



BELIZE CHAMBER OF  
COMMERCE & INDUSTRY



International  
Labour  
Organization

# SKILLS MISMATCH IN THE AGRICULTURE AND ICT LABOR MARKETS





# TABLE OF CONTENT

Forward .....	3
Executive Summary .....	5

## PART I-BACKGROUND AND DESIGN OF STUDY

Introduction .....	9
Background Literature .....	11

### SECTION 1.0 EFFECTS OF SKILL MISMATCH ON UNEMPLOYMENT .....

14

1.2 How and How Much does SMI Matter? .....	14
1.2.1 SMI and the Business Cycle .....	15
1.3 Getting Down to Occupational Specifics .....	16

### SECTION 2.0 BACKGROUND OF PROPOSED TECHNOLOGY .....

18

2.1 Needed Competencies (Demand Side) .....	18
2.2 Content Analysis of Curricula (Supply-side) .....	18
2.3 Result of Demand- and Supply-side Analyses: Juxtaposition .....	19

### SECTION 3.0 CUSTOMIZATION OF METHODOLOGY IN BCCI-ILO STUDY .....

20

3.1 Customized Validation of Demand-Side Needed Competencies .....	20
3.2 Content Analysis of Curricula and Program Offerings .....	21
3.2.1 Survey of Lecturers and ISCO-08 Skill Levels .....	22

## PART 2-RESULTS FROM SURVEY

### SECTION 4.0 INFORMATION AND COMMUNICATION TECHNOLOGY RESULTS .....

24

### SECTION 4.1 SOFTWARE AND APPLICATIONS DEVELOPERS AND ANALYSTS .....

25

4.1.1 Systems Analysts .....	25
4.1.2 Software Developers .....	26
4.1.3 Web and Multimedia Developers .....	28
4.1.4 Applications Programmers .....	29
4.1.5 Software and Applications Developers and Analyst N.E.C. ....	30

### SECTION 4.2 DATABASE AND NETWORK PROFESSIONALS .....

31

4.2.1 Database Designers and Administrators .....	31
4.2.2 Systems Administrators .....	32
4.2.3 Computer Network Professionals .....	33

### SECTION 4.2.4 DATABASE AND NETWORK PROFESSIONALS N.E.C. ....

35

### SECTION 5.0 DATABASE AND NETWORK PROFESSIONALS .....

36

### SECTION 5.1 MARKET GARDENERS AND CROP GROWERS .....

5.1.1 Field Crop and Vegetable Grower .....	37
5.1.2 Tree and Shrub Crop Growers .....	38
5.1.3 Gardeners, Horticultural and Nursery Growers .....	38
5.1.4 Mixed Crop Growers .....	39

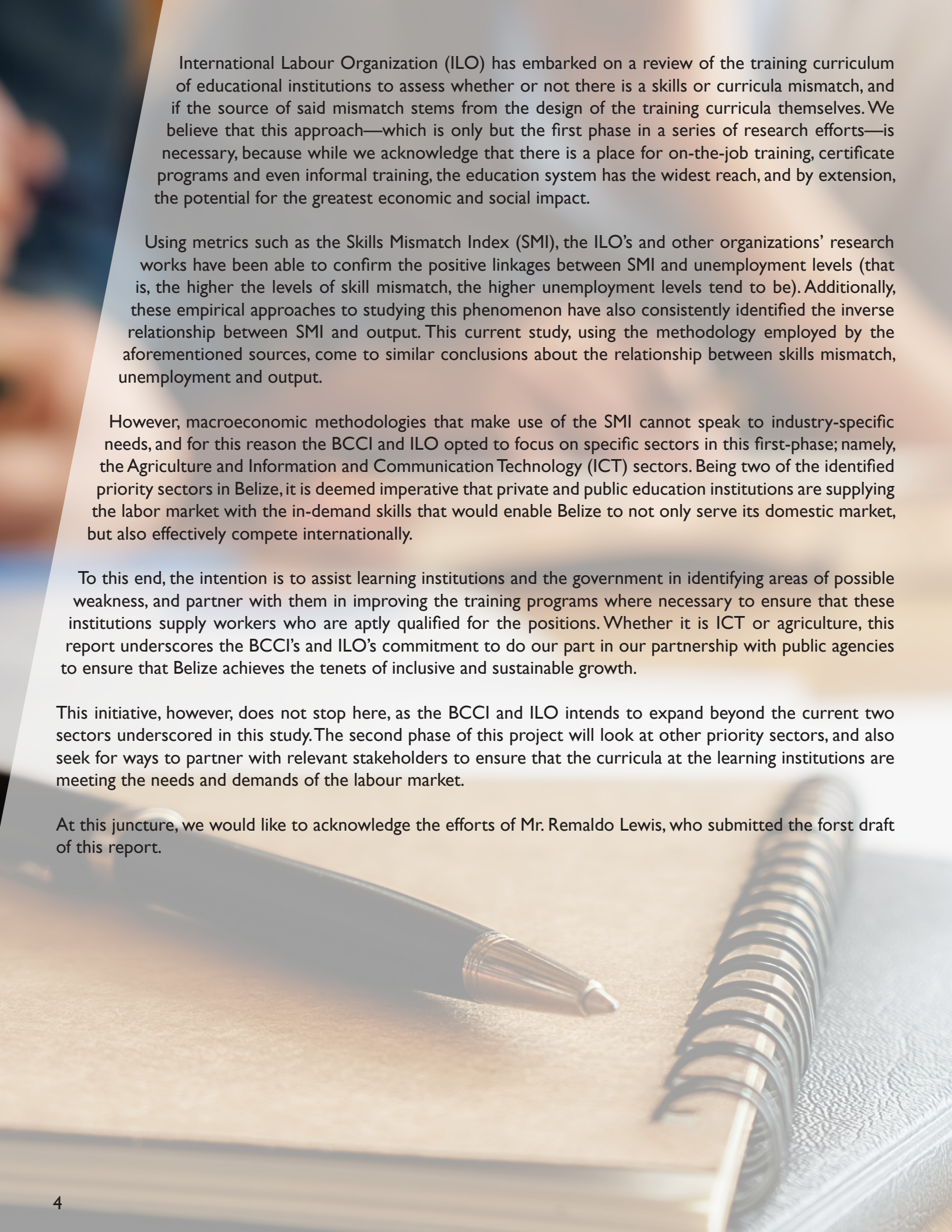
SECTION	<b>5.2</b>	<b>ANIMAL PRODUCERS</b>	40
	5.2.1	Livestock & Dairy Producers	40
	5.2.2	Poultry Producers	41
	5.2.3	Apirarists and Sericulturists	41
SECTION	<b>5.3</b>	<b>FISHERIES WORKERS</b>	42
SECTION	<b>6.0</b>	<b>DISCUSSION OF FINDINGS</b>	44
SECTION	<b>6.1</b>	<b>INFORMATION AND COMMUNICATION TECHNOLOGY</b>	45
SECTION	<b>6.2</b>	<b>SKILLED AGRICULTURAL AND FISHERY WORKERS (PRELIMINARY)</b>	46
SECTION	<b>7.0</b>	<b>RECOMMENDATIONS</b>	47
	7.1	Stronger Emphasis on Software, Web Development and Database Networking	47
	7.2	Strengthen Fisheries Curricula	48
	7.3	Expand the Number of Institutions Offering Programs	49
Conclusion			49
Reference			50
APPENDIX	<b>A</b>		
	Table A.1	Model Estimates	52
	Table A.2	Skills Mismatch Index Methodology	52
	Table A.3	Skills Mismatch by District for Month of April, 2013-2016	53
	Table A.2	Skills Mismatch by District for Month of September, 2013-2016	54
APPENDIX	<b>B</b>		
		Information and Communications Technology Questionnaire to Reviewers	55
		Skilled Agricultural and Fisheries Worker Survey to Program Reviewers	56
APPENDIX	<b>C</b>		
		Universities in Belize	68
APPENDIX	<b>D</b>		
		ICT Results with Junior College	69
APPENDIX	<b>E</b>		
		Terms of January	74

# FOREWARD

The link between an economy's human capital development and overall productivity levels is essentially an established fact, and has been such for many decades now. It is for this reason that economies, including the Belizean economy, allocate such significant portions of the national budget towards the educational sector; because the expected social benefits far outweigh the costs. This is so due to the fact that every sector, be it tourism, manufacturing, agriculture or aquaculture, relies on the capabilities, competencies and skills of those who make up their labour force. However, where skills are lacking or otherwise inadequate, productivity and efficiency are hampered.

For an economy that has to rely on the vigor of its export sector, improving productivity is a must. But this improvement requires that educational institutions are supplying the labor market with workers who are trained in line with what is demanded by employers. It is one thing to have people employed with the requisite "level" of education (primary, secondary and/or tertiary), but it is an entirely different matter as to whether or not the holders of these qualifications are adequately trained so as to meet the rapidly changing needs of the relevant industries.

Consequently, the Belize Chamber of Commerce and Industry (BCCI) with funding from the



International Labour Organization (ILO) has embarked on a review of the training curriculum of educational institutions to assess whether or not there is a skills or curricula mismatch, and if the source of said mismatch stems from the design of the training curricula themselves. We believe that this approach—which is only but the first phase in a series of research efforts—is necessary, because while we acknowledge that there is a place for on-the-job training, certificate programs and even informal training, the education system has the widest reach, and by extension, the potential for the greatest economic and social impact.

Using metrics such as the Skills Mismatch Index (SMI), the ILO's and other organizations' research works have been able to confirm the positive linkages between SMI and unemployment levels (that is, the higher the levels of skill mismatch, the higher unemployment levels tend to be). Additionally, these empirical approaches to studying this phenomenon have also consistently identified the inverse relationship between SMI and output. This current study, using the methodology employed by the aforementioned sources, come to similar conclusions about the relationship between skills mismatch, unemployment and output.

However, macroeconomic methodologies that make use of the SMI cannot speak to industry-specific needs, and for this reason the BCCI and ILO opted to focus on specific sectors in this first-phase; namely, the Agriculture and Information and Communication Technology (ICT) sectors. Being two of the identified priority sectors in Belize, it is deemed imperative that private and public education institutions are supplying the labor market with the in-demand skills that would enable Belize to not only serve its domestic market, but also effectively compete internationally.

To this end, the intention is to assist learning institutions and the government in identifying areas of possible weakness, and partner with them in improving the training programs where necessary to ensure that these institutions supply workers who are aptly qualified for the positions. Whether it is ICT or agriculture, this report underscores the BCCI's and ILO's commitment to do our part in our partnership with public agencies to ensure that Belize achieves the tenets of inclusive and sustainable growth.

This initiative, however, does not stop here, as the BCCI and ILO intends to expand beyond the current two sectors underscored in this study. The second phase of this project will look at other priority sectors, and also seek for ways to partner with relevant stakeholders to ensure that the curricula at the learning institutions are meeting the needs and demands of the labour market.

At this juncture, we would like to acknowledge the efforts of Mr. Remaldo Lewis, who submitted the forst draft of this report.

# EXECUTIVE SUMMARY

The objective of this study is to identify whether or not there exists a skills mismatch between skills required for the workforce in both the Agriculture and Information and Communication Technology (ICT) sectors and that provided by educational institutions.

Having employed the ISCO-08 skills-occupation classifications as a proxy for the demand-side skills, this study utilized Content Analysis and a comparative method to identify the degree to which those skills are provided for via various Agriculture and ICT curricula at relevant educational institutions. The latter was obtained via self-assessment surveys from ranking personnel representing the relevant learning institutions.

The study found that in the ICT sector there is need for universities to strengthen their syllabi so as to improve the provision of competencies associated with software development and database and networking skills. Nonetheless, overall, the curricula mismatch review showed that the skills provided, while relatively close to the “Improper Coverage” designation, are closer to the lower-end of proper coverage of relevant material, suggesting that there may be only relatively minor adjustments necessary to narrow the gap in ICT.

In terms of the agriculture sector, it was also found that the training provided within the agriculture sector sufficiently matches the ISCO-08

for most areas. However, the limited number of schools—especially at the secondary level—that provide training in this field is notable. While most areas highlighted by the ISCO-08 are passably covered in the few schools that offer agricultural training, formal trainings for fisheries sector are conspicuously absent. There is no long-term, institutionalized training provided by any school or organization in the country.

This paper recommends that not only should the agriculture-education institutions strengthen their programs in areas of conspicuous weaknesses, but it is also incumbent on the Government of Belize, via the Ministry of Education, to increase student's accessibility to these programs. For instance, in the Belize District, students have little to no immediate access to agriculture training. And to attend schools such as the Belize High School of Agriculture, UB Central Farm campus, or Agriculture and Natural Resource Institute (ANRI), it would require extensive commuting.

It is also practical for educational institutions, as a matter of sound workforce policy, to collaborate more closely with the labor market, as employers are very likely able to elucidate to the learning institutions what specific skills are being demanded by the private sector. This is especially valid for the ICT sector.

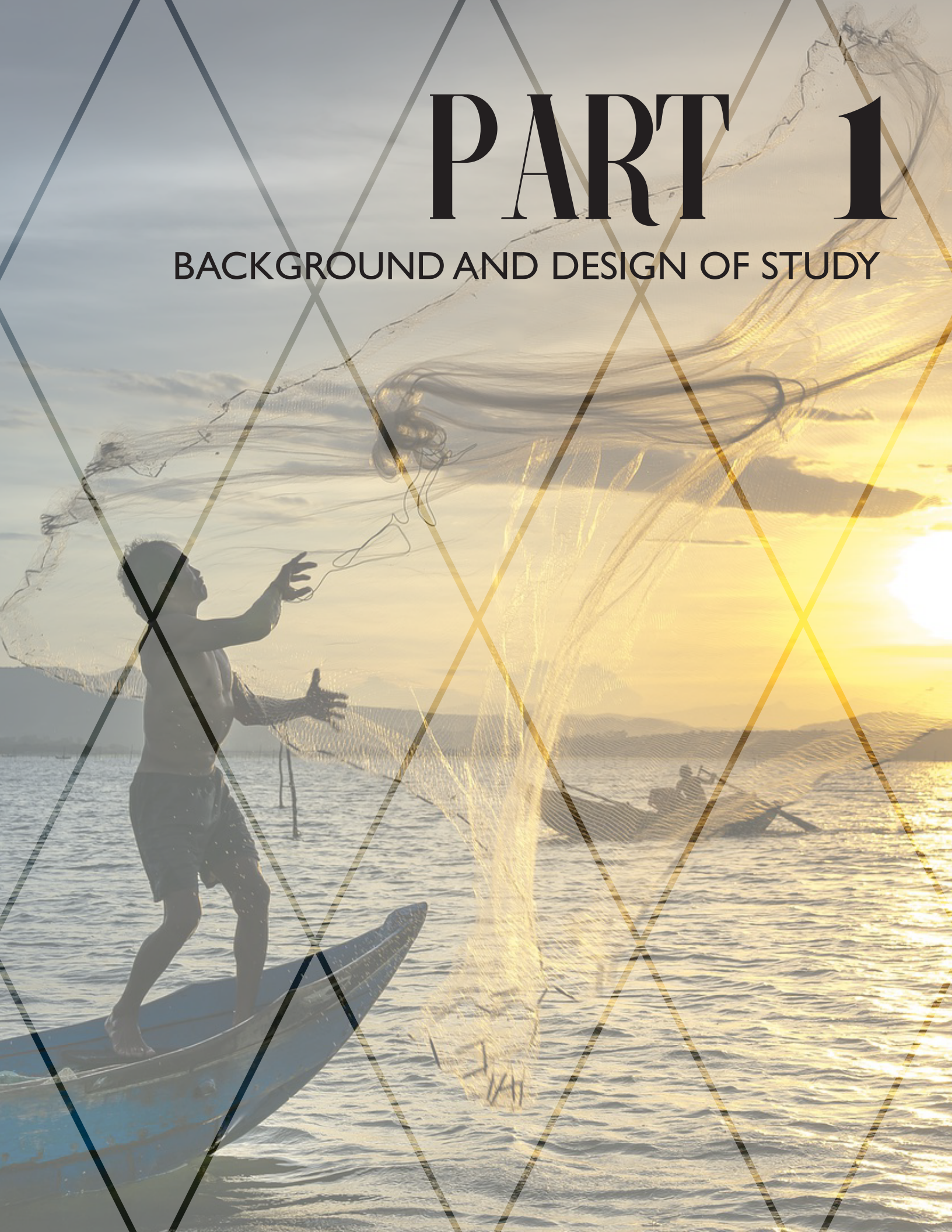
This report also provides the first known measures of Belize's Skill Mismatch Index (SMI), a quantitative tool for measuring the skills mismatch at a macroeconomic level. While not necessarily the primary focus of this study, the SMI was also used confirm the positive relationship Belize's unemployment levels and degree of skills gap.

Having empirically underscored the significance of addressing the skills gap phenomenon, and also highlighting areas of weakness in the two sectors studied, the report concludes with recommendations as to how best address these shortcomings.



# PART 1

BACKGROUND AND DESIGN OF STUDY



# INTRODUCTION

Economic thinking has for some time recognized the significant role that adequate training of an economy's human resources play in boosting productivity and economic development. This recognition, consequently, has led to economists and policymakers underscoring the need for there to be adequate training of the workforce in such a way as to ensure that workers' skills match what is actually required in the market.

Therefore, the Belize Chamber of Commerce and Industry (BCCI), the largest Business Support Organization (BSO) in Belize, which also doubles as the only International Labour Organizations (ILO) Employers' Organization, partnered with the ILO to conduct a skills gap analysis to gauge the degree of the skills mismatch at educational level. More precisely, the primary objective is to review the training curriculum in the fields of Agriculture and Information and Communication Technology (ICT) and identify competency gaps relative to what is demanded in the labor market.

While the research literature in the field of skills mismatch would rightly caution against relying solely on school curricula as the final word regarding the availability of skills due to the fact that on-the-job training or other informal methods are fairly valuable, academia is viewed in this study as a primary source capable of reaching the widest number of workers. Said differently, while on-the-job training and other informal approaches cannot be disregarded, it is also unreliable to depend on private firms to be willing to perpetually provide such trainings, as they also add to businesses' operational costs. Moreover, if the source of the skills gap can be traced to the curricula, then it is more appropriate to describe the mismatch as being institutionalized and structural in nature, given that by design the training curriculums do not cover all the requisite skills.

