150,845	108,273

Source: Data provided by NUS Finance Division

3.5.4 Current Status of Operation and Maintenance

Although no systematic inventory book of machines and parts was available at the time of project planning, a codebook that could be used as an inventory book was created with the use of the asset management software Catsoft, as already mentioned. This Catsoft-based codebook was later integrated with the inventory book of NUS-IHE to Attache. While the preparation is complete, however, the status of each piece of equipment is not always reflected in the latest software.

In order to deal with this problem, the Physical Facilities Director was drafting a Maintenance Management Plan at the time of ex-post evaluation. After the introduction of the plan, the problem is expected to be solved since a framework in which each department will report to the division the statuses of their equipment and the equipment will also be regularly inspected is to be established.

With respect to the conditions of facilities and equipment, facilities in general including the workshops were generally kept in good condition, but there were several cases where machines were left as they were, or spare parts and consumables had not been replaced in a timely manner due to the difficulties in local procurement. Some of the machines that had broken down remained unused during practical training sessions.

Based on the above, some problems have been observed in terms of O&M financing, therefore sustainability of the project effect is fair.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

NUS-IoT plays an important role in producing graduates necessary for the development of the Samoan economy as this country's only tertiary level technical & vocational education and training institute. This project supported the improvement of deteriorating facilities and replacement of equipment and was consistent with the country's policy to develop human resources equipped with vocational skills capable of meeting the demands of the business community. While the project output changed slightly from its original scope, both project cost and period were within the original plan. With regard to the effectiveness of the project, some improvement is desirable in terms of reversing the decline in student enrolment in some programmes of the School of Engineering and also in encouraging greater cooperation and interaction with the private sector. However, it was also observed that the staff and students of NUS are largely satisfied with the quality of facilities and equipment as well as that of the education provided. Regarding sustainability of the project, while there are no issues on the organisational structure and technical skills, a lack of maintenance management plan and a shortage of funds to fully support an operation and maintenance budget due to the university's operating deficit could be a future concern.

In light of the above, this project is evaluated to be satisfactory.

4.2 Recommendations

4.2.1 Recommendations to the Implementing Agency

4.2.1.1 Understanding NUS-IoT Programmes

The reasons for unpopularity of some of the NUS-IoT programmes could be a lack of direct promotion activities to secondary schools by NUS-IoT itself and also the negative image held by high school students against some programmes of the School of Engineering, such as Welding & Fabrication and Plumbing & Sheetmetal. Therefore, it is important to stir the interests of high school students by actually

visiting their schools to deepen their understanding of the programmes at NUS-IoT. From the viewpoint of expanding their knowledge on the technologies attached to their daily lives, it could be effective to introduce, where possible, curricula pertinent to TVET at secondary schools in the country.

Moreover, continuous collection of sufficient data on the working status of NUS-IoT graduates should be a significant PR element, and also essential information for high school students to contemplate their future. It is therefore desirable for NUS to identify the post-graduation paths of the graduates as comprehensively as possible.

4.2.1.2 Development of Maintenance Management Plan and Allocation of Budget

As more than four years have passed since the facilities and equipment were developed and procured in the project, it is estimated that there will be more O&M work needed in the future. For this reason, it is important to secure a sufficient budget in consideration of the necessity of periodic equipment renewals and to conduct the maintenance work in accordance with the plan with a focus on preventive measures. No budget is currently allocated for periodic renewals and no common views are shared between the divisions on the maintenance budget. Under these circumstances, steady development and implementation of the maintenance management plan will be of primary importance.

Also, it will be efficient to integrally manage both the facilities of NUS-IoT and of NUS-IHE, developed under assistance from Japan in the 1990s, as in the current structure.

4.2.2 Recommendations to JICA

As incomplete functioning of the current codebook Attache is leading to the improper management of equipment and there are also concerns related to O&M of some parts of the facilities, it is recommended that JICA monitor the progress of the development of Maintenance Management Plan and the proper implementation of maintenance activities by NUS.

4.3 Lessons Learned

During the design of the facilities, due consideration was given as a countermeasure against excessive heat to ensure improved heat insulation capacity of walls and roofs, deeper eaves, higher floor height, adjusted incident sunlight, and better ventilation. These measures appeared to be effective in Samoa, where temperature and humidity are high. In particular, sufficient heights of the ceilings in the workshops of the School of Engineering

seem to have improved air circulation and also safety and comfort. It was a design with ample considerations of the climate conditions, and could be a good reference for other projects that involve the construction of facilities in a country with similar climate conditions.