# A Cost Benefit Analysis of Vocational Education and Training in Rwanda

**By**

**Inhyoung Jeon**

**THESIS**

Submitted to
KDI School of Public Policy and Management
in partial fulfillment of the requirements
for the degree of

**MASTER OF DEVELOPMENT POLICY**

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## ABSTRACT

### A Cost Benefit Analysis of Vocational Education and Training in Rwanda

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This paper evaluates the technical vocational education and training (TVET) project, using cost-benefit analysis. The project was financed by KOICA for Rwanda from 2010 to 2011. By testing two alternative programs, the paper tries to find which program is more effective. The two alternative programs are: one is three-year College of technology program (CoT) at the post-secondary level; and the other one, one-year vocational training course (VTC), taking in youth with all educational background.

The results turn out that VTC and CoT, both are not economic viable although CoT is more desirable than VTC. It is tested by lifetime earning of graduates from each program. We also check the changes in income, drop-out rates and discount rate by sensitivity analyses. No matter how we change dropout rates, the result doesn't change. Above all, it's important to find the factors what makes the programs ineffective, and then remove the reason so as to improve the program for reducing unnecessary spending.

**Acknowledgement**

I am using this opportunity to express my gratitude to everyone who supported me throughout the thesis period.

First of all, I really appreciate Professor, Kye-woo Lee and Sung Jun Paik. Without their valuable and uncountable comments, this paper cannot be done. Especially my advisor, Kye woo Lee, I learned not only academic knowledge but also learning attitude from him. Also, I got a lot of helps from Eric, Ha-kyoung and my life mentor, Hugh.

I cannot say how much I love my mom and dad. Without the support, trust and unlimited love that they gave me, I might not be the person that I am today.

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## ABBREVIATION

| | |
|---|---|
| B/C ratio | Benefit and cost ratio |
| CBA | Cost Benefit Analysis |
| CEA | Cost Effectiveness Analysis |
| CFJs | Centres De Formation De Jeunes |
| CoT | College of Technology |
| CPS | Country partnership strategy |
| EAC | East African Community |
| EDPRS | Economic Development and Poverty Reduction Strategy |
| ESSP | Education Sector Strategy Plan |
| GDP | Gross Domestic Product |
| GoR | Government of Rwanda |
| ICT | Information and communication Technology |
| IP | Integrated Polytechnics |
| IPRC | Integrated Polytechnic Regional Center |
| IRR | Internal rate of return |
| KOICA | Korea International Cooperation Agency |
| M&E | Monitoring and Evaluation |
| MDG | Millennium Development Goal |
| MINEDUC | Ministry of Education |
| NPV | Net Present Value |
| PBE | Post Basic Education |
| RPHC | Rwanda Population and Housing Census |
| Rwf | Rwanda Franc |
| SERF | Shadow Exchange Rate Factor |
| TSS | Technical Secondary School |
| TVET | Technical Vocational Education and Training |
| VTC | Vocational Training Center |
| WDA | Workforce Development Authority |

# 1. Introduction

Over the past few decades, the Rwandan government has faced numerous hard decisions over budgets for educational programs. At the center of this debate is finding the most cost-effective program in terms of increasing the earning potential of school graduates at the lowest cost. One significant program includes Rwanda's Technical Vocational Education and Training (TVET), a program aimed at producing students with advanced technical skills. The purpose of this paper is to evaluate the alternative TVET programs which were already implemented during 2010-2011 in Rwanda, using the cost-benefit analysis. By comparing earning outcomes of the graduates from the alternative TVET programs(three-year college course and one-year vocational courses), this paper intends to find the most cost-effective program.

## 1.1 Budget Issues in Rwanda

Thanks to a number of factors indicated below, Rwanda has shown a good economic performance since Genocide in 1994. According to the World Bank, "the average economic growth was approximately 8% per year between 2001 and 2014." [1] Although Rwanda is still classified as a low income country, the nation has an ambitious aim to enter the middle income country by 2020.[2] In order to achieve this laudable goal, Rwanda has an impressive economic development agenda, consisting of many investment projects in every Ministry. Moreover, the Government of Rwanda (GoR) has proposed policy packages that promise to increase the public investment to 14% of GDP and private investment to more than 15% of GDP by 2017 in

[1] "Rwanda country overview," last modified Oct 06. 2015, http://www.worldbank.org/en/country/rwanda/overview
[2] International monetary fund, "Economic Development and poverty reduction strategy 2013-2018", IMF Country report(2013), ix

priority sectors.[3] However, GoR still leans on aid money, which is almost 30~40% of their whole budget.[4] Hence, the budget has to be used in the most efficient and effective way. From this perspective, in the education and training sector, it is one of the most important steps to check whether TVET programs are cost-effective in producing high-earning individuals.

### 1.2 Why Does TVET Matter?

Rwanda is a small and land-locked country in Africa. The size is only a quarter the size of Korea with similarly sparse amounts of natural resources. Given those conditions, the GoR recognizes the importance of human resources in developing the economy. However, most of Rwandans currently work in the agricultural sector, and the population of Rwanda like many African countries is quite young. The largest portion of the population has an educational level of just primary school or no formal schooling at all, which we can regard as 'Unskilled'. In order to transform the population into skilled workers, the GoR set TVET as the top priority in EDPRSII (Economic Development Poverty Reduction StarategyII). Furthermore, the TVET policy direction is clearly defined: involve national needs and vocational standards and reach a sufficient number of graduates who are well-trained and, therefore, able to meet the development needs of Rwanda. A key policy objective, in the medium term, is to maximize quality and access to vocational training by having around 100 training schools well distributed in all districts.[5] In line with TVET policies, international agencies have been planning to invest in the Education field, especially the TVET sector. Korean International Development Agency (KOICA) is also working actively as a counterpart in the TVET sector.

[3] Ibid.,xvi
[4] "Rwanda country overview," last modified Oct 06. 2015, http://www.worldbank.org/en/country/rwanda/overview
[5] Rwanda Ministry of Education, *TVET Policy* (Kigali, PO Box 622, 2008), 4

### 1.2.1 Overview of KOICA TVET Project

According to KOICA IPRC(Integrated Polytechnic Regional Center) final report, "KOICA implemented the TVET project at Integrated Polytechnic Regional College (IPRC) in Kigali from 2010 to 2011".[6] The budget is $3,900,000 for providing facilities, training teachers and staff and consulting improvement of curricular. The KOICA project focused on setting the vocational training center (VTC) within IPRC which already have 3years college of Technology (CoT) courses. The VTC project was tasked with designing and implementing one and a half year short course. Key tracks in this course correspond to the departments of VTC, which include Automotive, Electricity, Construction, Industrial Installation and Information Technology. Similarly, college courses have opened with three different departments; Civil Engineering, Mechanic engineering and Electronic & ICT. Hence, comparing existing course (3-year CoT) and a new course (1-year VTC), this evaluation could contribute to future decision making on whether more resources should be invested in either the VTC course or CoT course.

## 1.3 Measuring "Effectiveness" of the TVET Project

In this research, the cost-benefit analysis (CBA) tool is used for the evaluation. This method is a standard evaluation tool for vocational training and university programs which have the objective of improving graduates' labor market prospects.[7] Most of the data are from 'KOICA IPRC final report' and requests made to IPRC staff regarding the first monthly salary of graduates from CoT and VTC, employment rate and dropout rate. The costs are calculated from four measurements: personnel costs, non-personnel costs, construction costs, and foregone income as opportunity costs, which occurred during the students' enrollment in the courses,

[6] KOICA, *KOICA IPRC final report* ( Seoul, 2012), 7-8 .
[7] Pedro Belli et al. "Economic Analysis of Investment Operation", World Bank (Washington D.C, 2001), 84.

instead of working in the labor market. Measurement of Benefits' centers on graduates' lifetime earnings, which we evaluate in monetary terms.