However, equally important to the existence of vertical or horizontal mismatch among those employed is the reality that the lack of adequate skills often leads to higher levels of unemployment (Humal 2013). This positive relationship between unemployment and skill mismatch has been empirically confirmed in the fairly recent studies (Estevão and Tsounta 2011, European Central Bank, ECB 2012, Sparreboom and Tarvid, 2016; Humal 2013). These works have quantified the degree of mismatch via the Skills Mismatch Index (SMI) and subsequently employing the SMI as an explanatory variable in econometric models to not only confirm the direction of the relationship, but also the magnitude of the impact of the mismatch, as measured by the SMI's coefficient.

In 2011, to address unemployment, the Government of Belize, via entities such as the Belize Trade and Investment Development Service (BELTRAIDE)'s Belize Training and Employment Center (BTEC), established training sessions for individuals who had already successfully exited the formal education system but were unable to find work until they participated in the short-term BTEC trainings. As pointed out by Linduaer (2014, p. 30)<sup>1</sup>, it is curious that after a few weeks' of training, all trainees in the 2011 precursor to BTEC were able to find work at Business Processing Outsourcing Centers (BPOs).

There is room to debate the reasons for this phenomenon; however, what cannot be ignored is the fact that after individuals complete eight years of primary education, four years of secondary and at least two more of tertiary-level schooling, the Government still needs to incur additional costs to execute auxiliary programs. There are several valid concerns regarding such a reality. Chiefly, the Ministry of Education (MoE) already receives a budget that is approximately one-quarter of the total public expenditure for the current fiscal year. To then still have to provide or acquire additionally financing for supplementary programs is adding to these related costs.

Instead, it is likely far more prudent to guarantee that what is being provided via the core educational institutions are aligned with the needs of the labor force, thereby, reducing the need for additional expenditure by MoE or any other government entity. This is significant because MoE policies are understandably targeted at goals such as increasing enrollment and completion rates. It is also geared towards improving scores on national and regional standardized tests. None of these goals are inherently flawed; however, it is noteworthy that the demands of employers may not necessarily be aligned with these goals.

In other words, a policy focus on enrollment levels, higher completion rates, and stronger performance on standardized tests are necessary conditions; however, may not be sufficient if upon graduation at any level of schooling, employers find that hires are lacking in requisite technical and soft skills relevant for their industries. This is consistent with the findings by Näslund-Hadley, Alonzo and Martin (2013)<sup>2</sup> who found that while “formal education begins to pay off with the completion of secondary”, the returns for completing vocational education relative to secondary education “is consistent with findings that the labor market in Belize needs skilled labor in the areas in which the country is doing well”.

This, therefore, demands a refocusing to approaches like competency-based education (CBE), which place more emphasis on ensuring that students graduate and join the workforce after having demonstrated that they mastered relevant skills as opposed to simply having scored well on standardized tests or final exams. In line with CBE, it is also important that curricula design at all levels reflect the specific skills needed in Belize’s well-known priority sectors of agriculture, agro processing, ICT, tourism, and so on.

To this end, the BCCI and the ILO commissioned this study as a first step in the process of underscoring the need to focus on skills being supplied via the education system—especially since the formal education system provides the most far-reaching network to reach the largest proportion of the workforce. ICT and Agriculture are only two of the seven identified priority sectors that are expected to drive the Belizean economy in the near term. It is, nonetheless, important to assess the provision of these skills via the formal system, as it is insufficient to rely on on-the-job trainings which may depend on uncontrollable variables including business costs.

<sup>1</sup>Lindauer, D (2014). *Labour market performance in Belize*. Washington, DC, Inter-American Development Bank.

<sup>2</sup>Näslund-Hadley, E., Alonzo, H., and Martin, D (2013). *Challenges and Opportunities in Education Sector*. Washington, DC, Inter-American Development Bank.

# BACKGROUND LITERATURE

Investigations into the skills mismatch between labor market demand and supply have been approached from various perspectives and theoretical backgrounds over the years. Informed by varying schools of thought, studies have adhered to more traditional approaches, while others have become far more innovative. As ACT (2011) study described, the family of literature into this phenomenon could be broken down into three parent research categories: workforce policy research, industrial/organizational psychology, and economic research.

In the case of workforce policy category of research, ACT (2011) shows that this class of investigative methods could be further divided into two groups: “those that utilize employer surveys to collect data about employer perceptions of skills gaps, and those that impute skills gaps from aggregate labor supply and demand using level of education as a proxy for skill level”.

Within the former category are studies such as Holzer (1997), Conference Board (1999), Mahmood (2003) and Pasipamire (2014) that all used employer-based surveys to assess the in-demand skills for the labour force. The latter two studies quantified the level of skill demand via surveys that asked industry professionals to rate the importance of various required skills related to Library and Information Science (LIS) occupation on a nine-point scale. The closer the respondents’ scores were to nine, the more in demand those skills were considered to be. Mahmood and Pasipamire, in turn, employed a Content Analysis methodology to assess the degree to which the skills ranked highly by the industry professionals were provided by academic institutions, thereby, effectively executing a curricula mismatch analysis as opposed to the more conventional skills mismatch examination.

However, it is possible to criticize such approaches based on whether or not it is accurate to assume that the interviewees are adequately knowledgeable of the industry’s needs (ACT 2011, p. 4). A similar critique is applicable to the supply-side aspects that may utilize surveys of employees. The question raised is fairly simple: are current employees or employers adequately able to identify the needed skills in the labour market?

Also within the ambit of workforce policy and economic research is the question as to whether or not the use of aggregate data as proxies for labor supplies and labor demand appropriate. In terms of the former, more traditional methods include the use of education levels as a measure for the skill level available in the market (Peter 2010, Dowling et al 2010). The demand-side would normally be measured via proxies such as the number of persons employed with said skills or level of education.

This stream of macro-level education-occupation mismatch studies has also, in some instances, employed a more quantitative set of methodologies. These studies utilized a mix of tools such as the ILO’s (2013a and 2013b) Skill-Mismatch Index (SMI) approach as a means of quantifying the mismatch between skill levels as defined by the International Standard Classification of Education (ISECD-97) and the relevant occupation (Estevão and Tsounta 2011, European Central

Bank, ECB 2012, Sparreboom and Tarvid, 2016; Humal 2013). From a more economic research vantage point, these studies' quantitative approach, in which the SMI (an index of dissimilarity) was employed as an explanatory variable in econometric models, confirmed the positive relationship between education-mismatch and unemployment: that is, the greater the mismatch the higher levels of unemployment expected (Humal 2013).

Nevertheless, the SMI's limitations have been underscored by its users (see ILO 2013, and Humal 2013), as it only analyzes one dimension of the mismatch and does not include a look at that mismatch between the more detailed, job-specific skills supply and skills demand.

The macro-level education-occupation mismatch studies are useful given the functional relationship assumed between structural unemployment and educational levels. Fundamentally, higher levels of educational investments are positively related with higher levels of productivity, lower unemployment rates and the like (Hejke, 1996). These factors are what continue to drive governments to place such emphasis and spending on education.

However, others have questioned such macro-level approaches. Sgobbi and Suleman (2009) raised concerns regarding the applicability of education as a true proxy given the idiosyncratic nature of various industries and even within-industry jobs. In addressing this concern, they differentiated between job-specific skills and general skills (or core skills and supplementary skills). Additionally, fields of work and their related skill demands are not static, and continuously change over time on account of well-known factors such as structural and technological change, as well as the effects of globalization (Sparreboom and Tarvid, 2016, p. 15).

Notwithstanding Sgobbi and Suleman (2009)'s caveats, it is plausible that the methodology utilized could be said to depend on the objective of the study. Chantani (2010) utilized aggregated education data and overall current and future market trends to determine the skills gap in Aceh, Indonesia, to guide policy-level decisions. Specifically, Chantani's study did not attempt to inform detailed skills training curriculum; it catered, instead to a strategic skills development policy (p. 2).

To this end, unlike ACT (2011) that categorized research based on methodology, Chantani (2010) distinguished between the sources of the demand: those that are policy-driven, those that are market-driven, and skill demands that are essential for livelihood.

Market-driven skills, as utilized by Chantani (2010, p. 3), were defined as demanded skills stemming from "actual or anticipated business activities". This, then, suggests that increasing output or forecasted increases in activities within a given sector could be used as a signal for the skills that are or will be demanded. As the name implies, the policy-driven skill demands emanate from government policies that target a specific sector regardless if it is currently viable. Lastly, Chantani's skill demand for livelihood looked more at the skills necessary in rural families and/or communities.

The strengths and weaknesses of each approach have been covered fairly extensively throughout the skills or curricula mismatch literature (Sparreboom and Powell, 2009; Quintini 2011; Johansen and Gatelli 2012; and Wilson et. al. 2013). However, regardless of methodology, the overarching objectives remain the same: to identify the degree to which the skills possessed by members of the labour force is demanded by employers. Until this question is sufficiently

answered and the gap narrowed, it is argued that structural unemployment will remain pervasive.

The admonitions underscored by Sgobbi and Suleman (2009) and others (Heijke and Ramaekers, 1998; and Heijke et. al. 2002) regarding the heterogeneity of inter- and intra-industry skills demand cannot be ignored. The realization of the context-specific and job-specific nature of the mix skills demanded must be factored into any analysis, especially at the macroeconomic level. To this end, Mahmood (2003) and Pasipamire (2014)'s use of comparative and Content Analysis to analyze the skills and curricula mismatch within a single sector is informative at the microeconomic level. However, given that the two latter studies utilized employer surveys to validate the skills identified in literature, the time-consuming and costly nature of this method becomes conspicuous when one seeks to look at a group of individual sectors and subsectors.

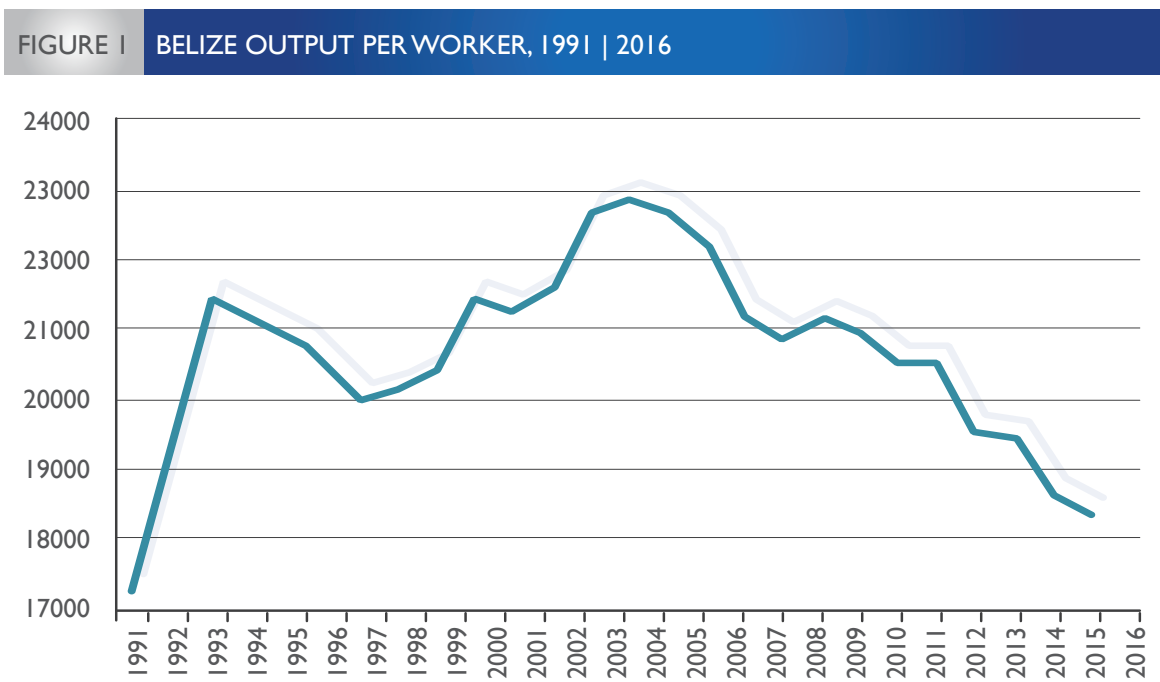
It is possible, however, to bypass the time-consuming and costly demand-side survey process and build on Mahmood (2003) and Pasipamire (2014)'s approach by using the fairly industry-specific skills identified by the ILO's International Standard Classification of Occupations (ISCO-08) or the country-specific versions that have been created in some jurisdictions. As pointed out by ACT (2011), the survey-associated costs for skills or curricula mismatch analyses could be fairly prohibitive, and the employer-based surveys could be less effective due to the absence of appropriate skill-set benchmarks. The ISCO-08 helps to bypass this problem, as it provides an internationally recognized set of skills for more than 400 occupational areas.

# SECTION 1.0 EFFECTS OF SKILL MISMATCH ON UNEMPLOYMENT

As discussed above, studies have opted to take a more quantitative and macro-level view of the skill mismatch phenomenon and, by extension, have analyzed its impact on key macroeconomic variables such as unemployment (for example, see ECB 2012, Humal 2013). While not the precise focus of this study, it is nonetheless useful for the mismatch to be contextualized in terms of its quantitative effects on unemployment.

To this end, the Labour Force Survey (LFS) data from the Belize Statistical Institution of Belize (SIB) was used to calculate the Skills Mismatch Index (SMI) for each District in Belize for the years 2013 to 2016<sup>3</sup>. Given that the LFS did not exist in Belize prior to 2012, the model described in **Table A.2** and the results for which are presented in **Table A.1**, only provided 24 observations in Model (1); thereby, being nowhere as robust as the results for the aforementioned studies. The subsequent models (i.e. Models (2) through (5)) used data for both reported months (April and September) separately; thereby, doubling the number of observations.

## 1.2 HOW AND HOW MUCH DOES SMI MATTER?



While the limitations in regards to data points must be noted, it is nonetheless useful to underscore that the coefficient for the SMI in the reported models carried the appropriate sign when regressed against unemployment. As can be seen in **Table A.1**, the results would imply that a 1% increase in the SMI could bring about anywhere between a 0.07% to .18% increase in unemployment. These figures, in terms of magnitude, are far cries away from the figures found in Humal (2013) or ECB (2012), but it is worth reiterating that the sample sizes utilized in the

<sup>3</sup>SIB calculates Labor Force data for two months of the year: April and September. Model (1) in Table A.1 presents data for only April 2013-2016. With the six districts, this amounts to only 24 observations. All other reported models use for both months

previously cited studies were significantly larger. Additionally, other control variables such as GDP per capita, gender, and age were not employed in this study, but should be explored in future studies dedicated to measuring the relationship between SMI and unemployment.

Consequently, the analysis of the SMI coefficient is limited in this current study to only the confirmation of the **positive sign**, as expected from theory and literature on this topic. This, as discussed in the literature, supports the theory that the more members of the labour force are mismatched with the demands of the labor market there is indeed a tendency for unemployment to climb. As a result, accelerating the decline in the skill mismatch is undoubtedly a matter to be prioritized.

This is also significant for productivity. Humal (2013, p.6) explained the connection thus: “[G]iven that education-occupation mismatch decreases productivity, it can be assumed to be positively associated with the natural rate of unemployment as well as (structural) unemployment in general.” For a country that has seen Output per worker trend downward for more than a decade (**see Figure 1**), any effort that could result in increased productivity could help towards a reversal of this trend.

Nevertheless, as shown in Tables A.3 and A.4, the SMI has fluctuated between 2013 and 2016 for both months observed. In the case of a few districts, the SMI had actually increased in 2016 versus 2013, particularly when the month of September is considered (**See Table A.4**). However, that is to be somewhat expected as the Belize economy contracted in 2016 (see Section 1.2.1 below).

## 1.2.1 HOW AND HOW MUCH DOES SMI MATTER?

On a similar note, while the SMI and unemployment theoretically should have a positive relationship, it is expected that the association with output should be negative. Output, measured by GDP per capita (See for example ECB 2012, Humal 2013), was not included in the model for Belize because of the to-be-expected collinearity concerns, especially considering how the data is structured in this study to accommodate for the small data points available.

However, its absence from the econometric model does not preclude a brief discussion of perceivable patterns that suggest that this negative relationship is also likely consistent with Belize’s data. The SMI for all six districts are presented in **Table A3** and **Table A4** in the Appendix. However, Table 1 compares April SMI figures for each district.

YEAR	GDP PER CAPITA ANNUAL %	COROZAL	ORANGE WALK	BELIZE CITY	CAYO	STANN CREEK	TOLEDO
2013	-0.88	0.00088	0.00015	0.00031	0.00023	0.00027	0.00025
2014	1.86	0.00005	0.00018	0.00064	0.00014	0.00021	0.00000
2015	0.13	0.00017	0.00001	0.00029	0.00011	0.00027	0.00002
2016	-2.85	0.00023	0.00015	0.00031	0.00023	0.00027	0.00025

The month of April is chosen, as opposed to September, because of its proximity to the first-quarter output figures provided by the Statistical Institute of Belize (SIB). For both 2013 and 2016, years when GDP per capita contracted (even though overall GDP growth was positive for 2013), output figures for the first quarter for these two years were negative (0.5% and 2%, respectively).



As shown in Table 1, in both 2013 and 2016, the SMI for five of the six districts were roughly the same for the month of April. For example, in 2013 and 2016—the two years with negative output per capita— Belize District’s SMIs were the same. This was observed for all other districts, except Corozal. A thorough investigation of the relationship between the SMIs for the two years is beyond the scope of this paper, and beyond what is possible with the data available; however, this should be examined further in future studies.

Nonetheless, there is some observable indication that SMIs do have an ostensibly negative relationship with the business cycle. With the exception of the Belize District and Orange Walk in 2014, all other district’s SMIs for 2014 and 2015—the years with positive GDP per capita growth—are relatively lower than the SMIs for 2013 and 2016. Again, the data here is far too limited for any robust conclusions; however, it does provide some signal that when Output per capita is up, the SMI should be approaching closer to “zero”.

## 1.3 GETTING DOWN TO OCCUPATIONAL SPECIFICS

As stated earlier, the SMI is one-dimensional: it cannot provide detailed, job-specific insights. To this end, the subsequent sections (Section 2 and 3) provide a curricula mismatch analysis for two specific sectors: Agriculture and Information and Communication Technology (ICT).

Additionally, for the SMI to be used at such a micro level, it would require more data regarding the number of persons trained in specific fields. Naturally, this has relevance in terms of the structure of the economy both now and in the medium term.