In order to investigate these pressing questions, this paper is organized into five progressive sections. The next section reviews the existing literature on Rwandan economy, TVET and Rwanda Education Policy. Following this analysis, section III presents methodology and data. Stemming from these methods and data sets, Section IV interprets and presents the empirical results. Finally, Section V contains conclusion and policy implication.

## 2. Literature Review

### 2.1 The Economic Context and Background of Research

#### 2.1.1 Rwanda Economic and Socio Status

The Republic of Rwanda is a relatively small country which is the quarter of South Korea located in Central Africa with a population of approximately 10 million people.[8] The current government is taking positive steps to help the country emerge from Genocide in 1994. In the years following this dark chapter in the country's history, the Rwandan economy remained weak with per capita GDP in the range of $200 to $300 during the period from 1998 to 2002.

Subsequently, with the initiation of proactive development policy such as Vision 2020 and Economic Development and Poverty Reduction Strategies (EDPRS II), the economy began to rebound strongly and sustained high growth with per capita GDP which showed $630 in 2013.[9] Also, Poverty reduction has been achieved with population lifted out below the poverty line from

[8] *Encyclopedia Britannica*, 15th ed., s.v. "Rwanda Land."
[9] "Rwanda country overview," last modified Oct 06. 2015, http://data.worldbank.org/country/rwanda

77% in 1995 to 45% in 2011. [10] Regarding GDP sector composition, the service sector has taken the most portion of GDP since 2000. In 2013, the service sector showed around 52%, the industry occupied 33% and the agriculture sector took 15%. Over 90% of Rwandan work in the agriculture sector [11], most of them are employed in subsistence farming. The Human Development Index (2014), based on factors like life expectancy, literacy rate, school enrollment, health service and per capita income, puts Rwanda in the 151st position among 187 countries. Although the GoR HDI remains as a low developed country, according to Vision 2020, the country aims to achieve middle-income country by 2020.

### 2.1.2 Development Challenges

One of the problems Rwanda faces is that they have disadvantages in trade environment for geographical features. Land-lock nature made logistic system being limited only used land and air transport. Consequently, the transportation cost in export and import is relatively high. In the Rwanda Country Partnership Strategy of KOICA (2012), it is mentioned that "the cost is almost double with US$165/ton/km, compared to US$95/ton/km for the neighbor East-African countries ."[12] Infrastructure also remains weak to foster the industry. The World Bank's "Doing Business (2015) report" also pointed out that the lack of electricity and trading across the borders are the biggest obstacles to overcome for making better business environment. If Rwanda had adequate enough infrastructures development, then more businesses could work actively, thereby allowing the industry and service sectors to create more jobs in a market. Therefore, the GoR has continuously emphasized fostering skillful workers as well as expanding infrastructure for the

[10] Ibid.
[11] "CIA information", access to Sep, 2015 https://www.cia.gov/library/publications/the-world-factbook/geos/rw.html
[12] KOICA, Country Partnership Strategy for Rwanda (Seoul, 2013), 306

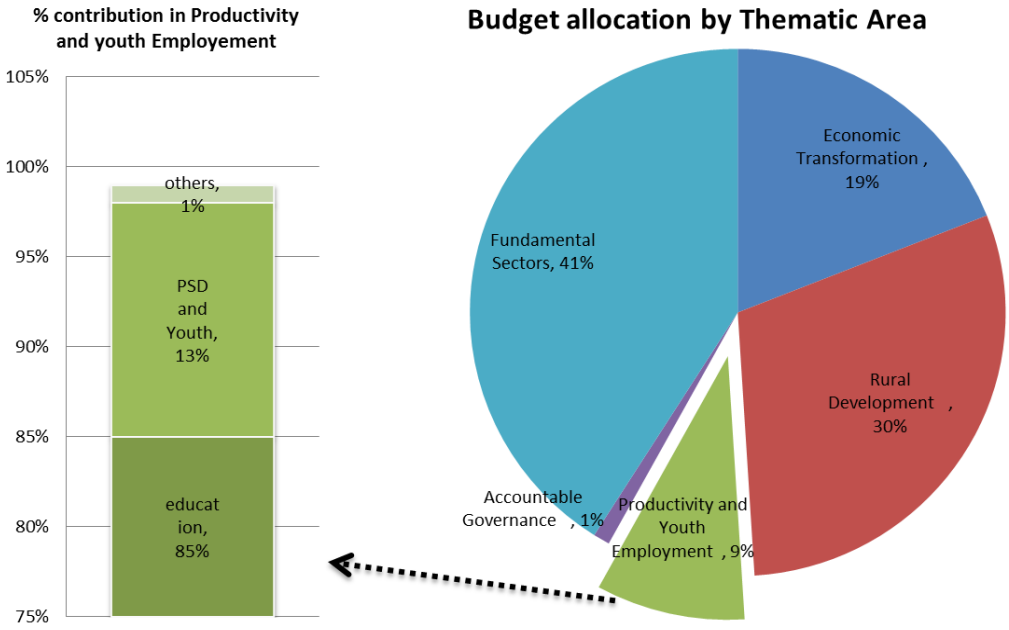
nation's economic development.

Another problem is a serious country dependency on foreign aid, which is estimated to be around 30 to 40% of the annual budget. Too much of aid dependency makes the nation fragile in the face of external shocks. In fact, Rwanda experienced a sharp decline in aid because of conflict with Democratic Republic of Congo, which was labeled an M23 issue in 2012.[13] Inevitably, the growth rate fell down to 4.7% from 8.8% in 2013 by 2014 Rwanda country report by UNDP.[14] Though the GoR has been trying to reduce dependency and increase domestic resource mobilization, revenue has remained low. Also, an unpredictable annual budget not only makes implementing planned projects in a timely manner nearly impossible, but also negatively affects ongoing as well.

In terms of the TVET sector in the budget situation, the GoR allocates 9% of the annual budget for productivity and youth employment (figure 1). There are five sectors under the productivity and youth employment heading: Education, Youth, Private sector development (PSD) and youth account, ICT and Finance. Skill development through TVET contributes to the prominence of education share of costs in this thematic area. As evident in the figure below, if the GoR does not secure a sensible budget for education, the TVET sector is also unsustainable.

[13] Alexandra Dumitru, *"Country Report Rwanda",* Economic Research (2014) accessed December, 15, https://economics.rabobank.com/publications/2014/january/country-report-rwanda/
[14] UNDP, "*Helping to Strengthen capacities and build effective institutions; Rwanda country Report"* , 2014, 20

**Figure1: Budget Allocation in Thematic Area**




**Source: reorganized base on EDPRS II**

## 2.2 The Vocational Education and Training System

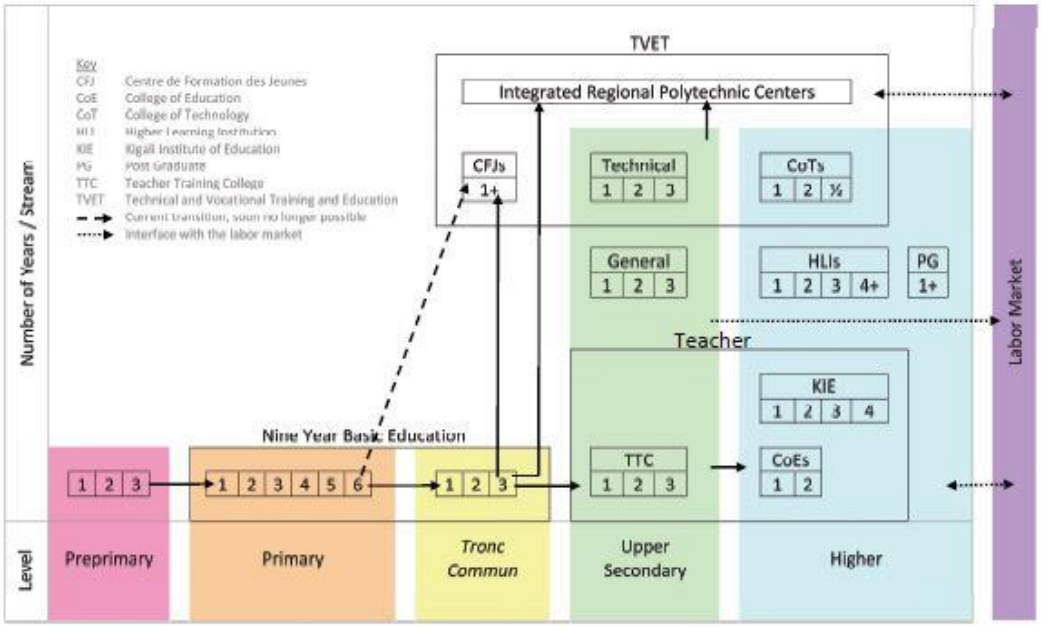
### 2.2.1 Overview of Rwanda Education System

The public education system in Rwanda consists of two levels: basic education and post-basic education. Basic education includes to 3-15 years old, consisting of preprimary education for 3 years followed by a primary school for six years and lower secondary school for three years. Following this sequence, post-basic education is 3years of upper - secondary school stage for ages 16 to 18, followed by the tertiary level. Education is made compulsory for 9 academic years primary six years and lower secondary 3 years. Further, the compulsory education has become tuition-free since 2007. [15] Primary and lower-secondary school graduates can choose either TVET or the further education course.

[15] Will Paxton, "IPAR Observatory report: The Rwandan Education and skills", Institute of Policy Analysis and Rwanda(2012), 15

TVET institutions consist of Technical Secondary Schools (TSS), the Vocational Training Center (VTC), Colleges of Technology (CoT) and Integrated Polytechnics (IP). VTC is equivalent to low secondary level institution and TSS is the level of upper secondary school. And CoT can be classified as a higher education institution. Especially, IP is a new type of TVET institution called IPRC (Integrated Polytechnic Regional Center) which are combining VTC, TSS, and CoT together under one administration. Currently, Five IPs are established in Capital city Kigali, Eastern, Western, Southern and Northern Province. As we see in Figure 2, the TVET system offers a clear alternative to the general education system.

**Figure 2 Education and TVET system in Rwanda**




* Tronc Commun is a French name of low secondary school

**Source: Rwanda country Education Status Report (2011), World Bank**

VTC were previously called "Centres De Formation De Jeunes (CFJs) and were mainly for primary (P6) graduates and other who did not complete lower secondary education.[16] Now, VTC

[16] Will Paxton, "IPAR Observatory report: The Rwandan Education and skills", Institute of Policy Analysis and Rwanda(2012), 25

is commonly used as the formal term instead of CFJs. The VTC course provides 6 months and 1 year program to trainees. According to 2013 Rwanda Education statistical data, the number of VTCs had raised to 132, comprised of 43 public, 83 private and 6 government-subsidized schools. The trainees consist of 15,592 students, 10,058 males, and 5,534 female.

**Table1. The VTC details in 2013**

| The number of trainees : 15,592 | | Total Number of VTC : 132 | | |
|---|---|---|---|---|
| Male | Female | Public | Private | Government Subsidized |
| 10,058 | 5,534 | 43 | 83 | 6 |

**Source: 2013 Rwanda Education statistics**

Technical Secondary Schools (TSS) are 3-year course that functions partly as formal upper secondary schools. 160 schools provide TSS programs in Rwanda. The total number of enrolled students in TSS program is 64,866, it is 31.6% of whole upper secondary students. The male students are 34,909 and the female students are 29,957. TSS program graduates can apply technical college or university depending on their leaving national examination score. The CoT is an A1 program[17] (Non-degree and diploma), 9 public CoTs provide TVET program, and total enrolled students are 3,095 in 2013. As seen below, the trend in enrollment in all TVET institutions is a slight increase.

**Table 2 TVET institutions students enrolled in 2012 and 2013**

| | 2012 | 2013 |
|---|---|---|
| VTC | 13,557 | 15,592 |
| TSS | 58,431 | 64,866 |
| CoT | 2,332 | 3,095 |
| Total | 74,320 | 83,553 |

**Source: 2013 Rwanda Education statistics**

[17] CoT is equivalent level of college, after 9 years basic education is classified as A2= Upper secondary, A1= Post-secondary technical college and institution, A0= Bachelor

### 2.2.2 TVET Matters in Labor Market Context

The most of the Rwandan work at agricultural sector and the population of Rwanda are quite young. When we see the composition of the Population (Table 3), almost 44% of the population is under 15 years old. Also, around 60 percent of the population is under the 34 years old in working age group (Figure 3).

**Table 3 Population Composition by age**

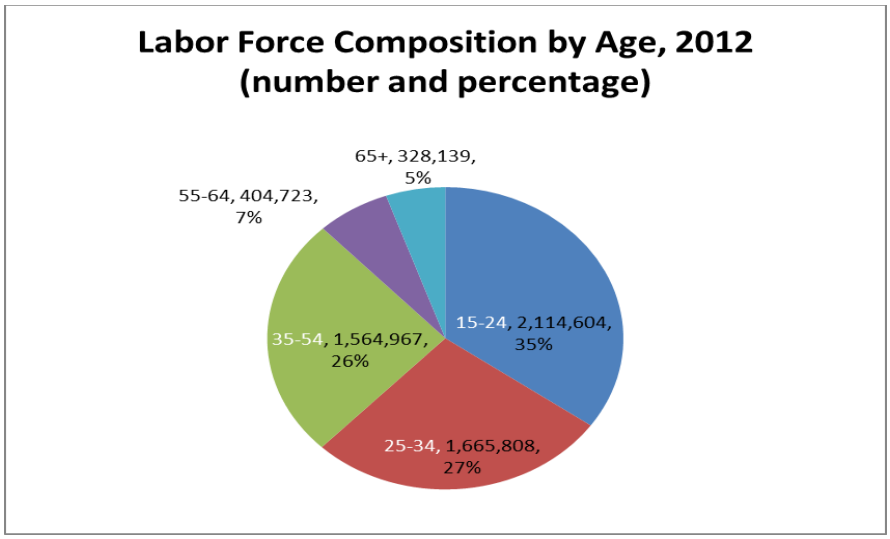
| | % of the population | % within the age group |
|---|---|---|
| Total Population | 100 | |
| 1. Population under six years old | 17.5 | |
| 2. Child population(6-15 years of age) | 25.9 | |
| Active | | 35.8 |
| Inactive | | 64.2 |
| 3. Working Age Population(16-64 years of age) | 53.4 | |
| Active(Working or looking for work) | | 72.8 |
| Inactive | | 27.2 |
| 4. Population 65+ years of age | 3.2 | |

**Source: author's calculation based on RPHC 2012**

The way of utilizing population is a crucial impact on the skills composition of the labor force. In terms of education attainment, the largest portion of the educational level is incomplete primary school (1.9 million people, or roughly half of the labor force). Also, 23% of the labor force is estimated to have no formal schooling at all. These two groups can be classified as "unskilled". In order to enhance the quality and reduce the inefficiency of the labor market, there should be related policies to make up the gap from the majority of unskilled to the skilled. TVET can be a key role in the labor market which reduces the gap between job market and the workers. Cohn argues along these lines, stating that "providing the required education and vocational

training is the bridge the gap between labor supply and demand."[18] The programs also such as public employment services and job training turn out to be helpful in improving labor market performance.[19] In this regards, TVET contributes to improving literacy, numeracy & problem-solving skills of human resources.