For instance, in Belize where agriculture accounts for about 15% of output, but more than 80% of merchandise exports, it is expedient that the market be supplied with individuals trained in this field.

FIGURE 2 DOMESTIC EXPORTS BY S.I.T.C 2016

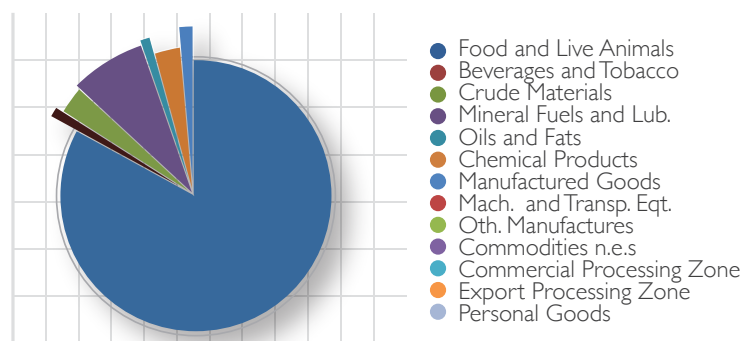
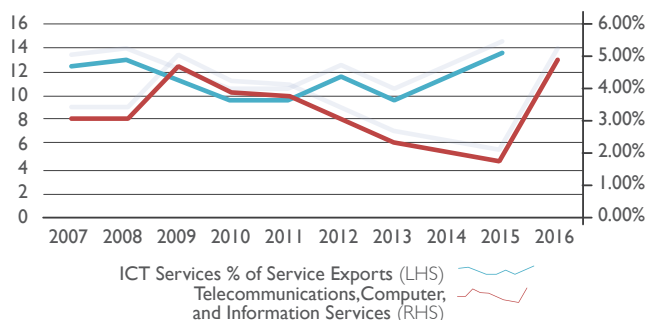


FIGURE 3 ICT SERVICES AND TELECOMMUNICATION SERVICES EXPORTS



Secondly, as the services sector continues to contribute more than half of the Belizean economy, with ICT recognized as a growing priority sector, this area too should be adequately covered by the education system if there is any hope to meet the current and growing demand for ICT professionals and for Market-oriented Skilled Agricultural Workers.

As Figure 3 shows, World Bank<sup>4</sup> data up to 2015 shows that ICT Services as a percentage of Services<sup>5</sup> Exports was approximately 14%, contributing roughly BZD \$135

billion.

Data from the United Nations Trade Statistics Database (UN Comtrade), also shown in Figure 3, shows that when

telecommunications, computer and information services are looked at as a percentage of services exports, this sector, as of 2016, accounts for about 5% of services exports based on Belize's Balance of Payments data, more than double the 2% average over the previous three years.

This upward trend is not isolated, as sources such as CompTIA, a leading technology association, forecast that the global IT industry is expected to grow by 4.7% in 2017, potentially surpassing “the \$3.5 trillion benchmark” CompTIA (2017)<sup>6</sup>. However, to truly capitalize on the upward, global trends the workforce has to be skilled enough to maximize competitiveness, a concern also raised by CompTIA (2017):

*“Given the breadth and pace of innovation, all signs point to a widening skills gap in many areas and for more types of workers. CompTIA workforce research consistently reports concerns among employers in finding candidates with the right combination of technical and soft skills.”*

To this end, it is imperative to ensure that educational institutions' Information and Communication Technology (ICT) programs are catering to a policy of narrowing the skills gap between what the market needs and what exits academia. According to the ISCO-08, ICT professionals' skills are classified at the Fourth Skill Level—which, according to the ISCO framework is associated with the ISCED-97's levels 5a and 6—and are acquired at higher educational institutions:

*“Skill Level 4 are usually obtained as a result of study at higher educational institution for a period of 3-6 years, leading to the award of a first degree or higher qualification (ISCED-97 Level 5a or higher)” (ISCO-08, p. 13)”*

Therefore, the focus for the ICT sector, as will be elucidated in Section 2 and 3, shall be primarily on the Bachelor's degree levels, although it may be useful to analyze some Associate's Degree programs, if they are accessible.

For Agriculture, the ISCO-08 classifies the skills needed in this sector at the Second Skill Level, which is consistent with secondary or post-secondary (non-tertiary) education. For this reason, special attention is given to secondary and post-secondary institutions such as the Agriculture and Natural Resource Institute (ANRI) located in southern Belize, and the Belize High School of Agriculture.

<sup>4</sup>World Bank (2017). World Development Indicators. Washington DC: World Bank. Retrieved from: <https://data.worldbank.org/indicator/BX.GSR.CCIS.ZS?locations=BZ>

<sup>5</sup>Note: This figure incorporates Information and communication technology service exports include computer and communications services (telecommunications and postal and courier services) and information services (computer data and news-related service transactions).

<sup>6</sup>CompTIA (2017). IT Industry Outlook. Available at: <https://www.comptia.org/resources/it-industry-trends-analysis-2017#section3>

## SECTION 2.0 EFFECTS OF SKILL MISMATCH ON UNEMPLOYMENT

Having seen evidence to support the argument that the skills mismatch phenomenon, as measured by the Skills Mismatch Index (SMI), is likely positively correlated with unemployment in Belize and is consistent with the literature on the subject, it is, therefore, prudent to look more closely at ways to narrow said gaps. This study seeks to examine one potential source of the gap: the design and learning outcomes associated with curricula or syllabi of relevant academic institutions. This curricula analysis focuses on two priority sectors in Belize: ICT and Agriculture.

To achieve the above, this report will utilize a qualitative Content Analysis methodology (Elo and Kyngas, 2007) and Comparative method as employed in Mahmood (2003), Pasipamire (2014) and Saeed & Rashidi (2017). In both studies, the curricula mismatch analysis (supply-side) was juxtaposed with the labor market demands and work requirements.

### 2.1 NEEDED COMPETENCES (DEMAND SIDE)

To identify the needed competencies, Mahmood (2003) used a list of 75 competencies that was derived from an extensive review of literature for the occupational field covered in the study<sup>7</sup>. These competencies or skills were further categorized into groups. In Mahmood's study, the 75 skills were further classified into six skill groups, which included a group for management competencies; resource development competencies, and general competencies.

This list of grouped competencies were "validated" via a survey of 70 practitioners and employers who indicated their perceptions on the significance (or lack thereof) of each skill on scale from one (1) to nine (9). A score of one (1) signified that the skill was "not needed" and nine (9) for "most needed" (i.e. in demand).

The scores for all respondents were averaged, and those skills that obtained higher averages were kept in the study. See **Figure 1** below.

### 2.2 CONTENT ANALYSIS OF CURRICULA (SUPPLY-SIDE)

On the supply-side, Mahmood (2003) Pasipamire (2014) utilized Content Analysis to examine the curricula or program offerings of universities that provided Graduate level degrees in the area of interest. Seven universities were utilized by Mahmood, whereby only three schools were included in Pasipamire (2014). Nonetheless, the approaches were similar: The curricula were ranked on a three-point scale, with one (1) representing "No Coverage" by the institution's courses as described by the course outlines, two (2) for "Improper Coverage" and three (3) for "Proper Coverage".

<sup>7</sup>Both Mahmood (2003) and Pasipamire (2014) analyzed the curricula mismatch with work requirements for Library and Information Science (LIS) professionals.

## 2.3 RESULT OF DEMAN AND SUPPLY SIDE ANALYSES:JUXTAPOSITION

The results from both the supply-side curricula Content Analysis and the “validation” survey were compared as shown in **Figure I**, which shows the results for one category: “Coverage of Management Competencies”.

Figure I shows a ten-column table, with the second column listing the fifteen competencies that fall within the broader heading of “management competencies”. The third column provided the mean score from the respondents regarding the level of demand for said skill. The closer the score is to the maximum of nine (9), the more necessary or in demand the skill is considered to be. Consequently, “leadership skills”, for example, receiving a score of 8.09, is highly demanded.

The remaining columns S1 through S7 represented the Content Analyses of the various universities’ level or degree of coverage of the relevant skill. Where a review of a course outline revealed that the program did not cover a particular skill at all, it received a score of one (1) for “No Coverage” (NC), and the opposite is true for PC (Proper Coverage).

Therefore, as shown in Figure I, the Content Analysis and comparative approaches allow for each relevant and required (in-demand) skills to be analyzed in terms of the degree of curricula (mis)match for each university’s course offerings. For instance, despite “Leadership Skill” receiving a score of 8.09—indicating high demand—the seven universities only provided between Improper Coverage (IC) or no coverage at all (NC).

**FIG I COVERAGE OF MANGAMENT COMPETENCIES FROM MAHMOOD (2003)**

RANK	COMPEPTENCY	MEAN	S1	S2	S3	S4	S5	S6	S7
1	Leadership skills	8.09	NC	IC	IC	IC	NC	NC	NC
2	Defining mission, role and objectives of an academic library	7.79	NC	IC	IC	PC	PC	NC	IC
3	Public relationing to ensure community support <i>(Library friends, fund raising, rapport development with faculty and administrators)</i>	7.77	NC	NC	NC	IC	NC	NC	NC
4-5	Preparing library budgets and their fiscal management	7.71	IC	IC	IC	IC	IC	IC	IC
4-5	Supervising subordinate staff	7.71	PC	PC	PC	PC	IC	PC	PC
6	Working in teams	7.60	NC	PC	PC	NC	NC	NC	NC
7	Marketing and promotion of library services and products	7.47	NC	PC	PC	PC	NC	NC	NC
8	Collecting library use and performance data, conducting statistical analysis, and applying it in planning and decision making	7.43	PC	PC	PC	PC	PC	PC	PC
9	Evaluating library performance qualitatively and quantitatively	7.40	NC	PC	PC	IC	IC	IC	IC
10	Managing libraries by developing appropriate organizational structure communication patterns, and huma resource development	7.34	PC	PC	PC	PC	IC	PC	IC
11	Strategicplanning <i>(developing long-range plans and translating them into medium range and operational plans)</i>	7.24	NC	IC	IC	NC	NC	NC	NC
12	Organizing extension activities for academic community like displays, talks, seminars, etc.	7.20	NC	NC	NC	NC	NC	NC	NC
13	Time Management	7.19	NC	NC	NC	NC	NC	NC	NC
14	Comprehending the role of knowledge management in libraries	7.06	NC	NC	NC	NC	NC	NC	NC
15	Change managment by integrating library resources and service with enviornmental changes	7.00	NC	NC	NC	NC	NC	NC	NC

# SECTION 3.0 CUSTOMIZATION OF METHODOLOGY IN BCCI-ILO STUDY

Ideally, the preference for the current study would be to utilize Mahmood (2003)'s and Pasipamire (2014)'s methodology exactly as outlined above and in their respective papers. However, given the target deadline and available resources for this study, some customizations were deemed necessary.

## 3.1 CUSTOMIZED VALIDATION OF DEMAND SIDE NEEDED COMPETENCIES

The main deviation from Mahmood (2003)'s and Pasipamire (2014)'s methodology comes in the alteration to how the “validation” of competencies is conducted. In absence of a survey as utilized in the aforementioned studies, an assumption could be made regarding the pre-validated nature of the occupation-specific skills identified in the International Labour Organization (ILO)'s International Standard Classification of Occupations (ISCO 2008)<sup>8</sup>.

The ISCO's substitutability for the survey-based validation process utilized in the referenced studies is found in the following description of the ISCO (p. 3, 2008):



*The International Standard Classification of Occupations 2008 (ISCO-08) provides a system for classifying and aggregating occupational information obtained by means of statistical censuses and surveys, as well as from administrative records. ... ISCO-08 is a four-level hierarchically structured classification that allows all jobs in the world to be classified into 436 unit groups. These groups form the most detailed level of classification structure and are aggregated into 130 minor groups, 43 sub-major groups and 10 major groups, based on their similarity in terms of the skill level and skill specialization required for jobs (Emphasis Added).*

To this end, the identified skills in the ISCO-08, which are already categorized into Major and subordinate groups, are useful for establishing the baseline for in-demand skills. This pre-classification of the groups is useful for the Content Analysis Methodology, especially since there are no “systematic rules for analyzing data”. The primary constant is that Content Analysis demands that the words of the text be classified into significantly smaller “content categories” (Weber 1990<sup>9</sup>, Burnard 1996<sup>10</sup>, Elo & Kyngas 2007). The ISCO's Major Group, Sub-Major Groups and Minor Groups already provide this structure.

Consequently, the ISCO-08 skills classification will serve as the “pre-validated” skills, and provide a proxy function to that of the survey of professionals in Mahmood (2003) and Pasipamire (2014). It would be assumed that all skills are highly demanded, and according to Mahmood's nine-point scale, would all average at nine (9). For this reason, this study's table would not contain a column for “mean” scores, and shall all be assumed as being in high demand.

Naturally, it is possible to constructively criticize the usage of the ISCO-08 from the standpoint of not looking at Belize-specific labor force demands. Conversely, it is also possible to posit that if Belize intends to keep up with the global market trends, it is practical—possibly imperative—to train students according to international standards.

<sup>8</sup>International Labour Organization (2008). *International Standard Classification of Occupations (ISCO): ISCO-08*. Geneva: ILO.

<sup>9</sup>Weber R.P. (1990) *Qualitative Research: Analysis Types and Software Tools*. Palmer PA, Bristol.

<sup>10</sup>Burnard P. (1996) *Teaching the analysis of textual data: an experiential approach*. *Nurse Education Today* 16, 278-281.

## 3.2 CONTENT ANALYSIS OF CURRICULA AND PROGRAM OFFERINGS

The “supply-side” component, unlike the above, will adhere to a method more akin to that found in Mahmood (2003) and Pasipamire (2014). The program offerings for the relevant subject areas from various institutions will be analyzed by lecturers or department heads that are experienced in the relevant fields and with their own programs’ expected learning outcomes. In the event members of the educational institution are not available, the analysis will be executed by independent reviewer(s).

As was stated above, Agriculture-related skills are associated with the ISCO-08’s Skill Level Two (ISCED-97’s levels 2 to 4), which corresponds with secondary or post-secondary-non-tertiary education. ICT, on the other hand, is associated with higher education studies at Skill Level Four, which corresponds with at least Bachelor’s degrees. As a result, emphasis will be given to institutions that provide courses and programs at the relevant skill levels for the respective occupations. The units of analysis (Elo & Kyngas, 2007) are the learning outcomes and the skills and competencies to be derived from completing a program of study.

As an example, it is useful to use the ISCO’s classifications for Information and Communication Technology (ICT). Firstly, like Mahmood (2003), the skills should be divided into primary groups. For ICT, the ISCO’s Major Sub-Group Heading 25 is designed for ICT in its entirety. This is further divided into two Minor Groups: Software and Applications Developers and Analyst (Heading 251) and Database and Network Professionals (Heading 252).

In this study, the Minor Groups will be treated independently. This is necessary because the Unit Groups under each Minor Group shall serve as the categories that are analyzed and presented in a similar fashion to that shown in **Figure 1**.

Secondly, given that the Unit Groups are being equated to Mahmood (2003)’s categories, then the key skills analyzed shall come from the Unit Groups (**see Table 1**). For instance, ISCO’s Unit Group 2513, “Web and Multimedia Developers”, shows that the requisite skills for this field are as follows:

- a** Analyzing, designing and developing Internet sites by applying a mixture of artistry and creativity with software programming and scripting languages and interfacing with operating environments;
- b** Designing and developing digital animations, imaging, presentations, games, audio and video clips and Internet applications using multimedia software, tools and utilities, interactive graphics and programming languages;
- c** Communicating with network specialists regarding web-related issues such as security hosting websites, to control and enforce Internet and web server security, space allocation, user access, business continuity, website backup and disaster recovery planning;
- d** Designing, developing and integrating computer code with other specialized inputs such as image files, audio files and scripting languages to produce, maintain and support websites;
- e** Assisting in analyzing, specifying and developing Internet strategies, web-based methodologies and development plans.

## 3.2.1 SURVEY OF LECTURERS AND ISCO-08 SKILL LEVEL

Having already classified the various skills by groups, the lecturer(s) and department heads of tertiary level institutions' IT departments will be surveyed according to the three-point scale used in Mahmood (2003) and Pasipamire (2014) to indicate the degree of coverage of the various skills identified by the ISCO-08 Unit Groups for this field (Sub-Major Group).

Keeping with the ICT example above, the skills will only be analyzed at the relevant level. For this reason, with the ISCO-08 classifying "Web and Multimedia Developers" at Skill Level 4 (ISCO-08, p. 13), which speaks to the completion of a 3-to-6 years of study at the tertiary level, usually leading to a First Degree (Bachelor's Degree), the curricula mismatch analysis for this field need only be conducted at the level indicated. There is, then, little to no need to conduct an analysis at the Associate's Degree level, since that falls below the 3-to-6-year threshold established. Moreover, as explained by an independent ICT practitioner who was consulted for this study, if Associate's degree-level programs are included, the "improper coverage" designation would most likely be utilized more frequently.

In Belize's case, only the University of Belize (UB), the University of the West Indies (UWI), and Galen University offer Bachelor's degree level programs. However, UWI does not offer ICT in its "local" program offerings. Consequently, it is only UB and Galen University's ICT programs that would be compared according to the methodology utilized by Mahmood (2003) and Pasipamire (2014). Therefore, a **sample** of the results table would appear analogous to **Table 1** below:

TAB 51 WEB AND MULTIMEDIA DEVELOPERS <sup>11</sup>				
	UNIVERSITY OF BELIZE	GALEN UNIVERSITY	UNIVERSITY OF WEST INDIES	
Competency: Analyzing, designing and developing Internet sites by applying a mixture of artistry and creativity with software programming and scripting languages and interfacing with operating environments;	PC	PC	PC	
Competency: Designing and developing digital animations, imaging, presentations, games, audio and video clips and Internet applications using multimedia software, tools and utilities, interactive graphics and programming languages;	IC	PC	IC	
Competency: Communicating with network specialists regarding web-related issues such as security hosting websites, to control and enforce Internet and web server security, space allocation, user access, business continuity, website backup and disaster recovery planning;	PC	IC	PC	
Competency: Designing, developing and integrating computer code with other specialized inputs such as image files, audio files and scripting languages to produce, maintain and support websites;	IC	IC	IC	
Competency: Assisting in analyzing, specifying and developing Internet strategies, web-based methodologies and development plans	PC	PC	PC	

**NOTES:** NC= "No Coverage" IC = "Improper Coverage" PC = "Proper Coverage"

<sup>11</sup> Note: The descriptions under the columns for the two universities are demonstrations only and do not represent actual outcomes.