**Figure 3 Labor force composition by age**




**Source: author's calculation based on RPHC 2012**

In a revealing study of vocational education in developing countries, Maarten and H.J Wolbers conclude that "although there are job mismatches after the vocational training in a long-term perspective, job mismatches are smaller in countries in which vocational orientation of the educational system is stronger."[20] Even if somehow unemployment is inevitable, the vocationally oriented policies such as giving information about job vacancies, training programs can reduce the time it takes unemployed workers to find new jobs.[21] Hence, vocational training is important not only in developed countries but also developing countries.

[18] El Chanan cohn, "The economics of education", Journal of Education Finance Vol5, No 2 (1979), 225-228
[19] Kim Yongsung, "Study on the Direction of Government-funded Job Program in Korea" KDI(2013)
[20] Maarten H.J.Wolbers, "Job Mismatches and their labor market effects among school-leavers in Europe", European Sociological Review Vol.19 No3(2002)
[21] N.Gregory Mankiw, "Principle of economics", (South-Western, 2008,6th edition)

### 2.3 TVET Policies and Strategies

EDPRS II emphasizes economic growth and poverty reduction. In order to achieve those two goals, EDPRS II set up the main four thematic areas[22]. Following the EDPRS II, Educational sector strategic plan (ESSP) was set up to evaluate and recommend educational policies. ESSP argues that the important issues in order to achieve successful TVET are four approaches: Access and retention, quality, relevance, and management and finance. The most notable suggestions include: 1) Expanding IPRC and Vocational Training Centers to increase accessibility and retention for the students who drop the school or who wants to keep learning. 2) the teachers and instructors in TVET have to enhance the teaching skills and ability to handle up to date materials. 3) TVET providers will increase student and teacher exposure to the workplace through internships, work placements, and industrial visit in order to ensure that teaching and skills are up-to-date. 4) TVET institutions should provide models of entrepreneurship for students (ESSP 2010-2015).

In conjunction with the ESSP, the GoR published policy framework only for targeting TVET: "Technical and Vocational Education and Training in Policy in Rwanda (April 2008); and "WDA [23] strategic and Action Plan for Implementation of the Integrated TVET System (December 2009)". The TVET policy paper elaborates on ways the TVET system will be integrated with a focus on the establishment of the WDA and IPRCs, while WDA strategic and action plan is a specific plan for implementing the TVET policy. The WDA has four objectives: integration of the overall TVET system, developing demand-led and competency-based curricula,

[22] EDPRSII has mainly four thematic area; Economic transformation, rural development, productivity and youth Employment and Accountable governance. P12

[23] Workforce Development Authority(WDA) is established to provide a strategic response to the skills development challenges facing the country across all sectors of the economy(www.wda.gov.rw/en/about_us, search date: 2015.10.14)

teacher recruitment and training standards, and a robust institutional framework for workforce skills development. According to those TVET policies, the GoR was begun to set up IPRC Kigali with KOICA funding.

### 2.4 KOICA TVET Project in IPRC-Kigali

IPRC Kigali was initially established in 2008 as Kicukiro College of Technology (KCT) in the category of Higher Learning Institutions. By The LAW No. 03/2009 of 27/03/2009, the GoR established the WDA and determined its mission, organization, and functions (IPRC annual report, 2014). KCT transformed to an Integrated Polytechnic Regional Institution (IPRC) which includes the different level of TVET such as College of Technology, Technical Secondary School and Vocational training center. The formal project name is "The Establishment of Kicukiro Technical Training Center within the IPRC-Kigali". KOICA implemented TVET project for 15months (2010.1~2011.3) in IPRC-Kigali. The main activities are consulting TVET Curriculum, providing equipment and facilities, training teachers and repairing the building.

The total estimated budget for this project was approximate $3,900,000, $ 1.4 million from the GoR and $2.5million from KOICA. The project was focused on setting the vocational training center (VTC) within IPRC, which already have 3 years college of Technology (CoT) courses. The VTC is supposed to design to operate for 1year or 6 month short courses. The departments of VTC are consisted of Automotive, Electricity, Construction, Industrial Installation and Information Technology. Similarly, college course has opened with 3 different departments; Civil engineering, Mechanic engineering and Electronic & ICT. Hence, comparing the existing course (3-year CoT) and the new course (1-year VTC), this paper analyzes which course has

more benefits compared with costs. The result would shed light on a future decision on further financial support for the VTC course or CoT course.

# 3 Methodology and Findings

In this section, we present the methodology to evaluate the economic costs and benefits derived from the IPRC project and sensitivity analysis. Such analysis requires making certain assumptions, which may have an important influence on the final result. The cost-benefit analysis of IPRC TVET project was conducted by applying the discount rate of 12%, which is recommended in the economic evaluation of ODA projects, and inflation deflator.[24] Based on this, in order to check the economic viability of each program, economic measures, namely the Economic Net Present Value (ENPV), the Economic Internal Rate of Return (EIRR), and Benefit and Cost ratio (B/C) were used. The study also considered the incremental benefits of the project as lifetime income both the "With" and "Without project". In case of Sensitivity analysis, it gives changes in variables: income, dropout rate and discount rate.

## 3.1 Identifying Costs and Benefits

### 3.1.1 Costs

Costs for the IPRC projects are divided into four types: personnel, non-personnel, facilities, and opportunity costs. The personnel costs include teachers and staff salary and experts consulting which is dispatched from KOICA for the project. The non-personnel costs are supplies (consumables), curriculum developments, training teachers, student's activities and academic activities. The facilities costs include repairing and expansion buildings, setting

[24] The guideline of feasibility study, The Export and import bank of Korea, (Seoul, 2007), 19

Equipment, and maintenance of the buildings. Especially, maintenance costs are likely to be increased as years pass, but there was a limitation to access the accurate budget for the maintenance. Hence, we assume that in this paper 10 percent of total 'Repairing and expansion cost' can be calculated as yearly maintenance fee, which would incur until the last project year. Among them 'teachers and staff salary' and 'income', which are in Rwanda franc currency is converted into US dollar currency using 1 USD from 571Rwf(2010.1.1), 595 Rwf (2011.1.1), 604 Rwf (2012.1.1), 630 Rwf (2013.1.1)[25]. Lastly, the opportunity cost is considered as foregone income which could be possibly generated during education period. Opportunity cost is calculated based on the first-month salary of lower secondary and upper- secondary graduates, and their employment rates at the national level which is 80% and 58%.[26] Also, the cost and benefit both are adjusted by annual Rwanda inflation rate as of 2010-2013.[27]

In order to valuae the costs accurately, however, some critical information is needed: the number of enrolled students, the number of graduated, the dropout rate and employment. Table 4 shows these rates in detail and the above total costs are based on these data.

**Table4 Comparison of VTC and CoT**

| | **VTC(1yr)** | **CoT(3yrs)** |
|---|---|---|
| The number of enrolled students | 250(in 2011) | 240(in 2011) |
| The number of graduated | 147(in 2012) | 123(in 2014) |
| Dropout rate | 41%(2011-2012) | 51%(2011-2014) |
| Employment rate | 100%(2012) | 100%(2014) |

[25] National bank of Rwanda, access to Oct, 2015 http://www.bnr.rw/index.php?id=204&no_cache=1
[26] Alice Nabalamba and Sennoga Edward. "Gender and Youth Employment in Rwanda," AfDB
[27] World bank data, access to Sep, 2015 http://data.worldbank.org/country/rwanda

As evident in table 5, the total cost required to develop a 1-year VTC course is US$ 1,314,383 and 3-year CoT course is US$ 1,155,408 in domestic market price in January 1, 2010. Also, equipment is imported to Rwanda from Korea in import-tax free prices. So, its imported border price needs to be converted into domestic market prices as all other categories of costs, by multiplying the Shadow Exchange Rate Factor (SERF), 2.37 in 2010, 2.34 in 2011, 2.31 in 2012 and 2.30 in 2013. A SERF usually estimated by dividing average Domestic Market Prices by averages Border price for imported items so as to convert border price equivalents values into domestic market price equivalents. The average domestic market prices are estimated by the GNI per capita (Current US$) and the shadow prices (border prices) are estimated by GNI per capita, PPP (Current US$) in 2010, which are 520 dollars and 1,230 dollars, respectively. the SERF in 2010 is calculated by SERF = SER/OER = GNI PPP/GNI = 1230/520 =2.365. Likewise, SERF from 2011 to 2013 is calculated as the same way. All costs are expressed in constant prices is year of January 1, 2010.

**Table 5 Project Cost in domestic market price**

(Unit: US dollar 2010.1.1)

| ITEM | Amount($) | |
|---|---|---|
| | 1 year VTC course | 3years CoT course |
| 1. Personnel Cost | | |
| Consultation Fee | 132,223 | 0 |
| Teacher and Staff salary | 2,198 | 4,798 |
| Total | 134,421 | 4,798 |
| 2. Non-personnel Cost | | |
| Development Curriculum | 4,741 | 0 |
| Training Teachers | 172,321 | 172,321 |
| Supplies(Consumables) | 1,526 | 3,066 |

| | | |
|---|---|---|
| Administrative cost | 3,394 | 4,737 |
| Total | 213,000 | 180,125 |
| 3. Construction Cost | | |
| Repairing and expansion | 107,780 | 91,339 |
| Equipment | 797,027 | 675,446 |
| Maintenance Building | 15,975 | 11,473 |
| Total | 920,782 | 778,259 |
| 4. Opportunity Cost | | |
| Foregone Income | 46,179 | 192,227 |
| Total | 46,179 | 192,227 |
| 5. Total:1+2+3+4 | **1,314,383** | **1,155,408** |

**Source: Author's calculation based on IPRC-Kigali annual Report (2013-14)**

### 3.1.2 Benefits

The age earning profile of graduates (both treatment and control groups) is taken as a proxy for the project benefit in this study. According to Pedro et al points out that "To use of age earning profile in project evaluation assumes that the age-specific gaps in earnings between people with different educational qualifications remain stable over time."[28] Hence, for the students who get 1-year and 3-years education and training, respectively, we can estimate the benefit of their investment in education and training by wage differences between those who under-went the education and training programs and those who did not participate in the programs for each program. We have considered labor earnings up to 60 years old as a period working in a labor market after graduation.[29] The data for the age-earning profile have been estimated by following average Rwandan lifetime income of one graduate who gets first monthly income in constant prices of January 1, 2010, just like the total cost of each education program.

[28] Pedro Belli et al. "Economic Analysis of Investment Operation", World Bank (Washington D.C, 2001),93
[29] National Institute of Statistics of Rwanda, Rwanda Per Household Survey (RPHS) 2012.

Furthermore, this benefit stream (age earnings profile times the employed graduates of each education program) was converted to the present value of January 1, 2010. The sum of the net present value of the benefit of each program is as follows:

**Table 6 Total Net Benefit**

(Unit: USD/per program in January 1, 2010 price)

| | 1year VTC course | 3 years CoT course |
|---|---|---|
| Benefit (sum of the net present value) | 633,106 | 864,774 |

As we see table 5, 3years CoT course has more benefits than 1 year VTC course. We estimate the lifetime income of 1-year VTC and 3-year CoT program graduates based on their first-month salary upon graduation. With first month salary of each program, individual lifetime income is estimated based on the Rwandan Average lifetime income, which is the only official data available for the life time earnings profile.[30] The details can be seen in table 7. In order to compare the impact of treatment (VTC and CoT), it is necessary to have its counterfactual earnings (opportunity costs), such as lower secondary and upper secondary graduates' earnings. These differences over the working years are the Net benefits of each education and training program.

This analysis was undertaken by comparing two scenarios.

(1) Scenario 1: 1-year vocational training, full employment of graduates, with 41% dropout rate

(2) Scenario 2: 3-year college education, full employment of graduates, with 51% dropout rate

[30] Alice Nabalamba and Sennoga Edward. "Gender and Youth Employment in Rwanda," AfDB, 18

Each scenario is based on the surveys conducted by IPRC staff member. Scenario 1 represents 1 year vocational training course which is found out 41% of dropout rate. Scenario 2 represents 3 years college education which is found out 51% dropout rate[31]. Both cases show full employment after education. Each scenario has a treatment group and control group. The treatment group is enrolled students of 1year VTC course at 2011 and enrolled students of 3years college course starting at 2011. The control group of scenario 1 includes all students who finished secondary school and do not participate in any vocational training. Scenario 2 includes all students who finished upper secondary education and upon graduation, worked in the labor market. The intervention is VTC education and CoT education.

**Table7 Estimation of Lifetime monthly income by education level**

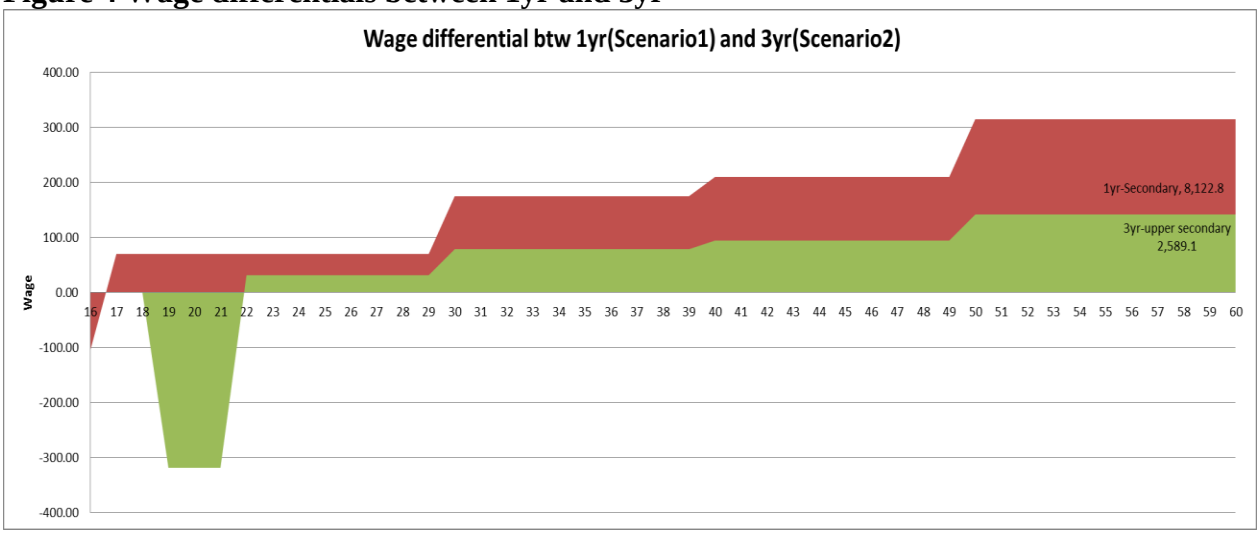
(Unit: USD/per person in January 1, 2010 price)

| | | 20-29 | 30-39 | 40-49 | Over 50 | Accumulative total |
|---|---|---|---|---|---|---|
| Average Lifetime income(Base) | | 60 | 149 | 179 | 268 | |
| Scenario1 | 1yr VTC graduate(With program) | 175 | 438 | 525 | 788 | 20,570 |
| | Secondary graduate (Without program) | 70 | 175 | 210 | 315 | 12,447 |
| Wage Differential | | | | | | 8,123 |
| Scenario2 | 3yr CoT graduate(With Program) | 350 | 875 | 1050 | 1575 | 39,389 |
| | Upper secondary graduate(Without program) | 319 | 797 | 956 | 1434 | 36,789 |
| Wage Differential | | | | | | 2,600 |

[31] KOICA, KOICA IPRC final report (Seoul, 2012) 335-348

Comparing to Scenario1 and two, it is found that one year VTC course has more benefit than three years CoT course in the sense of cumulative wage. Scenario1 represents wage gaps between a one-year vocational training graduate and a secondary graduate throughout a lifetime. It is shown that one VTC graduate earns 8,123 dollars more than a secondary graduate. Scenario 2 represents wage gap between a three years college graduate and an upper secondary graduate on a whole life. It is shown that one CoT graduate earns 2,600 dollars than an upper secondary graduate.