# PART 2

RESULT FROM SURVEY





# SECTION 4.0 INFORMATION AND COMMUNICATION TECHNOLOGY RESULTS

Information and Communication Technology (ICT), as mentioned above, is a growing field both globally and locally. However, the field could be divided into two primary sub-groups: Computer Science and ICT. The former traditionally focuses on developing new applications for computers, and thus requires computer scientists to be fairly comfortable with programming languages, computer science theory, and the like. On the other hand, ICT—which itself is described as an extension of Information Technology (IT)—places emphasis on practitioners being aware of programs and applications that exist, and how those applications can be used to fulfill business needs.

Naturally, these two branches have a significant amount of overlap, as an ICT professional should be knowledgeable of programming languages, and the computer scientists ought to be able to perform the tasks of an ICT professional. To this end, the ISCO-08's Sub-major Group 25 is useful, as it incorporates skills from both branches. For example, Unit Group 2512 looks at Software Developers.

Again, ICT professionals operate a Skill Level 4; therefore, only institutions that offer first-degree programs in ICT are considered. In Belize, only the University of Belize (UB) and Galen University offer programs in Information Technology and Computer Science, respectively. Nevertheless, one junior college—Wesley Junior College—responded to the survey, and their responses are included in Appendix D.

It is useful to note at this juncture that given the institutions' varying focus areas (i.e. Computer Science versus IT) neither university's programs offer a comprehensive coverage of all the skills outlined in Sub-major Group 25. This, however, is not necessarily problematic if the ICT team in a given organization hires personnel with various skills to execute functions that fall within the more traditional Computer Science vs. IT roles. It would be useful, however, for some sort of program standardization to occur between both institutions.

Additionally, a key limitation of using the ISCO-08 in this manner is that it does not address on-the-job trainings, experience, or more informal training that practitioners may acquire outside of the formal school systems. Nonetheless, this study is a curricula/syllabi mismatch analysis; therefore, attention is given to what is provided for within the formal institutions.

Consequently, the following sub-sections report on the responses derived from the self-assessment surveys conducted by head lecturers within the institutions' IT departments. The responses to each survey question are presented in **Tables 4.1.1 to 4.2.4**. Each skill is ranked on a three-point scale associated with choices of “not covered”, “improperly covered” or “proper coverage”, respectively.

# SECTION 4.1 SOFTWARE AND APPLICATIONS DEVELOPERS AND ANALYSTS

The first Minor Group that falls within the overarching umbrella of ICT Professionals is that of the Software and Applications Developers and Analysts. Keeping with the ISCO-08, this category of professionals “conduct research and plan, design, write, test, provide advice on and improve information technology systems such as hardware, software and other applications to meet specific requirement.”

Usually associated with this field are skills such as “researching information technology use in business functions and identifying areas in which improvements could be made to maximize effectiveness and efficiency”.

## 4.1.1 SYSTEMS ANALYSTS

As shown in Table 4.1.1, the respondents from the two Universities that offer first degrees in ICT related fields, the skills associated with Systems Analysts Skills vary between both entities. In terms of degree to which students would be capable of “Developing functional specifications for use by systems developers”, and “ability to consult with users to formulate document requirements and with management to ensure agreement on systems principles”, both institutions’ respondents indicated that this skill is adequately covered.

Given that “Functional Specification” provides a formal document or manual that details for software developers the intended capabilities, appearances and interactions with the users, this indicates that graduates from these institutions would be well able to carry out this function and create guidelines for program code writers.

On the other hand, both institutions report Improper Coverage of skills for “Expanding or modifying systems to improve workflow or serve new purposes” and “Identifying and evaluating inefficiencies and recommending optimal business practices and system functionality and behavior”.

These skills are essential to System Analysts, as they are pivotal for duties associated with this field of work. As described by the ISCO-08, “*Systems analysts conduct research, analyse and evaluate client information technology requirements, procedures or problems, and develop and implement proposals, recommendations and plans to improve current or future information systems*”.

Most other skills relevant to this career field have mixed results between “Proper” and “Incomplete” coverage, with the exception being the ability to coordinate and link computer systems within an organization “to increase compatibility”. The weakness in this skill, as well as the others that are both classified as Incomplete/Improper coverage, indicate that the labor force in this sector would be limited in the ability to make relevant recommendations and plans that could “improve current and/or future information systems.” Nonetheless, while this indicates some constraints, the skill is generally provided, and the institutions’ programs could benefit from some modifications.

COMPEPTENCY	UNIVERSITY OF BELIZE	GALEN UNIVERSITY	WESLEY JR COLLEGE
Consulting with users to formulate document requirements and with management to ensure agreement on systems principles	PC	PC	IC
Identifying and analyzing business processes, procedures and work practices	PC	IC	IC
Identifying and evaluating inefficiencies and recommending optimal business practices and system functionality and behavior	IC	IC	IC
Taking responsibility for developing functional solutions, such as creating, adopting and implementing system test plans	IC	PC	IC
Developing functional specifications for use by systems developers	PC	PC	IC
Expanding or modifying systems to improve workflow or serve new purposes	IC	IC	PC
Coordinating and linking the computer systems within an organization to increase compatibility *	IC	NC	PC

NOTES: NC= “No Coverage” IC = “Improper Coverage” PC = “Proper Coverage”

## 4.1.2 SOFTWARE DEVELOPERS

Table 4.1.2 provides the responses from the two institutions regarding the degree to which skills associated with software development professionals are provided by their respective programs. Software Developers’ generally engage in researching, analyzing and evaluating “requirements for existing or new software applications and operating systems”. Software Developers also design, test and maintain software solutions to meet the aforementioned requirements.

When looking at the University of Belize, the respondents indicated that six out of the eight skills related to this field are “Not Covered”, with only two given the Improper Coverage designation. It must be noted, however, that this is quite likely the case due to the fact that the University of Belize (UB) at both the Associates and Bachelor’s Degree levels only provide an Information Technology (IT) degree<sup>12</sup>.

By definition an IT degree and career places greater emphasis on installing, organizing and maintaining computer systems. It also places importance on the designing and operating of networks as well as databases. It does not, by nature, give extensive attention to computer program and software development.

While this is to be expected from an IT program, as software development skills are more likely acquired in Computer Science programs, a special note must be made here given that UB is the national university with the widest reach within the country of Belize.

On the other hand, while the University of Belize’s program is virtually exclusively Information Technology oriented and thus lacks much emphasis on software development skills, Galen University , a private institution, does provide a Computer Science four-year degree. Consequently, Galen’s IT Department’s respondent’s answers ranged from Improper to Proper Coverage for most of the eight skills identified (See Table 4.1.2).

The only skill that Galen University indicated was not provided for is as it relates to “Assessing, developing, upgrading and documenting maintenance procedures for operating systems, communications environments and applications software”. While provided by Galen, a similar note regarding accessibility must again be raised.

<sup>12</sup>See University of Belize (UB)’s Offerings at: <https://www.ub.edu.bz/academics/academic-faculties/faculty-of-science-and-technology/fst-program-descriptions/>

COMPEPTENCY	UNIVERSITY OF BELIZE	GALEN UNIVERSITY	WESLEY JR COLLEGE
Researching, analysing and evaluating requirements for software applications and operating systems	IC	PC	PC
Researching, designing and developing computer software systems	IC	IC	IC
Consulting with engineering staff to evaluate interfaces between hardware and software *	NC	IC	IC
Developing and directing software testing and validation procedures	NC	IC	IC
Modifying existing software to correct errors, to adapt it new hardware or to upgrade interfaces and improve performance	NC	IC	PC
Directing software programming and development of documentation	NC	PC	IC
Assessing, developing, upgrading and documenting maintenance procedures for operating systems, communications environments and applications software	NC	NC	IC
Consulting with customers concerning maintenance of software systems.	NC	IC	IC

NOTES: NC= "No Coverage" IC = "Improper Coverage" PC = "Proper Coverage"

# 4.1.3 WEB AND MULTIMEDIA DEVELOPERS

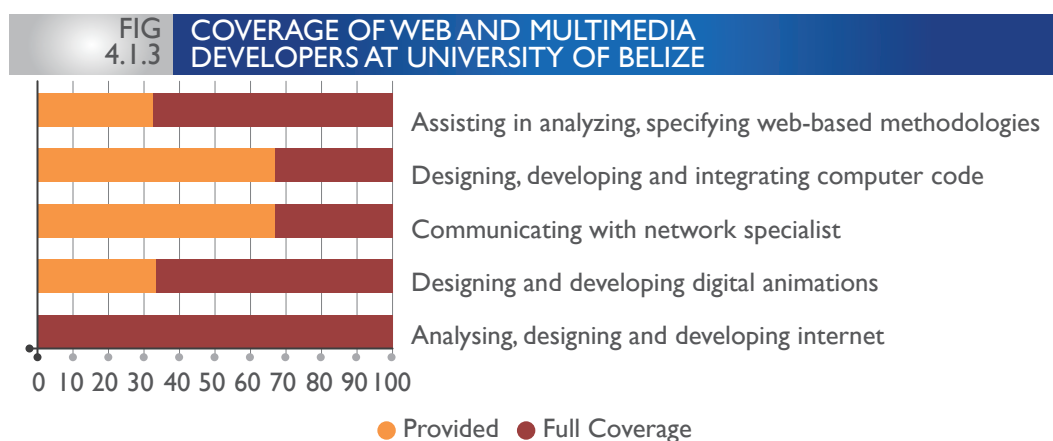
As described by the ISCO-08, Web and Multimedia professionals “combine design and technical knowledge to research, analyze, evaluate, design, program and modify websites and applications that draw together text, graphics, animations, imaging, audio and video displays and other interactive media”.

TAB 4.1.3-2513	WEB AND MULTIMEDIA DEVELOPERS	UNIVERSITY OF BELIZE	GALEN UNIVERSITY	WESLEY JR COLLEGE
	ANALYZING, DESIGNING AND DEVELOPING INTERNET SITES BY APPLYING A MIXTURE OF ARTISTRY AND CREATIVITY WITH SOFTWARE PROGRAMMING AND SCRIPTING LANGUAGES AND INTERFACING WITH OPERATING ENVIRONMENTS;	PC	IC	IC
	DESIGNING AND DEVELOPING DIGITAL ANIMATIONS, IMAGING, PRESENTATIONS, GAMES, AUDIO AND VIDEO CLIPS AND INTERNET APPLICATIONS USING MULTIMEDIA SOFTWARE, TOOLS AND UTILITIES, INTERACTIVE GRAPHICS AND PROGRAMMING LANGUAGES;	NC	IC	IC
	COMMUNICATING WITH NETWORK SPECIALISTS REGARDING WEB-RELATED ISSUES SUCH AS SECURITY HOSTING WEBSITES, TO CONTROL AND ENFORCE INTERNET AND WEB SERVER SECURITY, SPACE ALLOCATION, USER ACCESS, BUSINESS CONTINUITY, WEBSITE BACKUP AND DISASTER RECOVERY PLANNING;	IC	NC	IC
	DESIGNING, DEVELOPING AND INTEGRATING COMPUTER CODE WITH OTHER SPECIALIZED INPUTS SUCH AS IMAGE FILES, AUDIO FILES AND SCRIPTING LANGUAGES TO PRODUCE, MAINTAIN AND SUPPORT WEBSITES;	IC	IC	IC
	ASSISTING IN ANALYZING, SPECIFYING AND DEVELOPING INTERNET STRATEGIES, WEB-BASED METHODOLOGIES AND DEVELOPMENT PLANS	NC	NC	IC

**NOTES:** NC= “No Coverage” IC = “Improper Coverage” PC = “Proper Coverage”

Unlike with Software Development skills, both universities’ provision of these competencies is fairly similar. Figure 4.1.3, for example, shows the skill provision by the University of Belize, and Figure 4.1.3 (b) for Galen University.

As will be discussed in Section 6 below, any score below 70 but above 40 is treated as “Improper Coverage” (dubbed the “midrange”), while any score above or below the midrange is considered “Proper” (dubbed the ‘upper bound’) or “No Coverage” (lower bound), respectively.



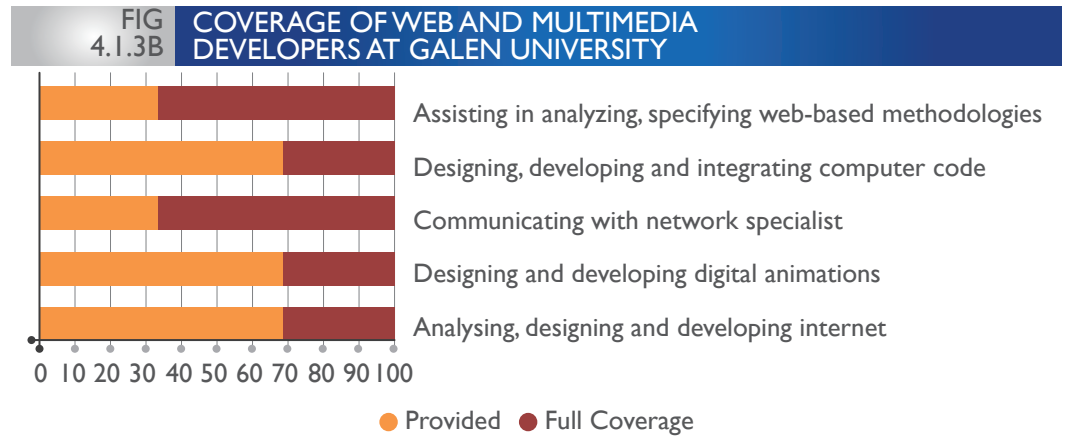
For both Figures 4.1.3 and 4.1.3b, one would note that the skills related to “assisting in analyzing, specifying and developing Internet strategies, web-based methodologies and development plans” are equally not supplied by the two institutions, being that

they're both ranked below the midrange.

In terms of “designing and developing digital animations, imaging, presentations, games, audio and video clips and Internet applications using multimedia software, tools and utilities, interactive graphics and programming languages”, both institutions’ coverage indicate that graduates—without on-the-

job trainings, informal or other certificate trainings—would either be completely without this set of skills, or only somewhat capable.

More specifically, except for the University of Belize’s adequate provision of skills associated with “analyzing, designing and developing Internet sites by applying mixture of artistry and creativity”, used in conjunction with software programming and scripting languages, all other skills are within or below the midrange.



## 4.1.4 APPLICATIONS PROGRAMMERS

This career field involves professionals who “write and maintain programmable code outlined in technical instructions and specifications for software applications and operating systems”. As shown in Table 4.1.4, Galen University’s overall provision of this set of skills is in the upper bound, as it scores comfortably above 70 points. Again, this is to be somewhat expected given their Computer Science emphasis.

**TAB 4.1.4-2514 APPLICATIONS PROGRAMMERS**

COPECTENCY	UNIVERSITY OF BELIZE	GALEN UNIVERSITY	WESLEY JR COLLEGE
Writing and maintaining program code outlined in instructions and specifications in accordance with quality accredited standards	IC	PC	IC
Revising, repairing or expanding existing programs to increase operating efficiency or adapt to new requirements	NC	PC	PC
Conducting trial runs of programs and software applications to confirm that they will produce the desired information	IC	IC	PC
Compiling and writing documentation of program development	IC	PC	PC
Identifying and communicating technical problems, processes and solutions	IC	IC	PC

**NOTES:** NC= “No Coverage” IC = “Improper Coverage” PC = “Proper Coverage”

For the University of Belize, however, while the score is above the lower bound, it does predominantly fall within the midrange.

# 4.1.5 SOFTWARE AND APPLICATIONS DEVELOPERS AND ANALYST N.E.C

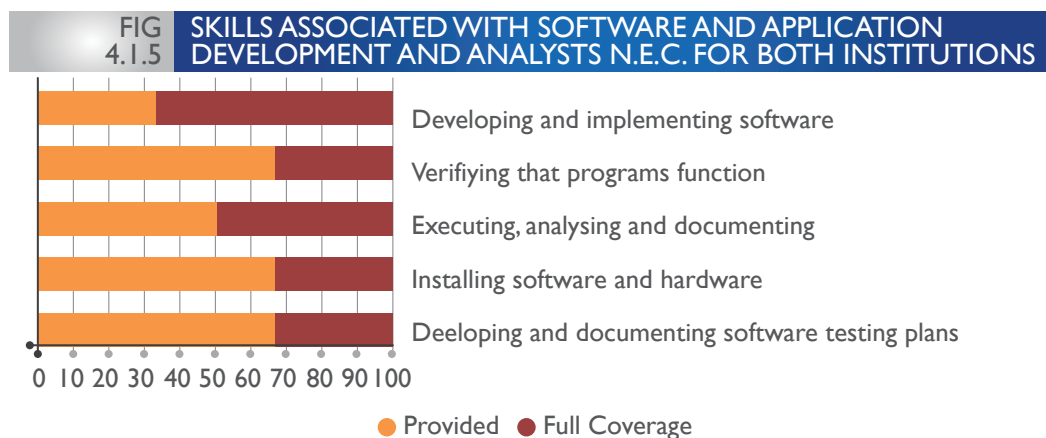
This class of professionals generally includes those who are responsible for “quality assurance”, and may include the need for practitioners to have good software-testing skills. These may include job titles such as systems and software testers, and quality assurance analysts.

TAB 4.1.5-2515 SOFTWARE AND APPLICATIONS DEVELOPERS AND ANALYSTS NOT ELSEWHERE CLASSIFIED			
	COMPEPTENCY	UNIVERSITY OF BELIZE	GALEN UNIVERSITY
	Developing and documenting software testing plans	IC	IC
	Installing software and hardware and configuring operating system software in preparation for testing	IC	IC
	Executing, analysing and documenting results of software application tests and information and telecommunications systems tests	IC	NC
	Verifying that programs function according to user requirements and established guidelines	IC	IC
	Developing and implementing software and information system testing policies, procedures and scripts.	NC	NC

**NOTES:** NC= “No Coverage” IC = “Improper Coverage” PC = “Proper Coverage”

Figure 4.1.5 shows the combined scores for both institutions. It is noteworthy that overall this set of skills range from improper to “no” coverage for both institutions.

However, most glaring is the lack of capacity for skills associated with “Developing and implementing software and information system testing policies, procedures and scripts”.



# SECTION 4.2 DATABASE AND NETWORK PROFESSIONALS

Database and network professionals' field encompasses job titles such as Network Administrator, database administrator, and network or systems analysts to name a few. This class of professionals requires skills that enable them to “design, develop, control, maintain and support the optimal performance and security of IT systems and infrastructure.” These include managing databases, networks and operating systems, as well as hardware and software.