**Figure 4 Wage differentials between 1yr and 3yr**




When we see the benefit as a school unit, CoT($864,774) has more benefits than VTC($633,106). However, VTC is better in a sense of one person's lifetime earnings. The reasons behind that result, the dropout rate and employment rate affects to the school unit. The dropout rates in each course are 41% and 51% respectively. Also, the employment rates of low and upper secondary graduates are 80% and 58%. When we apply those rates on benefits in a school unit, it turns out to be that CoT is better than VTC. We must, however, evaluate which program is more desirable if costs and benefits are considered jointly through the following economic viability tests.

### 3.2 Economic Viability Test

Now we are ready to compare the total cost and benefit of each program (VTC and CoT, respectively) by economic investment criteria (B/C ratio, NPV, and IRR).

The Benefit/Cost ratio (B/C ratio) is regarded as significant to invest in the proposed project when we get over 1. The Net Present Value (NPV) is the difference between the sum of the present value of the project's future benefits and the sum of the present value of the project's costs. If NPV is over zero, it considers economically feasible. Internal Rate of Return (IRR) for education investment is the discount rate at which the net present value of benefits minus costs equals zero. If IRR is greater than the real interest rate, here 12%, we consider that it is economically viable. Three criterions have advantages and disadvantages at the same time as we use a decision tool. So, this paper uses B/C ratio, NPV and IRR all for helping better a decision when we compare 1year VTC course with 3 years CoT course.

The formula to calculate the IRR is as the following.

(1) 1 year Vocational Course

$$\sum_{t=2}^{46} \frac{(Y_{t1}-Y_l)_t}{(1+r)^t} = \frac{(Y_p+C_{t1})_t}{(1+r)^t}$$ (1 year vocational course)

Where,

$\boldsymbol{Y_{t1} - Y_l}$ stands for the earnings differential between a graduate of the 1 year (subscript t1) course and do not participate in the education and training course (subscript l, lower secondary graduate)

$\boldsymbol{C_{t1}}$ stands for the direct costs of the 1 year vocational training

**r** is the internal rate of return(IRR)

**t** refers to the time periods beginning at t=2 at age 16 and ending at t=46 at age 60

(2) 3 years college course

$\sum_{t=4}^{45} \frac{(Y_{t3}-Y_u)_t}{(1+r)^t} = \sum_{t=1}^{3} \frac{(Y_u+C_{t3})_t}{(1+r)^t}$ (3 year college course)

Where,

$\boldsymbol{Y_{t3} - Y_u}$ stands for the earnings differential between a graduate of the 3 years (subscript t3) course and do not have a college education (subscript u, upper secondary graduate)

$\boldsymbol{C_{t3}}$ stands for the direct costs of the 3 years college course

**r** is the internal rate of return(IRR)

**t** refers to the time periods, beginning at t=4 at age 19 and ending at t= 45 at age 60.

The left-side of the equation stands for the present value of the benefits while the right-side stands for the present value of the incremental costs, including forgone earnings.

### 3.2.1 Result from the Economic Viability Test

#### (1) Benefit and Cost Ratio

The results from the Economic Viability Test are summarized in Table 8. If it is economically viable, the ratio should be greater than one. According to the result, the B/C ratio shows values as 0.48 and 075. Hence, while 3-year program is more viable over 1-year program, both courses are not economically viable only given B/C ratio.

**Table 8 B/C Ratio table**

| | 1 year VTC course | 3 years CoT course |
|---|---|---|
| Benefit | 633,106 | 864,774 |
| Cost | 1,1314,383 | 1,155,408 |
| B/C Ratio | 0.48 | 0.75 |

### (2) Net Present Value

NPV results also show the same: it is found that VTC is -$809,869 (1-year program) and CoT is -$ 605,942 (3-year program). Both the values are negative, which means VTC and CoT are not economically viable.

### (3) Internal Rate of Return

As a feasibility measure, the investment tolerance criterion of IRR greater than the discount rate 12%. In this sense, VTC shows 5.87% which is less than discount rate, 12%. CoT as well shows 7.27%. This result indicates that the IRR of the both courses are not economically viable.

Considering the three criterions, while CoT are desirable than VTC, VTC and CoT both are not economically viable in B/C ratio, NPV and IRR. The summary of the result is shown following table 9.

**Table 9 Economic Viability Test Result**

| | VTC(1 year) course | CoT(3 years) course |
|---|---|---|
| B/C Ratio | 0.48 | 0.75 |
| NVP | -809,869 | -605,942 |
| IRR | 5.87% | 7.27% |

## 3.3 Sensitivity Analysis

The result obtained from a valuation of costs and benefits can be moderately sensitive to some of the assumptions employed in the monetary quantification of the benefits derived from a project: income, dropout rate, discount rate. The base case is 100% of the employment rate and a 41% drop-out rate in VTC, and a 51 % of drop-out rate in CoT.

When we give a change to 'income' as +10%, IRR is slightly increased in both programs. Sensitivity Indicator (SI) tells how much key variable influences the result. Regarding 'income', it turns out to be insensitive. In case of CoT, student cohorts take three years to enter the labor market. Also, most of the students are likely not to be consisted education given high drop-out rate. When we conduct sensitivity analysis with dropout rate, it does not go over 12% as we set the discount rate although giving changes up to +80%. Also, SI is less than 1 or slightly over the 1 which means insensitive at any cases. While it is moderately sensitivity (SI around 1), the projects are still not viable unless the discount rate changes to 6.27% (1-year) and 7.84% (3-year).Thus, under a reasonable assumptions that macroeconomic factors do not fluctuate much (earnings are sticky), and that discount rate cannot go upto that level, the programs will never be viable.

By sensitivity analysis, we know the result from the cost-benefit analysis will not change by earning, dropout rate and even adjusting discount rate. The result is shown in table 7.

**Table 10 Result from Sensitivity Analysis**

| | 1 Year Program | | | | 3 Year Program | | | |
|---|---|---|---|---|---|---|---|---|
| | NPV | IRR(%) | SI | SW(%) | NPV | IRR(%) | SI | SW(%) |
| **Base** | **809,869** | **5.87%** | - | - | **605,942** | **7.27%** | - | - |
| **Income** | | | | | | | | |
| -10% | 860,340 | 5.34% | -0.90698 | -1.E+02 | 660,900 | 6.69% | -0.90698 | 1.E+02 |
| +10% | 759,398 | 6.36% | -0.6232 | -2.E+02 | 550,984 | 7.81% | -0.90698 | 1.E+02 |
| **Dropout rate** | | | | | | | | |
| -10% | 770,034 | 6.27% | 0.491869 | 2.E+02 | 540,193 | 7.84% | 1.085062 | 9.E+01 |
| +10% | 877,438 | 5.23% | 1.338076 | 7.E+01 | 687,021 | 6.54% | 1.338076 | 7.E+01 |
| **Discount Rate** | | | | | | | | |
| -2% pt | 671,696 | 5.87% | 0.680217 | 5.86E+13 | 432,438 | 7.27% | 1.22422 | 8.E+01 |
| -4.5% pt | 358,550 | 5.87% | -0.30232 | -1.8E+13 | -49,923 | 7.27% | -0.5441 | 2.E+02 |

# 4 Conclusion and Policy Implications

Rwanda TVET program has been an important role to foster technical skills workforce since genocide. Although Rwanda shows a good economic performance among other developing countries, Rwanda still has a lot of decisions and programs to boost their economy for middle-income country by 2020. However, considering 30-40% of Aid dependency, the GoR is suffering from unstable budget to implement remaining many programs. Also, scarce natural resources and high-density population would be another challenge to overcome. The GoR is trying to expand TVET programs so that raising skillful workers and providing competent labor. In line with Rwanda policy, KOICA also supports the implementation of short period courses in VTC. Many TVET programs have been implemented, but now we want to find out which TVET program is more effective at least comparing KOICA new short VTC course and existing CoT course. The result will influence when next TVET project implement program within a certain budget either supporting existing program or investing VTC.

Here, cost-benefit analysis is conducted as a post evaluation for KOICA implemented IPRC project. There had been an already 3years college course, and KOICA invested short period vocational course for 6month and 1year. By analyzing cost-benefit of 3years CoT and 1year VTC, we get a result that VTC and CoT both are not economically viable. The benefit is considered as life time income of one graduate each. In details, VTC, and CoT, they all show 100% of employment after graduation while drop-out rate is high as 41%(VTC), 51%(CoT). By sensitivity analysis, we check even when we reduce the dropout rate, the cost benefit result

KOICA IPRC project is in a aligning with Rwanda Government policy which try to expand TVET to all over the country but, VTC and CoT is not economically viable in this study. But CoT program is more desirable than VTC program in terms of rate of return. It seems that supporting existing programs is better rather than investing a new course at least. Moreover, it's important to find the factors what makes the programs ineffective and then, remove the reason so as to improve the program. This study also has some limitations; there must be invisible effect that we cannot quantify directly by TVET programs. We have only focused on the benefits which are able to be evaluated currently. Adding this cost-effectiveness analysis with other benefits such as productivity, improvement will bolster research on this vital topic.

**Appendix1. Cost-Benefit Analysis of 1 year VTC**

(Unit: US$)

| | | Implementation | Enrolled | After Graduation | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Calender Year | | 2010 | 2011 | 2012 | 2013 | 2014 | … | 2052 | 2053 | 2054 | 2055 |
| Project Year | | 1 | 2 | 3 | 4 | 5 | … | 43 | 44 | 45 | 46 |
| Age | | | 16 | 17 | 18 | 19 | … | 57 | 58 | 59 | 60 |
| Item | Present Value | | | | | | | | | | |
| 1. Personnel Cost | | | | | | | | | | | |
| Teacher and Staff Salary | 2,198 | 1,826 | 711 | 0 | 0 | 0 | … | 0 | 0 | 0 | 0 |
| Consultation Fee | 132,223 | 148,090 | 0 | 0 | 0 | 0 | … | 0 | 0 | 0 | 0 |
| Total | 134,421 | 149,916 | 711 | 0 | 0 | 0 | … | 0 | 0 | 0 | 0 |
| 2. Non- Personnel Cost | | | | | | | … | | | | |
| Supplies(consumables) | 1,526 | 0 | 1,915 | 0 | 0 | 0 | … | 0 | 0 | 0 | 0 |
| Curriculum Development | 4,741 | 5,310 | 0 | 0 | 0 | 0 | … | 0 | 0 | 0 | 0 |
| Training teachers | 203,339 | 227,740 | 0 | 0 | 0 | 0 | … | 0 | 0 | 0 | 0 |
| Administrative Cost | 3,394 | 2,006 | 2,010 | 0 | 0 | 0 | … | 0 | 0 | 0 | 0 |
| Total | 213,000 | 235,056 | 3,925 | 0 | 0 | 0 | … | 0 | 0 | 0 | 0 |
| 3. Facilities | 0 | | | | | | … | | | | |
| Repairing and expansion buildings | 107,780 | 120,714 | 0 | 0 | 0 | 0 | … | 0 | 0 | 0 | 0 |
| Equipment | 797,027 | 892,670 | 0 | 0 | 0 | 0 | … | 0 | 0 | 0 | 0 |
| Maintenance of the buildings | 15,975 | 0 | 2,889 | 2,613 | 2,040 | 2,040 | … | 2,040 | 2,040 | 2,040 | 2,040 |
| Total | 920,782 | 1,013,384 | 2,889 | 2,613 | 2,040 | 2,040 | … | 2,040 | 2,040 | 2,040 | 2,040 |
| 4. Opportunity Cost | 0 | | | | | | … | | | | |
| Foregone Income | 46,179 | 0 | 57,927 | 0 | 0 | 0 | … | 0 | 0 | 0 | 0 |
| Total | 46,179 | 0 | 57,927 | 0 | 0 | 0 | … | 0 | 0 | 0 | 0 |
| **5.Total costs :1+2+3+4** | **1,314,383** | 1,398,356 | 65,452 | 2,613 | 2,040 | 2,040 | … | 2,040 | 2,040 | 2,040 | 2,040 |
| 6.Benefits | | | | | | | … | | | | |
| A.Graduate's Lifetime Earnings | 952,734 | | | 107,504 | 80,420 | 80,420 | … | 361,889 | 361,889 | 361,889 | 361,889 |
| B.Secondary students' earnings | 319,628 | | | 37,914 | 26,825 | 26,825 | … | 120,711 | 120,711 | 120,711 | 120,711 |
| **7.Net benefit:A-B** | **633,106** | | | 69,591 | 53,595 | 53,595 | … | 241,177 | 241,177 | 241,177 | 241,177 |
| **8.Net cash flow: 7-5** | **-681,277** | -1,398,356 | -65,452 | 66,978 | 51,555 | 51,555 | … | 239,137 | 239,137 | 239,137 | 239,137 |
| Discount Rate | **12.00%** | | | | | | | | | | |
| B/C ratio | **0.48** | | | | | | | | | | |
| Net Present Value | **-809,869** | | | | | | | | | | |
| Internal Rate of Return | **5.87%** | | | | | | | | | | |

**Appendix2 Cost-Benefit Analysis of 3 year CoT**

(Unit: US$)