## 4.2.1 DATABASE DESIGNERS AND ADMINISTRATORS

The first Unit Group within this sub category is Database Designers and Administrators, whose work focuses on ensuring that databases are secure and operate optimally. As can be gleaned from Table 4.2.1, with the exception of one skill area (i.e. “Conducting research and providing advice on the selection, application and implementation of database management tools”), all other relevant skills fall within midrange or lower bound, suggesting that—in the absence of on-the-job or informal training in these areas—graduates supplied to the market would have insufficient skills to carry out this function adequately.

TAB 4.2.1-252   DATABASE DESIGNERS AND ADMINISTRATORS				
	COMPEPTENCY	UNIVERSITY OF BELIZE	GALEN UNIVERSITY	WESLEY JR COLLEGE
	Designing and developing database architecture, data structures, tables, dictionaries and naming conventions for information systems projects	IC	IC	PC
	Designing, constructing, modifying, integrating, implementing and testing database management systems	IC	IC	IC
	Conducting research and providing advice on the selection, application and implementation of database management tools	PC	PC	IC
	Developing and implementing data administration policy, documentation, standards and models	IC	IC	IC
	Developing policies and procedures for database access and usage and for the backup and recovery of data	IC	IC	IC
	Performing the operational establishment and preventive maintenance of backups and recovery procedures, and enforcing security and integrity controls	IC	NC	IC

**NOTES:** NC= “No Coverage” IC = “Improper Coverage” PC = “Proper Coverage”



## 4.2.2 SYSTEMS ADMINISTRATORS

Like all jobs under the overarching heading of Database and Network Professionals, the work of systems administrators revolves chiefly around installing, upgrading and monitoring hardware and software. This may include tasks such as ensuring adequate backup and recoverability of data.

TAB 4.2.2-2522 SYSTEMS ADMINISTRATORS		UNIVERSITY OF BELIZE	GALEN UNIVERSITY	WESLEY JR COLLEGE
	COMPEPTENCY			
	Maintaining and administering computer networks and related computing environments, including computer hardware, systems software, applications software and all configurations	PC	IC	IC
	Recommending changes to improve systems and network configurations, and determining hardware or software requirements related to such changes	IC	NC	IC
	Diagnosing hardware and software problems	PC	IC	IC
	Performing data backups and disaster recovery operations	IC	NC	IC
	Operating master consoles to monitor the performance of computer systems and networks, and to coordinate network access and use	NC	NC	PC

**NOTES:** NC= "No Coverage" IC = "Improper Coverage" PC = "Proper Coverage"

The University of Belize, as shown in Table 4.2.2, appears to provide superior coverage of the skills necessary for this field relative to Galen University. The former's aggregate scores place it within the low end of the upper bound, suggesting that while all the skills are not perfectly provided, graduates would be able to operate with decent levels of competence.

The same, however, cannot be said for Galen University. Galen's score falls within the lower bound of the mid-range, and does not accommodate training in three of the five skills listed as necessary for systems administrators.

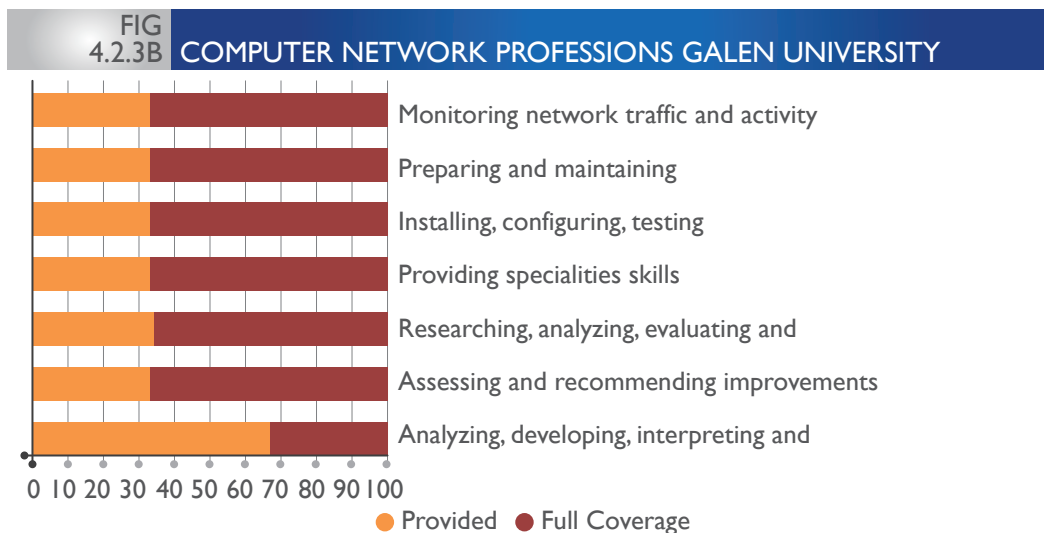
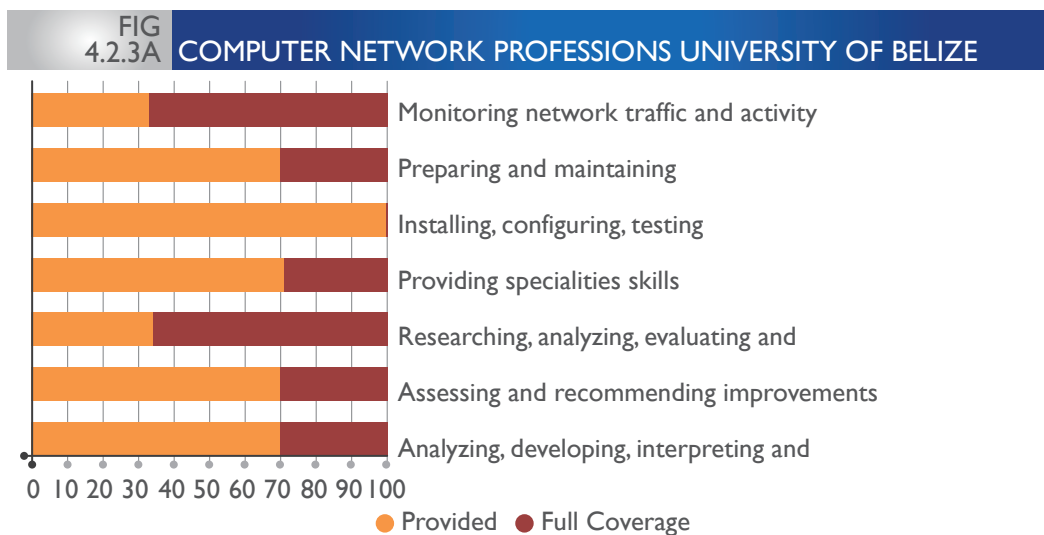
The combined scores for both institutions show that indeed this skill falls within the mid-range, indicating "improper coverage". Given that the University of Belize, however, is a larger institution with more campuses and years of operation, it may be possible to argue that the University of Belize should carry heavier weights, and a weighted as opposed to an arithmetic average may be more appropriate. Such a point would be fairly valid, and would suggest that the score could be relatively higher than the combined 60. The question, however, would be what would serve as the appropriate weight<sup>14</sup>.

Nonetheless, keeping with the objective of this study, it is more useful to keep the focus on the skills that are provided (or otherwise undersupplied) via the formal curricula for the institutions observed. From that standpoint, then, the mid-range score implies "Improper Coverage" overall, but with the University of Belize, as an individual institution, providing more adequate (upper bound) level of training in this area. The fact that UB provides Proper Coverage (albeit not 'complete') is, however, useful given that it is the National University with a fairly high level of accessibility.

<sup>14</sup>In terms of weights, one consideration is for it to be based on total number of graduates from each institution.

## 4.2.3 COMPUTER NETWORK PROFESSIONALS

Similar to what was observed under Section 4.1, the two universities' focus areas contribute to the respective responses and by extension scores. For Galen University, where the program's focus is more computer-science oriented, Figure 4.2.3b shows where most of the skills relevant to Computer Network Professionals are not supplied by Galen University as part of the formal training.



Conversely, The University of Belize, with a more IT orientation, also reports relatively better provision of the skills highlighted as most significant for Computer Network Professionals (see (Figure 4.2.3a). Nevertheless, even for UB, the overall supply of computer networking-related skills falls within the midrange (See Table 4.2.3).

COMPEPTENCY	UNIVERSITY OF BELIZE	GALEN UNIVERSITY	WESLEY JR COLLEGE
Analyzing, developing, interpreting and evaluating complex system design and architecture specifications, data models and diagrams in the development, configuration and integration of computer systems	IC	IC	PC
Assessing and recommending improvements to network operations and integrated hardware, software, communications and operating systems	IC	NC	IC
Researching, analyzing, evaluating and monitoring network infrastructure to ensure that networks are configured to operate at optimal performance	NC	NC	IC
Providing specialist skills in supporting and troubleshooting network problems and emergencies	IC	NC	IC
Installing, configuring, testing, maintaining and administering new and upgraded networks, software database applications, servers and workstations	PC	NC	IC
Preparing and maintaining procedures and documentation for network inventory, and recording diagnosis and resolution of network faults, enhancements and modifications to networks and maintenance instructions	IC	NC	IC
Monitoring network traffic and activity, capacity and usage to ensure continued integrity and optimal network performance	NC	NC	IC

NOTES: NC= "No Coverage" IC = "Improper Coverage" PC = "Proper Coverage"

# SECTION 4.2.4 DATA AND NETWORK PROFESSIONALS N.E.C.

This “not elsewhere classified” group includes job titles such as Data miners, Security Specialist, and Digital Forensic Specialists. The set of skills, as shown in Table 4.2.4, are mostly unsupplied by Galen University for which the respondents indicated “No Coverage” for all tasks except “Developing plans to safeguard computer files against accidental or unauthorized modification, destruction or disclosure and to meet emergency data processing needs”.

On the other hand, all skills for this Unit Group are somewhat provided by the University of Belize at the “Improper Coverage” level.

TAB 4.2.4-2529	DATABASE AND NETWORK PROFESSIONALS NOT ELSEWHERE CLASSIFIED			
	UNIVERSITY OF BELIZE	GALEN UNIVERSITY	WESLEY JR COLLEGE	
Developing plans to safeguard computer files against accidental or unauthorized modification, destruction or disclosure and to meet emergency data processing needs	IC	IC	PC	
Training users and promoting security awareness to ensure system security and to improve server and network efficiency	IC	NC	PC	
Conferring with users to discuss issues such as computer data access needs, security violations and programming changes	IC	NC	PC	
Monitoring current reports of computer viruses to determine when to update virus protection systems	IC	NC	PC	
Modifying computer security files to incorporate new software, correct errors or change individual access status	IC	NC	PC	
Monitoring use of data files and regulate access to safeguard information in computer files	IC	NC	PC	
Performing risk assessments and executing tests of data processing system to ensure functioning of data processing activities and security measures	IC	NC	IC	
Encrypting data transmissions and erecting firewalls to conceal confidential information as it is being transmitted and to keep out tainted digital transfers.	IC	NC	IC	

**NOTES:** NC= “No Coverage” IC = “Improper Coverage” PC = “Proper Coverage”

## SECTION 5.0 SKILLED AGRICULTURE AND FISHERY WORKERS

The Belizean economy is benefited by the abundance of arable land and natural resources that have logically led to the development of the country's agriculture sector. Among Belize's most essential commodity exports are bananas, citrus, sugar, and more recently beans and livestock. However, while Belize technically should have a comparative advantage in agriculture given its natural endowments, in order to maximize its potential in this sector—including aquaculture—an adequately trained workforce is a necessity.

To that end, Tables 5.1.1 to 5.3.3 report on the self-assessment survey responses from officials at secondary-level institutions that offer a specialized agriculture program.

# SECTION 5.1 MARKET GARDENERS AND CROP GROWERS

The ISCO-08 describes Market Gardeners and Crop Growers as those who “plan, organize and perform operations to grow and harvest field crops; to grow fruit and other tree and shrub crops; to grow garden vegetables and medicinal and other plants; and to produce horticultural and horticultural nurseries products for sale or delivery on a regular basis to wholesale buyers, marketing organizations or at markets”.

This class of workers is distinguished from those found in Sub-major Group 63: Subsistence Farmers, Fishers, Hunters and Gathers, as at that level the commodities are produced only for consumption at the household level and not for the market.

## 5.1.1 FIELD CROP AND VEGETABLE GROWERS

The institutions that provided responses to the survey were the Agriculture and Natural Resources Institute (ANRI) and the Belize High School of Agriculture (BHSA). As can be seen in Table 5.1.1, both schools provide near complete (“Proper”) coverage of the skills associated with this field. The individual scores for both ANRI and BHSA are comfortably above 80 percent.

TAB 5.1.1-6111 FIELD CROP AND VEGETABLE GROWERS		
COMPEPTENCY	ANRI	BELIZE HIGH SCHOOL OF AGRICULTURE
Monitoring market activity and conditions, determining types and quantities of crops to be grown, and planning and coordinating production accordingly	PC	PC
Preparing soil by hand or machine, and spreading fertilizers and manure	PC	PC
Selecting and sowing seeds, and planting seedlings	PC	PC
Maintaining crops by cultivating soil, by transplanting, pruning or thinning plants, and by setting up and operating irrigation equipment	IC	PC
Controlling weeds, pests and diseases by applying herbicides and pesticides	PC	PC
Harvesting crops and destroying diseased or superfluous crops	PC	PC
Inspecting, cleaning, grading, packaging, storing and loading crops for sale or delivery to market	PC	PC
Tending working animals and maintaining farm buildings, structures, equipment and water supply systems	PC	IC
Storing and carrying out some processing of produce	IC	NC
Promoting and marketing products, arranging the sale, purchase and transportation of produce and supplies and maintaining and evaluating records of farm activities and transactions	PC	IC
Training and supervising workers in crop production, maintenance duties and health and safety precautions, and hiring and discharging workers and contractors.	IC	IC

**NOTES:** NC= “No Coverage” IC = “Improper Coverage” PC = “Proper Coverage”

## 5.1.2 TREE AND SHURB CROP GROWERS

Originally, this job title was associated with eleven ISCO-08 identified skills. However, given that many of the skills are already covered elsewhere (including many of those identified in Section 5.1.1), only the two skills unique to this job category were included in the survey instrument.

As can be easily gleaned from Table 5.1.2, both institutions' overall score on this job category are virtually identical, despite individual response differences. The result being well within the upper bound, indicates that the skills necessary for planning, growing and harvesting of trees "and shrubs such as fruit and nut trees, tea and coffee bushes, grape vines, berry-bearing bushes, cocoa trees and rubber trees" are adequately supplied at these institutions. Like all market-oriented jobs, the end goal is for sale to wholesalers, buyers, marketing organizations or at markets.

TAB 5.1.2-6112 TREE AND SHURB CROP GROWERS		Belize High School of Agriculture	
	COMPEPTENCY	ANRI	BELIZE HIGH SCHOOL OF AGRICULTURE
	Maintaining crops by cultivating soil, by transplanting, pruning or thinning trees and shrubs, and by setting up and operating irrigation equipment	IC	PC
	Tending trees or bushes, collecting sap and harvesting crops	PC	IC

**NOTES:** NC= "No Coverage" IC = "Improper Coverage" PC = "Proper Coverage"

## 5.1.3 GARDENERS, HORTICULTURE AND NURSERY GROWERS

This category speaks to occupations such as landscape gardeners, horticultural scientists and mushroom cultivators. Both ANRI and BHSa provide coverage of these skills at an adequate level. The percentage score for both ANRI and BHSa are both above 75, with ANRI being well over 90.

Consequently, based on the respondents' responses, it is safe to surmise that this skill is adequately provided for by these institutions. However, the difficulty faced is likely one of accessibility as of the more than 50 high schools found throughout the country of Belize, only four secondary institutions and the Agriculture College of the University of Belize, Central Farm Campus, provide any training in agriculture.

COMPEPTENCY	ANRI	BELIZE HIGH SCHOOL OF AGRICULTURE
Monitoring market activity and conditions, determining types and quantities of crops to be grown, and planning and coordinating production accordingly	PC	PC
Preparing soil by hand or machine, and spreading fertilizers and manure	PC	PC
Selecting and sowing seeds, and planting seedlings	PC	PC
Maintaining crops by cultivating soil, by transplanting, pruning or thinning plants, and by setting up and operating irrigation equipment	PC	PC
Controlling weeds, pests and diseases by applying herbicides and pesticides	IC	IC
Harvesting crops and destroying diseased or superfluous crops	PC	PC
Inspecting, cleaning, grading, packaging, storing and loading crops for sale or delivery to market	PC	IC
Tending working animals and maintaining farm buildings, structures, equipment and water supply systems	PC	IC
Storing and carrying out some processing of produce	PC	NC
Promoting and marketing products, arranging the sale, purchase and transportation of produce and supplies and maintaining and evaluating records of farm activities and transactions	PC	IC
Training and supervising workers in crop production, maintenance duties and health and safety precautions, and hiring and discharging workers and contractors.	IC	IC

NOTES: NC= "No Coverage" IC = "Improper Coverage" PC = "Proper Coverage"

## 5.1.4 MIXED CROP GROWERS

As was done for Unit Group 6112, the list of skills associated with Mixed Crop Growers was refocused to only two that were unique to this Unit Group (6114). While ANRI's coverage of the skills is comfortably in the upper bound zone, BHSA falls within the midrange for this occupation. The overall score between both institutions suggests a midrange score. However, it must be noted that there are at least three other institutions that provide some form of agriculture training or the other; however, no responses to this survey were obtained from these other institutions.

COMPEPTENCY	ANRI	BELIZE HIGH SCHOOL OF AGRICULTURE
Maintaining crops by cultivating soil, by transplanting, pruning or thinning trees and shrubs, and by setting up and operating irrigation equipment	PC	IC
Tending trees or bushes, collecting sap and harvesting crops	IC	NC

NOTES: NC= "No Coverage" IC = "Improper Coverage" PC = "Proper Coverage"



# SECTION 5.2 SKILLED AGRICULTURE AND FISHERY WORKERS

The general duties of Animal Producers involve the performance of farming operations “to breed and raise domesticated animals, poultry, insects and non-domesticated animals for the production of meat, dairy products, honey, skins, textiles and other products, or for use as working, sporting or recreational animals, for sale or delivery to wholesale buyers, marketing organizations or at markets” (ISCO-08, p. 265).

## 5.2.1 LIVESTOCK AND DAIRY PRODUCERS

This occupation focuses on those who raise domesticated animals such as sheep, cattle, goats, and horses, to name a few, except poultry. Based on the feedback from the respondents, the overall curriculum covers the requisite skills up to the lower end of the upper bound. However, the results vary significantly across individual institutions, with once again, ANRI's curriculum comfortably providing “Proper Coverage”. This is not the case for the BHSA's curriculum.

TAB 5.2.1-6121 LIVESTOCK AND DAIRY PRODUCERS			
	COMPEPTENCY	ANRI	BELIZE HIGH SCHOOL OF AGRICULTURE
	Monitoring market activity and conditions, determining kinds and amounts of stock to produce, and planning and coordinating production accordingly	PC	PC
	Cultivating pastures and providing and monitoring fodder and water supplies to maintain appropriate nutritional levels and condition of livestock	PC	PC
	Monitoring and examining animals to detect illness, injury or disease, and to check physical condition such as rate of weight gain	PC	PC
	Grooming, marking, clipping, trimming, drenching and/or castrating animals, and shearing coats to collect hair or wool	PC	PC
	Herding livestock to pastures for grazing or to scales, sheds, vehicles or other enclosures	IC	IC
	Milking animals by hand or using milking machines	PC	PC
	Mixing feed, additives and medicines in prescribed portions and distributing or hand-feeding to animals for consumption	PC	IC
	Performing duties related to livestock reproduction, such as breeding, artificial insemination and helping with animal births	PC	IC
	Slaughtering and skinning animals and preparing them for market	PC	IC
	Storing and carrying out some processing of animal and dairy produce	PC	NC
	Promoting and marketing products, arranging the sale, purchase and transportation of livestock, produce and supplies, and maintaining and evaluating records of farm activities and transactions	PC	IC
	Training and supervising workers in animal care procedures, maintenance duties and health and safety precautions, and hiring and discharging workers and contractors.	IC	IC

**NOTES:** NC= “No Coverage” IC = “Improper Coverage” PC = “Proper Coverage”

## 5.2.2 POULTRY PRODUCERS

According to the ISCO-08 (p. 266) description, Poultry Producers perform “farming operations to breed and raise chickens, turkeys, geese, ducks and other poultry to produce meat, eggs and breeding stock for sale or delivery to wholesale buyers, marketing organizations or at markets”. With the exception of one “Improper Coverage” response, ANRI’s curriculum, once again, adequately covers most of the skills for this occupation, as it comfortably falls within the higher end of upper bound. This, however, is not the case for BHSA, which falls within the midrange.

TAB 5.2.2-6122 POULTRY PRODUCERS		
COMPEPTENCY	ANRI	BELIZE HIGH SCHOOL OF AGRICULTURE
Monitoring and examining poultry to detect illness, injury or disease and to check physical condition such as rate of weight gain, and removing weak, ill and dead poultry from flock	PC	PC
Vaccinating poultry via drinking water, injection or dusting of air	PC	PC
Collecting and storing eggs and packaging them for sale or delivery to market	PC	IC
Determining sex of chicks and facilitating breeding, artificial insemination and hatching of eggs	PC	NC
Slaughtering and dressing poultry for sale or delivery to market	PC	PC
Storing and carrying out some processing of produce	PC	IC
Training and supervising workers in poultry production procedures, maintenance duties and health and safety precautions, and hiring and discharging workers and contractors	IC	PC

**NOTES:** NC= “No Coverage” IC = “Improper Coverage” PC = “Proper Coverage”

## 5.2.3 APIARISTS AND SERICULTURISTS

This occupational field involves those who raise insects such as honey bees and silkworms to produce honey, beeswax and silk. Although falling within the lower end of the Upper Bound, ANRI’s curriculum also appears to adequately provide trainings in this field, while two out of the three skills listed are not provided by BHSA. It is, however, noteworthy that the full list for this occupation has seven prioritized skills, but due to the fact that several of the skills are already accounted for in other Unit Groups they were not included here.

TAB 5.2.3-6123 APIARISTS AND SERICULTURISTS		
COMPEPTENCY	ANRI	BELIZE HIGH SCHOOL OF AGRICULTURE
Purchasing insects and growing or purchasing feed and other supplies	PC	PC
Breeding, raising and tending insects and collecting their products	PC	PC
Storing and carrying out some processing of produce	PC	IC

**NOTES:** NC= “No Coverage” IC = “Improper Coverage” PC = “Proper Coverage”

# SECTION 5.3 FISHERIES WORKER

As shown in Tables 5.3.1 to 5.3.3, the ISCO-08 classification had divided the Fishery Workers occupation into three related sub-categories: Aquaculture Workers, Inland & Coastal Waters Fishery Workers, and Deep-sea Fishery Workers. It is especially noteworthy that unlike occupations found under Section 5.1 and 5.2, these occupational fields are virtually completely uncovered by the respondent institutions.

The absence of any real coverage by ANRI is in itself notable, as the results presented in Sections 5.1 and 5.2 indicate that this institution's curriculum is generally more comprehensive and adequate. Given that Belize has a growing aquaculture sector, the lack of formal, institutionalized curricula suggests that most trainings are conducted on-the-job, informally or via some other means.

TAB 5.3.1-6221 AQUACULTURE WORKERS			BELIZE HIGH SCHOOL OF AGRICULTURE
	COMPEPTENCY	ANRI	
	Breeding, raising and cultivating fish, mussels, oysters and other forms of aquatic life as cash crops or for release into freshwater or saltware	NC	NC
	Collecting and recording growth, production and environmental data	NC	NC
	Conducting and supervising stock examinations in order to identify diseases or parasites	NC	NC
	Monitoring environments to ensure maintenance of optimum conditions for aquatic life	NC	NC
	Directing and monitoring trapping and spawning of fish, egg incubation and fry rearing, applying knowledge of management and fish culturing techniques	NC	NC
	Cleaning, freezing, icing or salting catch on or offshore, and preparing fish and other products for shipment	NC	NC
	Maintaining buildings, tanks, machinery, boats and other equipment	NC	NC
	Delivering or marketing products	PC	NC
	Renting or investing in buildings, equipment and machinery, and purchasing food and other supplies	IC	NC
	Supervising and training aquaculture and fish hatchery support workers	NC	NC

**NOTES:** NC= "No Coverage" IC = "Improper Coverage" PC = "Proper Coverage"

TAB 5.3.2-6222 INLAND AND COASTAL WATERS FISHERY WORKERS			
	COMEPTENCY	ANRI	BELIZE HIGH SCHOOL OF AGRICULTURE
	Preparing and repairing nets and other fishing gear and equipment	NC	NC
	Selecting areas for fishing, plotting courses and computing navigational positions using compass, charts and other aids	NC	NC
	Operating fishing vessels to, from and at fishing grounds	NC	NC
	Baiting, setting, operating and hauling in fishing gear by hand or using hoisting equipment	NC	NC
	Maintaining engine fishing gear and other on-board equipment	NC	NC
	Keeping records of transactions, fishing activities and weather and sea conditions, and estimating costs and budgets	NC	NC
	Removing catches from fishing equipment, measuring them to ensure compliance with legal size and returning undesirable or illegal catches to the water	NC	NC
	Directing fishing operations, and supervising fishing crew members	NC	NC
<b>NOTES:</b> NC= "No Coverage" IC = "Improper Coverage" PC = "Proper Coverage"			

TAB 5.3.3-6223 DEEP SEA FISHERY WORKERS			
	COMEPTENCY	ANRI	BELIZE HIGH SCHOOL OF AGRICULTURE
	Commanding and operating fishing vessels to, from and at deep-sea fishing grounds	NC	NC
	Steering vessels and operating navigational instruments and electronic fishing aids	NC	NC
	Recording fishing progress and activities, as well as weather and sea conditions, on ship's log	NC	NC
<b>NOTES:</b> NC= "No Coverage" IC = "Improper Coverage" PC = "Proper Coverage"			

# SECTION 6.0 DISCUSSION AND FINDINGS

Based on the results presented in Sections 4 and 5 above, the discussion, in this section, is also aligned with the respective ISCO-08 Minor Groups. In the case of ICT, for example, these are Minor Groups 252 (Software and Applications Developers and Analysts) and 252 (Database and Network Professionals).

Figures 4 through 8, however, must not be read as being representative of the percentage of skills covered versus what is not covered. Being that the three-point scale in the survey utilized a value of one (1) for “No Coverage”, then even a skill area that is not provided for by an institution still receives a score (lowest possible score .33 or 33%). Instead, the graphs below provide a relative and comparative look at the skills in such a way to show which skills are least covered, and therefore, in need of more attention by relevant authorities.

For that reason, consistent with the scale utilized, any score found in the “mid-range” which constitutes below 70% but above 40% would be associated with “Improper Coverage”. Naturally, any skill with score below or above the “mid-range” would be associated with “No Coverage” and “Proper Coverage”, respectively.

# SECTION 6.1 DISCUSSION AND FINDINGS

**FIG 4 SKILLS COVERAGE FOR SOFTWARE AND APPLICATIONS DEVELOPERS AND ANALYSTS**

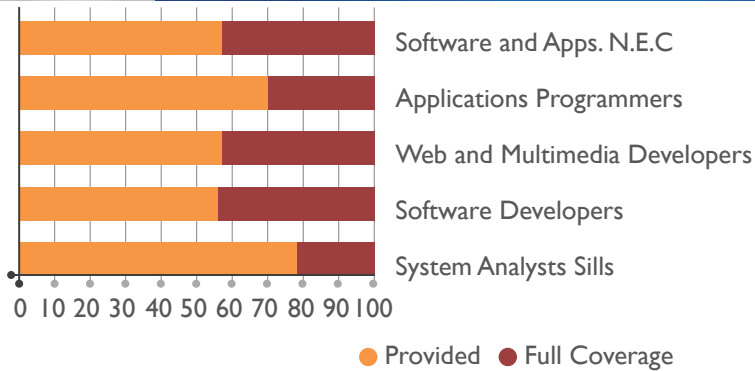
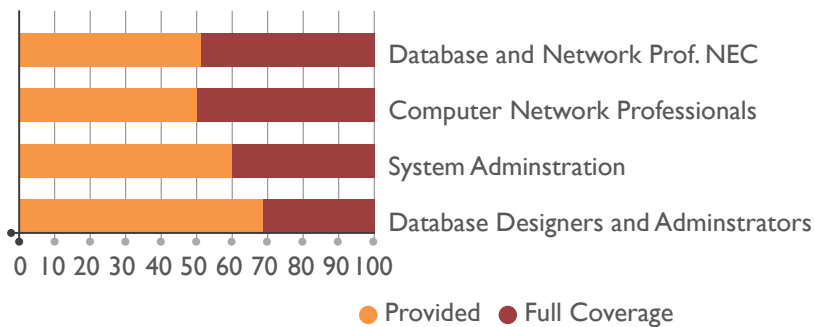


Figure 4 shows that Software Developers, which falls within Minor Group 251—Software and Applications Developers and Analysts—is the least provided. In line with the scale used, software development score falls within the “midrange”, which is representative of “Improper Coverage” in this study.

**FIG 5 DATABASE AND NETWORK PROFESSIONALS**



This finding is fairly consistent with anecdotal reports from industry professionals who have underscored the need for more personnel with adequate training in programming languages, and other relevant skills associated with software development.

Closely following software developer skills, it is shown that the provision of formal training in Web and Multimedia development also falls within the “Improper Coverage” area,

Applications Programmers falls right at the lower-bound limit of the “Proper Coverage” range (i.e. 70% or above).

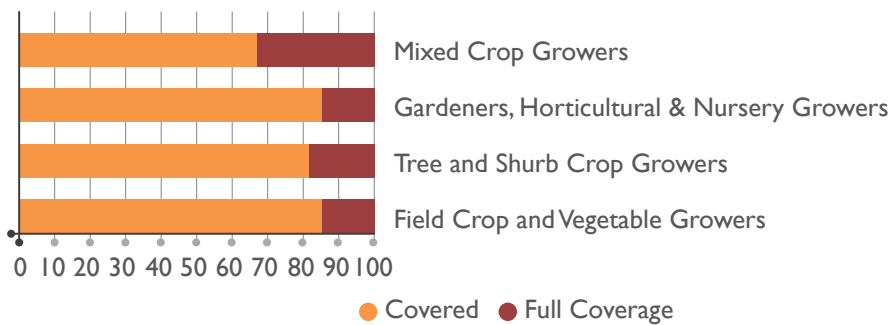
It is, however, unexpected to find that Unit Group 2515—Software & Applications Developers and Analysts Not Elsewhere Classified—so closely rivaling the perceived gap between skills needed and what is provided by the represented institutions. The skills that make up this category range from common-place activities such as “installing software and hardware and configuring operating system software in preparation for testing”, or verifying that “programs function according to user requirements and established guidelines”. Nonetheless, both tertiary-level institutions reported that this class of skills is “Improperly” or “Not” Covered (See Table 4.1.5).

Figure 5 provides an overview of the results from Minor Group 252—Database and Network Professionals. The skills relevant for “Computer Network Professionals” are shown to have the least provision between the two universities. This finding suggests that the requisite research and analysis skills necessary to “recommend strategies for network architecture and development” are undersupplied via academia.

Second to Unit Group 2523 is Database and Network Professionals Not Elsewhere classified with the ISCO-08 (Unit Group 2529). As shown in Table 4.2.4 both institutions’ provision of this particular set of skills range from Improper to “No” coverage of the eight skills identified within this group.

# SECTION 6.2 SKILLED AGRICULTURE AND FISHERY WORKERS (PRELIMINARY)

FIG 6 MARKET GARDENERS AND CROP GROWERS

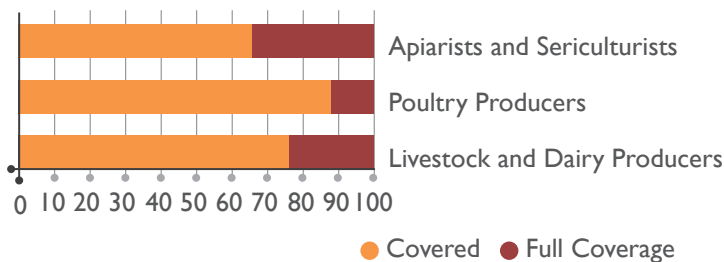


With the exception of Apiarists and Sericulturists (See Figure 7) and Mixed Crop Growers (See Figure 6), the training provided by institutions such as Belize High School of Agriculture, and the Agriculture and Natural Resource Institute (ANRI) fall above the midrange, and are, therefore, more associated with “Proper Coverage”.

as well as the Animal Producers' categories such as Livestock and Dairy producers and Poultry Producers closely satisfy the skill demands of not only the Belize market, but within the global market as reflected in the ISCO-08.

Said differently, the programs for Field Crop and Vegetable Growers,

FIG 7 MARKET GARDENERS AND CROP GROWERS

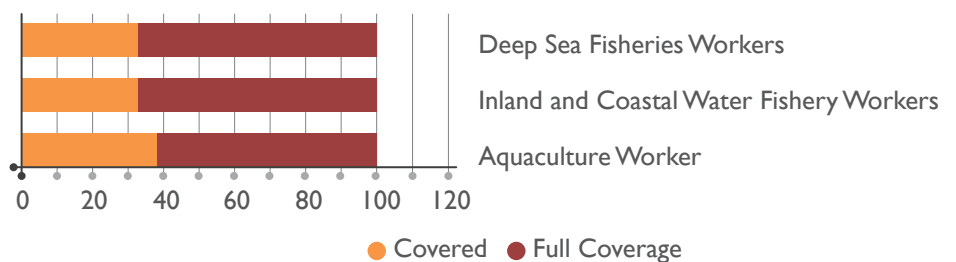


The relevant question, then, is the number of students who attend and graduate from these institutions. A secondary question is also whether or not these programs ought to be adapted at other secondary schools throughout the country so as to increase the accessibility of such trainings to potential workers in the agriculture sector.

of respondent institutions, Fisheries content is quite the opposite. As Figure 8 shows, coverage for Fisheries-related training all fall below the midrange into the “Not Covered” zone—an area which, by designing the scale to have a value of one (1) and not “zero” as the lowest value, is fairly difficult to arrive at in this study.

The Belize Fisheries Department was also contacted regarding the availability of Fisheries-related trainings availability in the country. The Department confirmed that there was no known institution in the country that provided any formal, institutionalized and long-term training for the sub-sector. The only existing trainings are intermittent sessions associated with donor programs or projects.

FIG 8 FISHERIES WORKERS



The Fisheries Department's officials did indicate that they are working on developing a type of apprenticeship program for fishers, but at current, the training in the industry is likely informal and largely familial in nature.