| | | Implementation | Enrolled | | | After Graduation | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Calender Year | | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | … | 2050 | 2051 | 2052 |
| Project Year | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | … | 41 | 42 | 43 |
| Age | | | 19 | 20 | 21 | 22 | 23 | 24 | … | 58 | 59 | 60 |
| Item | Present Value | | | | | | | | | | | |
| 1. Personnel Cost | | | | | | | | | | | | |
| Teacher and Staff Salary | 4,798 | 1,548 | 603 | 537 | 4,017 | 0 | 0 | 0 | … | 0 | 0 | 0 |
| Consultation Fee | 0 | 0 | | | | | | | … | | | |
| Total | 4,798 | 1,548 | 603 | 537 | 4,017 | 0 | 0 | 0 | … | 0 | 0 | 0 |
| 2. Non- Personnel Cost | | | | | | | | | | | | |
| Supplies(consumables) | 3,066 | 0 | 1,623 | 1,467 | 1,146 | 0 | 0 | 0 | … | 0 | 0 | 0 |
| Training teachers | 172,321 | 193,000 | 0 | 0 | 0 | 0 | 0 | 0 | … | 0 | 0 | 0 |
| Administrative Cost | 4,737 | 1,700 | 1,704 | 1,541 | 1,203 | 0 | 0 | 0 | … | 0 | 0 | 0 |
| Total | 180,125 | 194,700 | 3,326 | 3,008 | 2,349 | 0 | 0 | 0 | … | 0 | 0 | 0 |
| 3. Facilities | | | | | | | | | | | | |
| Repairing and expansion buildings | 91,339 | 102,300 | 0 | 0 | 0 | 0 | 0 | 0 | … | 0 | 0 | 0 |
| Equipment | 675,446 | 756,500 | 0 | 0 | 0 | 0 | 0 | 0 | … | 0 | 0 | 0 |
| Maintenance of the buildings | 11,473 | 0 | 2,075 | 1,876 | 1,465 | 1,465 | 1,465 | 1,465 | … | 1,465 | 1,465 | 1,465 |
| Total | 778,259 | 858,800 | 2,075 | 1,876 | 1,465 | 1,465 | 1,465 | 1,465 | … | 1,465 | 1,465 | 1,465 |
| 4. Opportunity Cost | | | | | | | | | … | | | |
| Foregone Income | 192,227 | 0 | 103,640 | 92,324 | 69,064 | 0 | 0 | 0 | … | 0 | 0 | 0 |
| Total | 192,227 | 0 | 103,640 | 92,324 | 69,064 | 0 | 0 | 0 | … | 0 | 0 | 0 |
| **5..Total costs :1+2+3+4** | 1,155,408 | 1,055,048 | 109,644 | 97,745 | 76,895 | 1,465 | 1,465 | 1,465 | … | 1,465 | 1,465 | 1,465 |
| 6..Benefits | | | | | | | | | | | | |
| Graduate's Lifetime Earnings | 1,831,372 | | | | | 130,852 | 130,852 | 130,852 | … | 588,836 | 588,836 | 588,836 |
| Upper secondary student's earning | 966,598 | | | | | 69,064 | 69,064 | 69,064 | … | 310,788 | 310,788 | 310,788 |
| **7.Net Benefit** | **864,774** | | | | | 61,789 | 61,789 | 61,789 | … | 278,048 | 278,048 | 278,048 |
| **8. Total cash flow:7-5** | **-290,634** | -1,055,048 | -109,644 | -97,745 | -76,895 | 60,323 | 60,323 | 60,323 | … | 276,583 | 276,583 | 276,583 |
| Discount Rate | **12.00%** | | | | | | | | | | | |
| B/C ratio | **0.75** | | | | | | | | | | | |
| Net Present Value | **-605,942** | | | | | | | | | | | |
| Internal Rate of Return | **7.27%** | | | | | | | | | | | |

**Appendix3. Calculations of Lifetime earning**
(Unit: USD/per person in January 1, 2010 price)

| Age | Average lifetime earnings | (A)1yr | (B)Secondary | (A)-(B) | (C)3yr | (D)Upper secondary | (C)-(D) |
|---|---|---|---|---|---|---|---|
| 16 | | | 105.04 | -105.04 | | | |
| 17 | | 175.06 | 105.04 | 70.02 | | | |
| 18 | | 175.06 | 105.04 | 70.02 | | | |
| 19 | | 175.06 | 105.04 | 70.02 | | 318.61 | -318.61 |
| 20 | 59.52 | 175.06 | 105.04 | 70.02 | | 318.61 | -318.61 |
| 21 | 59.52 | 175.06 | 105.04 | 70.02 | | 318.61 | -318.61 |
| 22 | 59.52 | 175.06 | 105.04 | 70.02 | 350.12 | 318.61 | 31.51 |
| 23 | 59.52 | 175.06 | 105.04 | 70.02 | 350.12 | 318.61 | 31.51 |
| 24 | 59.52 | 175.06 | 105.04 | 70.02 | 350.12 | 318.61 | 31.51 |
| 25 | 59.52 | 175.06 | 105.04 | 70.02 | 350.12 | 318.61 | 31.51 |
| 26 | 59.52 | 175.06 | 105.04 | 70.02 | 350.12 | 318.61 | 31.51 |
| 27 | 59.52 | 175.06 | 105.04 | 70.02 | 350.12 | 318.61 | 31.51 |
| 28 | 59.52 | 175.06 | 105.04 | 70.02 | 350.12 | 318.61 | 31.51 |
| 29 | 59.52 | 175.06 | 105.04 | 70.02 | 350.12 | 318.61 | 31.51 |
| 30 | 148.80 | 437.65 | 262.59 | 175.06 | 875.30 | 796.53 | 78.78 |
| 31 | 148.80 | 437.65 | 262.59 | 175.06 | 875.30 | 796.53 | 78.78 |
| 32 | 148.80 | 437.65 | 262.59 | 175.06 | 875.30 | 796.53 | 78.78 |
| 33 | 148.80 | 437.65 | 262.59 | 175.06 | 875.30 | 796.53 | 78.78 |
| 34 | 148.80 | 437.65 | 262.59 | 175.06 | 875.30 | 796.53 | 78.78 |
| 35 | 148.80 | 437.65 | 262.59 | 175.06 | 875.30 | 796.53 | 78.78 |
| 36 | 148.80 | 437.65 | 262.59 | 175.06 | 875.30 | 796.53 | 78.78 |
| 37 | 148.80 | 437.65 | 262.59 | 175.06 | 875.30 | 796.53 | 78.78 |
| 38 | 148.80 | 437.65 | 262.59 | 175.06 | 875.30 | 796.53 | 78.78 |
| 39 | 148.80 | 437.65 | 262.59 | 175.06 | 875.30 | 796.53 | 78.78 |
| 40 | 178.56 | 525.18 | 315.11 | 210.07 | 1,050.37 | 955.83 | 94.53 |
| 41 | 178.56 | 525.18 | 315.11 | 210.07 | 1,050.37 | 955.83 | 94.53 |
| 42 | 178.56 | 525.18 | 315.11 | 210.07 | 1,050.37 | 955.83 | 94.53 |
| 43 | 178.56 | 525.18 | 315.11 | 210.07 | 1,050.37 | 955.83 | 94.53 |
| 44 | 178.56 | 525.18 | 315.11 | 210.07 | 1,050.37 | 955.83 | 94.53 |
| 45 | 178.56 | 525.18 | 315.11 | 210.07 | 1,050.37 | 955.83 | 94.53 |
| 46 | 178.56 | 525.18 | 315.11 | 210.07 | 1,050.37 | 955.83 | 94.53 |
| 47 | 178.56 | 525.18 | 315.11 | 210.07 | 1,050.37 | 955.83 | 94.53 |
| 48 | 178.56 | 525.18 | 315.11 | 210.07 | 1,050.37 | 955.83 | 94.53 |
| 49 | 178.56 | 525.18 | 315.11 | 210.07 | 1,050.37 | 955.83 | 94.53 |
| 50 | 267.84 | 787.77 | 472.66 | 315.11 | 1,575.55 | 1,433.75 | 141.80 |
| 51 | 267.84 | 787.77 | 472.66 | 315.11 | 1,575.55 | 1,433.75 | 141.80 |
| 52 | 267.84 | 787.77 | 472.66 | 315.11 | 1,575.55 | 1,433.75 | 141.80 |
| 53 | 267.84 | 787.77 | 472.66 | 315.11 | 1,575.55 | 1,433.75 | 141.80 |
| 54 | 267.84 | 787.77 | 472.66 | 315.11 | 1,575.55 | 1,433.75 | 141.80 |
| 55 | 267.84 | 787.77 | 472.66 | 315.11 | 1,575.55 | 1,433.75 | 141.80 |
| 56 | 267.84 | 787.77 | 472.66 | 315.11 | 1,575.55 | 1,433.75 | 141.80 |
| 57 | 267.84 | 787.77 | 472.66 | 315.11 | 1,575.55 | 1,433.75 | 141.80 |
| 58 | 267.84 | 787.77 | 472.66 | 315.11 | 1,575.55 | 1,433.75 | 141.80 |
| 59 | 267.84 | 787.77 | 472.66 | 315.11 | 1,575.55 | 1,433.75 | 141.80 |
| 60 | 267.84 | 787.77 | 472.66 | 315.11 | 1,575.55 | 1,433.75 | 141.80 |
| **Total** | **6,815.12** | **20,569.65** | **12,446.83** | **8,122.82** | **39,388.69** | **36,799.54** | **2,589.15** |

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