# SECTION 7.0 RECOMMENDATIONS

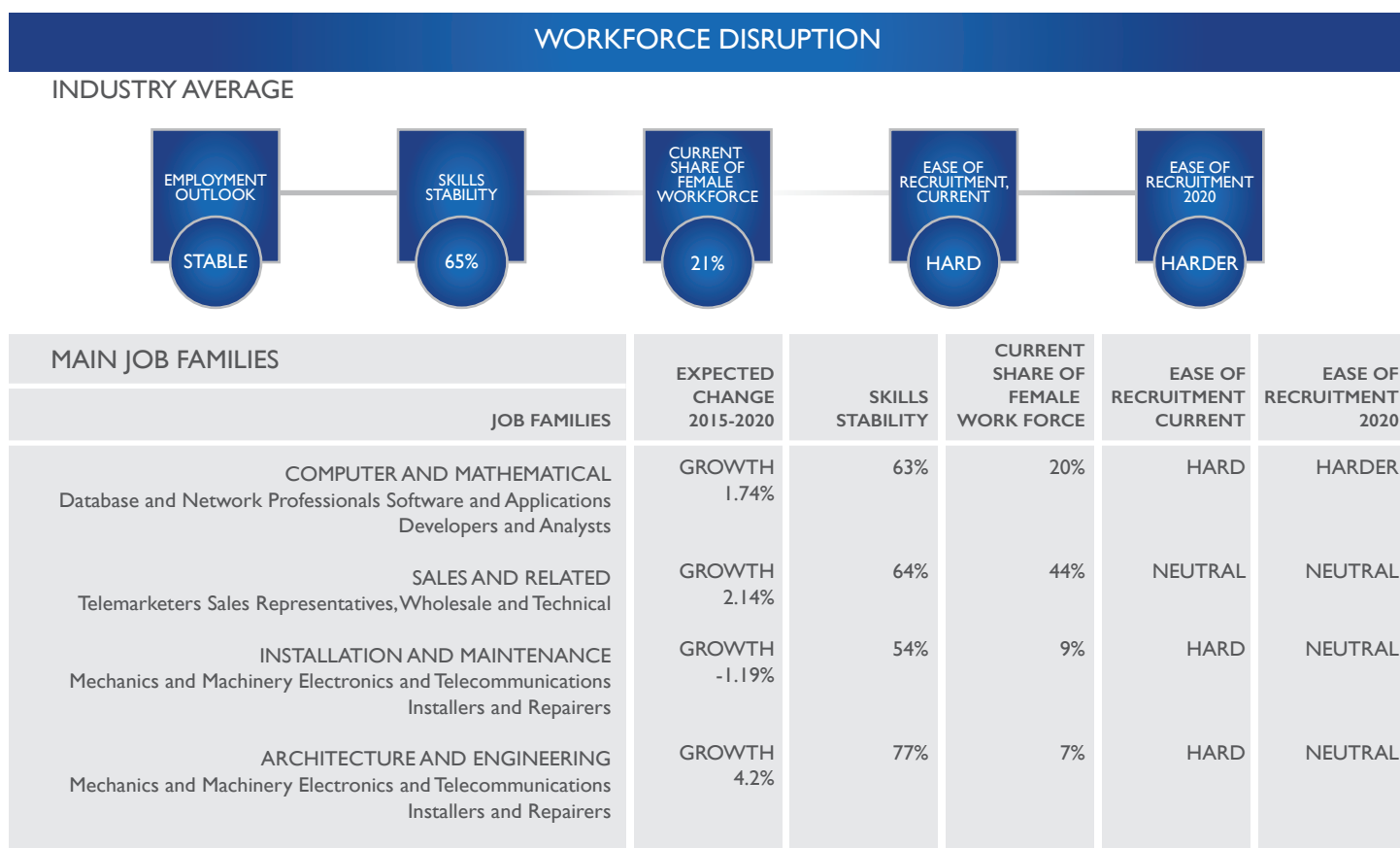
This study, first and foremost, was a curricula mismatch analysis. Therefore, by design, it considered only the formal training(s) provided for two priority sectors: Agriculture and ICT. It must be underscored; however, that on-the-job training or more informal methods also play a significant role in the labour force, and cannot be summarily overlooked.

Notwithstanding the above, the subsequent portions of this report provide recommendations on how to address the curricula mismatch, especially where—as shown in Section 6—there is “Improper Coverage” even in schools that specialize in a particular sector.

## 7.1 STRONGER EMPHASIS ON SOFTWARE, WEB DEVELOPMENT AND DATABASE NETWORKING

As the global IT industry outlook continues to trend upward up to 2020 or beyond, it is imperative that software development skills be prioritized in Belize’s formal education institutions if our ICT professionals will be able to help the Belizean economy keep up with international trends.

Fundamentally, with reports such as the World Economic Forum (WEF)’s The Future of Jobs<sup>15</sup> report predicting an average 1.74% growth in this sector; and an expected increase in the degree of difficulty in recruiting software and applications developers and analysts, graduates would need to enter the workforce fully capable of keeping up with the growing demands for this class of professionals.





As valid industry workforce strategies between now and 2020, the WEF (2016) report revealed that 35% of respondents considered closer collaboration with educational institution as necessary. To this end, it is advisable that the relevant institutions consult regularly with ICT companies both locally and, where possible, internationally to identify the specific needs of the labor market. Any adjustment to the programs offered at tertiary level institutions should be informed by such consultations.

While ICT professionals are classed at Skill Level 4, it is also prudent for relevant ICT skill development to begin much earlier in the education system—possible even as early as elementary school in some aspects. Such early starts could free up resources at the tertiary-level institutions, as they would not have to cover certain fundamentals. Instead, they would be afforded more time to focus on developing skills identified as needed by the industry. This approach is also useful for Web and Multimedia trainings, and areas identified as deficient under Database and Network Professionals Unit Groups.

## 7.2 STRENGTHEN FISHERIES CURRICULA

For the most part, agriculture-related curricula appear to adequately provide the necessary skills as identified by the ISCO-08. However, this statement does not apply to the Fisheries sector, where virtually no long-term, formal, and institutionalized training program exists currently.

Belize has a growing marine sector, which despite more recent exogenous setbacks, is expected to grow in the medium term. To optimize the output in this sector, it is useful for aquaculture training to be added as a choice within the agriculture curricula throughout the country.

## 7.3 EXPAND THE NUMBER OF INSTITUTIONS OFFERING PROGRAMS

As stated earlier, the focus of this study is a curricula/syllabi analysis. However, a secondary observation is the scant number of institutions that offer specific programs in agriculture. In Belize, there are fifty-six (56) secondary schools; however, only about four offer an actual agriculture program. This is a counterintuitive statistic for a country for which the primary sector makes up approximately 15% of output on average.

To add to the Skill-Level 2 provision of this class of skills, the Agriculture College of the University of Belize, Central Farm Campus, has recently established a certificate program in agriculture, thereby, adding a fifth secondary or post-secondary (non-tertiary level) training to those already available. However, again, this is located only in the Cayo District.

Fundamentally, every school has limited capacity; therefore, in any given year, the number of students enrolled in any agriculture program at these schools cannot exceed their cumulative max enrollment figures. To alleviate this, a policy initiative should be to increase the number of schools that offer agriculture as a program choice at the high school level.

This recommendation does not imply the need to build entirely new institutions, but rather for the existing secondary schools to be expanded where possible. This would also address the distance variable, and the need to travel to schools such as ANRI to Central Farm, Cayo, from distant towns or districts.

<sup>15</sup>World Economic Forum (2016). *The Future of Jobs: Employment, Skills and Workforce Strategy for the Fourth Industrial Revolution*. Available at: [http://www3.weforum.org/docs/WEF\\_Future\\_of\\_Jobs.pdf](http://www3.weforum.org/docs/WEF_Future_of_Jobs.pdf)

# CONCLUSION

The objective of this report is to identify whether or not there exist a curricula mismatch between skills required for the workforce and that supplied by the education system. This study, after having confirmed the positive relationship between skills mismatch and unemployment at the macro-economic level, utilized the ISCO-08 skills-occupation classifications as a proxy for the demand-side skills. The supply-side was obtained via self-assessment surveys from ranking personnel representing the relevant learning institutions.

The study found that in the ICT sector there is need for universities to strengthen their syllabi so as to improve the skill levels of software developers and database and network professionals. However, overall, the curricula review showed that the skills provided, while relatively close to the “Improper Coverage” designation, are closer to the lower-end of proper coverage and provision of relevant material.

In terms of the agriculture sector, it was also found that the training provided within the agriculture sector sufficiently matches the ISCO-08 for most areas; however, formal trainings for fisheries-sector is conspicuously absent. There is no long-term, institutionalized training provided by any school or organization in the country.

This paper recommends that not only should the institutions strengthen their programs in areas of conspicuous weaknesses; it is also incumbent on the Government of Belize, via the Ministry of Education, to increase student’s accessibility to these programs. For example, in the Belize District, students have little to no immediate access to agriculture training. And to attend schools such as the Belize High School of Agriculture, UB Central Farm campus, or ANRI, it would require extensive commuting.

Lastly, it is practical for educational institutions, as a matter of sound workforce policy, to collaborate more closely with the labor market, as employers are very likely able to elucidate to the learning institutions what specific skills are being demanded by the private sector.

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# APPENDIX A

TAB A.1 MODEL ESTIMATES

DEPENDENT VARIABLE: UNEMPLOYMENT	FIXED-EFFECTS ESTIMATOR (1)	FIXED-EFFECTS ESTIMATOR (2)	FIXED-EFFECTS ESTIMATOR ROBUST STD. ERROR (3)	POOLED OLS (4)	POOLED OLS TIME AND DIST. DUMMIES (5)
Log-change in Skill Mismatch Index	0.074*** (.025)	.071 (.044)	.071*** (.0179)	.176*** (.0432)	.142*** (.039)
Constant	-1.581 (.186)	-1.716 (.383)	-1.716 (.154)	-.850 (.376)	-.623 (.284)
Observations	24	48	48	48	48
Adjusted R-Squared	.549	.25	.25	.239	.415

NOTES: \*\*\* denotes statistical significance at 10%, 5%, and 1%, respectively. Standard Errors are reported in parentheses. Pooled OLS model, according to Breusch-Pagan test, does not display any signs of heteroskedasticity. Model (5) also uses robust standard errors, as the original Model (5) without the robust standard errors showed signs of heteroskedasticity.

TAB A.2 SKILLS MISMATCH INDEX METHODOLOGY

The model employed in this report is patterned after that utilized in Humal (2013) and ECB (2012), which were both based on the methodology used by Estevão & Tsounta (2011). All studies used the Skills Mismatch Index (SMI) to quantify the mismatch at a macroeconomic level. Along with demographic controls, the aforementioned studies used SMI and output per capita as explanatory variables that were regressed on unemployment, the dependent variable.

This study, however, deviated from the original model due to data and time constraints. Therefore, the only variables employed in this study are unemployment and SMI. Similar to Humal (2013)'s usage of county-level fixed effects and time effects, the current model also provides for intra-district effects for each of the six districts. Consequently, the Model takes the form:

$$u_{it} = b_0 + b_1 SMI_{it} + \eta_i + \gamma_t + \varepsilon_{it}$$

Where i refer to individual districts and t represents the years:

- $u_{it}$  is the log of unemployment rate;
- $SMI_{it}$  is the log of the Skills Mismatch Index
- $\eta_i$  Represents individual districts fixed effects
- $\gamma_t$  Represents year effects
- $\varepsilon_{it}$  The error term

Multiple different specifications of the model were explored; however, only five are presented in this report as show in Table A.1. Model 5, a Pooled OLS Model, utilizes time and district dummies.

The Skill Mismatch Index is calculated in line with the formula specifications in ECB (2012):

$$SMI_{it} = \sum_{j=1}^3 (S_{ijt} - D_{ijt})^2$$

Where i refer to individual districts and t represents the years:

- $S_{ijt}$  is the share of the Labor Force with skill level j;
- $SMI_{it}$  is the log of the Skills Mismatch Index
- $D_{ijt}$  Is the share of employed persons with skill level j in the district at time t.

Skill levels (represented by i) are primary or lower, secondary and tertiary, which corresponds with low-, semi-, and high-skilled, respectively.

TAB A.3 SKILLS MISMATCH BY DISTRICT FOR MONTH OF APRIL 2013-2016

DISTRICT	YEAR	SKILLS MISMATCH INDEX APRIL	DISTRICT
Corozal	2013	0.00088	0.11300
Corozal	2014	0.00005	0.10100
Corozal	2015	0.00017	0.06800
Corozal	2016	0.00023	0.04600
Orange Walk	2013	0.00015	0.10500
Orange Walk	2014	0.00018	0.07400
Orange Walk	2015	0.00001	0.06300
Orange Walk	2016	0.00015	0.07200
Belize	2013	0.00031	0.11500
Belize	2014	0.00064	0.14300
Belize	2015	0.00029	0.10300
Belize	2016	0.00031	0.09600
Cayo	2013	0.00023	0.12400
Cayo	2014	0.00014	0.12100
Cayo	2015	0.00011	0.13400
Cayo	2016	0.00023	0.08000
Stann Creek	2013	0.00027	0.15000
Stann Creek	2014	0.00021	0.08100
Stann Creek	2015	0.00027	0.14600
Stann Creek	2016	0.00027	0.10600
Toledo	2013	0.00025	0.08000
Toledo	2014	0.00000	0.04100
Toledo	2015	0.00002	0.03700
Toledo	2016	0.00025	0.03900

TAB A.4 SKILLS MISMATCH BY DISTRICT FOR MONTH OF SEPTEMBER 2013-2016

DISTRICT	YEAR	SKILLS MISMATCH INDEX APRIL	DISTRICT
Corozal	2013	0.00010	0.15200
Corozal	2014	0.00004	0.11300
Corozal	2015	0.00004	0.10200
Corozal	2016	0.00017	0.11100
Orange Walk	2013	0.00040	0.11900
Orange Walk	2014	0.00005	0.10300
Orange Walk	2015	0.00006	0.09500
Orange Walk	2016	0.00056	0.08400
Belize	2013	0.00050	0.13000
Belize	2014	0.00057	0.13100
Belize	2015	0.00056	0.07900
Belize	2016	0.00089	0.12800
Cayo	2013	0.00094	0.16600
Cayo	2014	0.00045	0.11000
Cayo	2015	0.00071	0.14000
Cayo	2016	0.00016	0.09900
Stann Creek	2013	0.00024	0.15100
Stann Creek	2014	0.00100	0.18300
Stann Creek	2015	0.00034	0.15200
Stann Creek	2016	0.00037	0.17700
Toledo	2013	0.00013	0.12700
Toledo	2014	0.00020	0.06500
Toledo	2015	0.00002	0.05800
Toledo	2016	0.00016	0.03400

# APPENDIX B

## INFORMATION AND COMMUNICATIONS TECHNOLOGY QUESTIONNAIRE TO REVIEWERS

Thank you for your willingness to participate in this survey.

This survey is part of a study being conducted by the International Labour Organization (ILO) and the Belize Chamber of Commerce and Industry (BCCI). The goal is to assess the degree to which program offerings and learning outcomes match the required skills demanded by employers in specific fields. The demand-side skills are derived from the internationally recognized International Standard Classification of Occupations (ISCO-08). Kindly indicate the degree to which you believe the identified skills from the ISCO-08 are obtained by students who complete the program at your university.

**Please indicate your position within your institution \***

Please choose... ▼

**Please indicate which of the following educational institutions you represent. \***

- Galen University
- University of Belize
- University of West Indies
- Wesley Junior College
- San Pedro Jr. College
- St. John's College Junior College
- John Paul II Junior College
- Sacred Heart Jr. College
- Belize Adventist Junior College
- Centro Escolar Mexico Jr. College
- Corozal Junior College
- Muffles Junior College
- Independence Junior College
- Stann Creek Ecumenical Jr. College
- Independent Reviewer



**2511 WEB ASYSTEMS ANALYSTS SKILLS**

COMPEPTENCY	NOT COVERED	SOMEWHAT COVERED	PROPER COVERAGE
Consulting with users to formulate document requirements and with management to ensure agreement on systems principles	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Identifying and analyzing business processes, procedures and work practices	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Identifying and evaluating inefficiencies and recommending optimal business practices and system functionality and behavior	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Taking responsibility for developing functional solutions, such as creating, adopting and implementing system test plans	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Developing functional specifications for use by systems developers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Expanding or modifying systems to improve workflow or serve new purposes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Coordinating and linking the computer systems within an organization to increase compatibility *	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**NOTES:** NC= "No Coverage" IC = "Improper Coverage" PC = "Proper Coverage"

**2512 SOFTWARE DEVELOPERS**

COMPEPTENCY	NOT COVERED	SOMEWHAT COVERED	PROPER COVERAGE
Researching, analysing and evaluating requirements for software applications and operating systems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Researching, designing and developing computer software systems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Consulting with engineering staff to evaluate interfaces between hardware and software *	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Developing and directing software testing and validation procedures	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Modifying existing software to correct errors, to adapt it new hardware or to upgrade interfaces and improve performance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Directing software programming and development of documentation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Assessing, developing, upgrading and documenting maintenance procedures for operating systems, communications environments and applications software	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Consulting with customers concerning maintenance of software systems.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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2513 WEB AND MULTIMEDIA DEVELOPERS

COMPEPTENCY	NOT COVERED	SOMEWHAT COVERED	PROPER COVERAGE
Analyzing, designing and developing Internet sites by applying a mixture of artistry and creativity with software programming and scripting languages and interfacing with operating environments;	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Designing and developing digital animations, imaging, presentations, games, audio and video clips and Internet applications using multimedia software, tools and utilities, interactive graphics and programming languages;	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
communicating with network specialists regarding web-related issues such as security hosting websites, to control and enforce Internet and web server security, space allocation, user access, business continuity, website backup and disaster recovery planning;	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Designing, developing and integrating computer code with other specialized inputs such as image files, audio files and scripting languages to produce, maintain and support websites;	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Assisting in analyzing, specifying and developing Internet strategies, web-based methodologies and development plans	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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2514 APPLICATION PROGRAMERS

COMPEPTENCY	NOT COVERED	SOMEWHAT COVERED	PROPER COVERAGE
Writing and maintaining program code outlined in instructions and specifications in accordance with quality accredited standards	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Revising, repairing or expanding existing programs to increase operating efficiency or adapt to new requirements	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Conducting trial runs of programs and software applications to confirm that they will produce the desired information	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Compiling and writing documentation of program development	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Identifying and communicating technical problems, processes and solutions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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## 2515 SOFTWARE AND APPLICATIONS DEVELOPERS AND ANALYSTS NOT ELSEWHERE CLASSIFIED

COMPEPTENCY	NOT COVERED	SOMEWHAT COVERED	PROPER COVERAGE
Developing and documenting software testing plans	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Installing software and hardware and configuring operating system software in preparation for testing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Executing, analysing and documenting results of software application tests and information and telecommunications systems tests	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Verifying that programs function according to user requirements and established guidelines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Developing and implementing software and information system testing policies, procedures and scripts.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

NOTES: NC= "No Coverage" IC = "Improper Coverage" PC = "Proper Coverage"

## DATABASE AND NETWORK PROFESSIONALS

### 2521 DATABASE DESIGNERS AND ADMINISTRATORS

COMPEPTENCY	NOT COVERED	SOMEWHAT COVERED	PROPER COVERAGE
Designing and developing database architecture, data structures, tables, dictionaries and naming conventions for information systems projects	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Designing, constructing, modifying, integrating, implementing and testing database management systems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Conducting research and providing advice on the selection, application and implementation of database management tools	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Developing and implementing data administration policy, documentation, standards and models	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Developing policies and procedures for database access and usage and for the backup and recovery of data	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Performing the operational establishment and preventive maintenance of backups and recovery procedures, and enforcing security and integrity controls	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

NOTES: NC= "No Coverage" IC = "Improper Coverage" PC = "Proper Coverage"

2522 SYSTEM ADMINISTRATORS

COMPEPTENCY	NOT COVERED	SOMEWHAT COVERED	PROPER COVERAGE
Maintaining and administering computer networks and related computing environments, including computer hardware, systems software, applications software and all configurations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Recommending changes to improve systems and network configurations, and determining hardware or software requirements related to such changes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Diagnosing hardware and software problems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Performing data backups and disaster recovery operations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Operating master consoles to monitor the performance of computer systems and networks, and to coordinate network access and use	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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2523 COMPUTER NETWORK PROFESSIONALS

COMPEPTENCY	NOT COVERED	SOMEWHAT COVERED	PROPER COVERAGE
Analyzing, developing, interpreting and evaluating complex system design and architecture specifications, data models and diagrams in the development, configuration and integration of computer systems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Assessing and recommending improvements to network operations and integrated hardware, software, communications and operating systems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Researching, analyzing, evaluating and monitoring network infrastructure to ensure that networks are configured to operate at optimal performance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Providing specialist skills in supporting and troubleshooting network problems and emergencies	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Installing, configuring, testing, maintaining and administering new and upgraded networks, software database applications, servers and workstations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Preparing and maintaining procedures and documentation for network inventory, and recording diagnosis and resolution of network faults, enhancements and modifications to networks and maintenance instructions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Monitoring network traffic and activity, capacity and usage to ensure continued integrity and optimal network performance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

NOTES: NC= "No Coverage" IC = "Improper Coverage" PC = "Proper Coverage"

COMPEPTENCY	NOT COVERED	SOMEWHAT COVERED	PROPER COVERAGE
Developing plans to safeguard computer files against accidental or unauthorized modification, destruction or disclosure and to meet emergency data processing needs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Training users and promoting security awareness to ensure system security and to improve server and network efficiency	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Conferring with users to discuss issues such as computer data access needs, security violations and programming changes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Monitoring current reports of computer viruses to determine when to update virus protection systems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Modifying computer security files to incorporate new software, correct errors or change individual access status	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Monitoring use of data files and regulate access to safeguard information in computer files	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Performing risk assessments and executing tests of data processing system to ensure functioning of data processing activities and security measures	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Encrypting data transmissions and erecting firewalls to conceal confidential information as it is being transmitted and to keep out tainted digital transfers.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

NOTES: NC= "No Coverage" IC = "Improper Coverage" PC = "Proper Coverage"

# SKILLED AGRICULTURAL AND FISHERIES WORKER SURVEY TO PROGRAM REVIEWERS

Thank you for your willingness to participate in this survey.

This survey is part of a study being conducted by the International Labour Organization (ILO) and the Belize Chamber of Commerce and Industry (BCCI). The goal is to assess the degree to which program offerings and learning outcomes match the required skills demanded by employers in specific fields. The required skills (indicator for employers' demand) are derived from the internationally recognized International Standard Classification of Occupations (ISCO-08), which associates jobs to their appropriate skill level as shown in the International Standard Classification of Education (ISCED-97). To assist us with this study, kindly indicate the degree to which you believe the identified skills are covered and are expected to be acquired by students who complete the program at your institution.

**Please indicate which of the following educational institutions you represent \***

- Chunox St. Viator Vocational High School
- Escuela Secundaria Técnica México
- Belize High School of Agriculture
- Agriculture and Natural Resource Institute – ANRI
- ITVET
- Independent Reviewer

**Please indicate your position within the institution \***

- Head of Department
- Lecturer
- Administrator
- Other

Please indicate the degree to which a graduate of the program would be able to perform the following duties

6111 FIELD CROP AND VEGETABLE GROWERS			
COMPEPTENCY	NOT COVERED	SOMEWHAT COVERED	PROPER COVERAGE
Monitoring market activity and conditions, determining types and quantities of crops to be grown, and planning and coordinating production accordingly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Preparing soil by hand or machine, and spreading fertilizers and manure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Selecting and sowing seeds, and planting seedlings	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Maintaining crops by cultivating soil, by transplanting, pruning or thinning plants, and by setting up and operating irrigation equipment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Controlling weeds, pests and diseases by applying herbicides and pesticides	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Harvesting crops and destroying diseased or superfluous crops	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Inspecting, cleaning, grading, packaging, storing and loading crops for sale or delivery to market	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tending working animals and maintaining farm buildings, structures, equipment and water supply systems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Storing and carrying out some processing of produce	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Promoting and marketing products, arranging the sale, purchase and transportation of produce and supplies and maintaining and evaluating records of farm activities and transactions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Training and supervising workers in crop production, maintenance duties and health and safety precautions, and hiring and discharging workers and contractors.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>NOTES:</b> NC= "No Coverage" IC = "Improper Coverage" PC = "Proper Coverage"			

6112 TREE AND SHURB CROP GROWERS			
COMPEPTENCY	NOT COVERED	SOMEWHAT COVERED	PROPER COVERAGE
Maintaining crops by cultivating soil, by transplanting, pruning or thinning trees and shrubs, and by setting up and operating irrigation equipment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tending trees or bushes, collecting sap and harvesting crops	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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6113 GARDENERS; HORTICULTURAL AND NURSERY GROWERS

COMPEPTENCY	NOT COVERED	SOMEWHAT COVERED	PROPER COVERAGE
Monitoring market activity and conditions determining kinds and amounts of vegetables and horticultural and nursery products to be grown, and planning and coordinating production accordingly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Preparing land by conditioning soil, leveling ground and installing and operating irrigation and drainage systems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Planting trees, hedges, garden plants and grass	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pruning and trimming trees, shrubs and hedges, installing plant supports and protection, and rolling, mowing, aerating and edging lawns	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Constructing features and facilities within gardens, such as paths or paved areas, walls, rockeries, garden beds, ponds and water features, sheds and fences	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Checking the health of plants and trees, identifying and treating weeds, pests and diseases, and applying mulch and fertilizers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Producing saplings, bulbs and seeds and raising plants from seeds or cuttings	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Harvesting crops and inspecting, cleaning, grading, packaging, storing and loading products for sale or delivery to market	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Maintaining buildings, greenhouses and other structures, equipment and water supply systems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Storing and carrying out some processing of produce	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Promoting and marketing products, arranging the sale, purchase and transportation of produce and supplies, and maintaining and evaluating records of activities and transactions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Training and supervising workers in production, maintenance duties, and health and safety precautions, and hiring and discharging workers and contractors	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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6114 MIXED CROP GROWERS

COMPEPTENCY	NOT COVERED	SOMEWHAT COVERED	PROPER COVERAGE
Growing flowers and vegetables by intensive cultivation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Producing saplings, bulbs and seeds	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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# ANIMAL PRODUCERS

## 6121 LIVESTOCK AND DAIRY PRODUCERS

COMPEPTENCY	NOT COVERED	SOMEWHAT COVERED	PROPER COVERAGE
Monitoring market activity and conditions, determining kinds and amounts of stock to produce, and planning and coordinating production accordingly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cultivating pastures and providing and monitoring fodder and water supplies to maintain appropriate nutritional levels and condition of livestock	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Monitoring and examining animals to detect illness, injury or disease, and to check physical condition such as rate of weight gain	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Grooming, marking, clipping, trimming, drenching and/or castrating animals, and shearing coats to collect hair or wool	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Herding livestock to pastures for grazing or to scales, sheds, vehicles or other enclosures	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Milking animals by hand or using milking machines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mixing feed, additives and medicines in prescribed portions and distributing or hand-feeding to animals for consumption	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Performing duties related to livestock reproduction, such as breeding, artificial insemination and helping with animal births	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Slaughtering and skinning animals and preparing them for market	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Storing and carrying out some processing of animal and dairy produce	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Promoting and marketing products, arranging the sale, purchase and transportation of livestock, produce and supplies, and maintaining and evaluating records of farm activities and transactions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Training and supervising workers in animal care procedures, maintenance duties and health and safety precautions, and hiring and discharging workers and contractors.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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6122 POULTRY PRODUCERS

COMPEPTENCY	NOT COVERED	SOMEWHAT COVERED	PROPER COVERAGE
Monitoring and examining poultry to detect illness, injury or disease and to check physical condition such as rate of weight gain, and removing weak, ill and dead poultry from flock	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Vaccinating poultry via drinking water, injection or dusting of air	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Collecting and storing eggs and packaging them for sale or delivery to market	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Determining sex of chicks and facilitating breeding, artificial insemination and hatching of eggs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Slaughtering and dressing poultry for sale or delivery to market	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Storing and carrying out some processing of produce	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Training and supervising workers in poultry production procedures, maintenance duties and health and safety precautions, and hiring and discharging workers and contractors	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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6123 APIARISTS AND SERICULTURISTS

COMPEPTENCY	NOT COVERED	SOMEWHAT COVERED	PROPER COVERAGE
Purchasing insects and growing or purchasing feed and other supplies	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Breeding, raising and tending insects and collecting their products	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Storing and carrying out some processing of produce	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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# FISHERIES WORKER

## TAB 5.3.1-6221 AQUACULTURE WORKERS

COMPEPTENCY	NOT COVERED	SOMEWHAT COVERED	PROPER COVERAGE
Breeding, raising and cultivating fish, mussels, oysters and other forms of aquatic life as cash crops or for release into freshwater or saltware	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Collecting and recording growth, production and environmental data	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Conducting and supervising stock examinations in order to identify diseases or parasites	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Monitoring environments to ensure maintenance of optimum conditions for aquatic life	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Directing and monitoring trapping and spawning of fish, egg incubation and fry rearing, applying knowledge of management and fish culturing techniques	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cleaning, freezing, icing or salting catch on or offshore, and preparing fish and other products for shipment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
maintaining buildings, tanks, machinery, boats and other equipment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Delivering or marketing products	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Renting or investing in buildings, equipment and machinery, and purchasing food and other supplies	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Supervising and training aquaculture and fish hatchery support workers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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## TAB 5.3.2-6222 INLAND AND COASTAL WATERS FISHERY WORKERS

COMPEPTENCY	NOT COVERED	SOMEWHAT COVERED	PROPER COVERAGE
Preparing and repairing nets and other fishing gear and equipment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Selecting areas for fishing, plotting courses and computing navigational positions using compass, charts and other aids	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Operating fishing vessels to, from and at fishing grounds	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Baiting, setting, operating and hauling in fishing gear by hand or using hoisting equipment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Maintaining engine fishing gear and other on-board equipment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Keeping records of transactions, fishing activities and weather and sea conditions, and estimating costs and budgets	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Removing catches from fishing equipment, measuring them to ensure compliance with legal size and returning undesirable or illegal catches to the water	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Directing fishing operations, and supervising fishing crew members	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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COMPEPTENCY	NOT COVERED	SOMEWHAT COVERED	PROPER COVERAGE
Commanding and operating fishing vessels to, from and at deep-sea fishing grounds	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Steering vessels and operating navigational instruments and electronic fishing aids	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Recording fishing progress and activities, as well as weather and sea conditions, on ship's log	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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# APPENDIX C

## UNIVERSITIES IN BELIZE

UNIVERSITIES IN BELIZE				
DISTRICT	SCHOOL NAME	CITY   TOWN   VILLAGE	PRESIDENT	PHONE NUMBER
Belize Cayo Toledo	University of Belize <i>(various faculties)</i>	Belmopan <i>(Belize City, Punta Gorda, Central Farm)</i>	Alan Slusher	822.1000
Belize	Univeristy of West Indies School of Continuing	Princess Margret Drive. Belize City	Jane Bennett <i>(Resident Tutor)</i>	223.0484
Cayo	Galen University	Central Farm, Cayo District	Andreas Charalambous	824.3226

# APPENDIX D.1

## SOFTWARE AND APPLICATIONS DEVELOPERS AND ANALYSTS

TAB 4.1.1-2511 SYSTEMS ANALYSTS SKILLS		UNIVERSITY OF BELIZE	GALEN UNIVERSITY	WESLEY JR COLLEGE
COMPEPTENCY				
Consulting with users to formulate document requirements and with management to ensure agreement on systems principles		PC	PC	IC
Identifying and analyzing business processes, procedures and work practices		PC	IC	IC
Identifying and evaluating inefficiencies and recommending optimal business practices and system functionality and behavior		IC	IC	IC
Taking responsibility for developing functional solutions, such as creating, adopting and implementing system test plans		IC	PC	IC
Developing functional specifications for use by systems developers		PC	PC	IC
Expanding or modifying systems to improve workflow or serve new purposes		IC	IC	PC
Coordinating and linking the computer systems within an organization to increase compatibility *		IC	NC	PC

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TAB 4.1.2-2512 SOFTWARE DEVELOPERS		UNIVERSITY OF BELIZE	GALEN UNIVERSITY	WESLEY JR COLLEGE
COMPEPTENCY				
Researching, analysing and evaluating requirements for software applications and operating systems		IC	PC	PC
Researching, designing and developing computer software systems		IC	IC	IC
Consulting with engineering staff to evaluate interfaces between hardware and software *		NC	IC	IC
Developing and directing software testing and validation procedures		NC	IC	IC
Modifying existing software to correct errors, to adapt it new hardware or to upgrade interfaces and improve performance		NC	IC	PC
Directing software programming and development of documentation		NC	PC	IC
Assessing, developing, upgrading and documenting maintenance procedures for operating systems, communications environments and applications software		NC	NC	IC
Consulting with customers concerning maintenance of software systems.		NC	IC	IC

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TAB  
4.1.3-2513

**WEB AND MULTIMEDIA DEVELOPERS**

COEPTENCY	UNIVERSITY OF BELIZE	GALEN UNIVERSITY	WESLEY JR COLLEGE
Analyzing, designing and developing Internet sites by applying a mixture of artistry and creativity with software programming and scripting languages and interfacing with operating environments;	PC	IC	IC
Designing and developing digital animations, imaging, presentations, games, audio and video clips and Internet applications using multimedia software, tools and utilities, interactive graphics and programming languages;	NC	IC	IC
Communicating with network specialists regarding web-related issues such as security hosting websites, to control and enforce Internet and web server security, space allocation, user access, business continuity, website backup and disaster recovery planning;	IC	NC	IC
Designing, developing and integrating computer code with other specialized inputs such as image files, audio files and scripting languages to produce, maintain and support websites;	IC	IC	IC
Assisting in analyzing, specifying and developing Internet strategies, web-based methodologies and development plans	NC	NC	IC

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TAB  
4.1.4-2514

**APPLICATIONS PROGRAMMERS**

COEPTENCY	UNIVERSITY OF BELIZE	GALEN UNIVERSITY	WESLEY JR COLLEGE
Writing and maintaining program code outlined in instructions and specifications in accordance with quality accredited standards	IC	PC	IC
Revising, repairing or expanding existing programs to increase operating efficiency or adapt to new requirements	NC	PC	PC
Conducting trial runs of programs and software applications to confirm that they will produce the desired information	IC	IC	PC
Compiling and writing documentation of program development	IC	PC	PC
Identifying and communicating technical problems, processes and solutions	IC	IC	PC

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COMPEPTENCY	UNIVERSITY OF BELIZE	GALEN UNIVERSITY	WESLEY JR COLLEGE
Developing and documenting software testing plans	IC	IC	PC
Installing software and hardware and configuring operating system software in preparation for testing	IC	IC	IC
Executing, analysing and documenting results of software application tests and information and telecommunications systems tests	IC	NC	IC
Verifying that programs function according to user requirements and established guidelines	IC	IC	IC
Developing and implementing software and information system testing policies, procedures and scripts.	NC	NC	IC

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# APPENDIX D.2

## DATABASE AND NETWORK PROFESSIONALS

TAB 4.2.1-2521 DATABASE DESIGNERS AND ADMINISTRATORS				
COMPETENCY	UNIVERSITY OF BELIZE	GALEN UNIVERSITY	WESLEY JR COLLEGE	
Designing and developing database architecture, data structures, tables, dictionaries and naming conventions for information systems projects	IC	IC	PC	
Designing, constructing, modifying, integrating, implementing and testing database management systems	IC	IC	IC	
Conducting research and providing advice on the selection, application and implementation of database management tools	PC	PC	IC	
Developing and implementing data administration policy, documentation, standards and models	IC	IC	IC	
Developing policies and procedures for database access and usage and for the backup and recovery of data	IC	IC	IC	
Performing the operational establishment and preventive maintenance of backups and recovery procedures, and enforcing security and integrity controls	IC	NC	IC	

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TAB 4.2.2-2522 SYSTEMS ADMINISTRATORS				
COMPETENCY	UNIVERSITY OF BELIZE	GALEN UNIVERSITY	WESLEY JR COLLEGE	
Maintaining and administering computer networks and related computing environments, including computer hardware, systems software, applications software and all configurations	PC	IC	IC	
Recommending changes to improve systems and network configurations, and determining hardware or software requirements related to such changes	IC	NC	IC	
Diagnosing hardware and software problems	PC	IC	IC	
Performing data backups and disaster recovery operations	IC	NC	IC	
Operating master consoles to monitor the performance of computer systems and networks, and to coordinate network access and use	NC	NC	PC	

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TAB  
4.2.3-2523

**COMPUTER NETWORK PROFESSIONALS**

COMPEPTENCY	UNIVERSITY OF BELIZE	GALEN UNIVERSITY	WESLEY JR COLLEGE
Analyzing, developing, interpreting and evaluating complex system design and architecture specifications, data models and diagrams in the development, configuration and integration of computer systems	IC	IC	PC
Assessing and recommending improvements to network operations and integrated hardware, software, communications and operating systems	IC	NC	IC
Researching, analyzing, evaluating and monitoring network infrastructure to ensure that networks are configured to operate at optimal performance	NC	NC	IC
Providing specialist skills in supporting and troubleshooting network problems and emergencies	IC	NC	IC
Installing, configuring, testing, maintaining and administering new and upgraded networks, software database applications, servers and workstations	PC	NC	IC
Preparing and maintaining procedures and documentation for network inventory, and recording diagnosis and resolution of network faults, enhancements and modifications to networks and maintenance instructions	IC	NC	IC
Monitoring network traffic and activity, capacity and usage to ensure continued integrity and optimal network performance	NC	NC	IC

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TAB  
4.2.4-2529

**DATABASE AND NETWORK PROFESSIONALS NOT ELSEWHERE CLASSIFIED**

COMPEPTENCY	UNIVERSITY OF BELIZE	GALEN UNIVERSITY	WESLEY JR COLLEGE
Developing plans to safeguard computer files against accidental or unauthorized modification, destruction or disclosure and to meet emergency data processing needs	IC	IC	PC
Training users and promoting security awareness to ensure system security and to improve server and network efficiency	IC	NC	PC
Conferring with users to discuss issues such as computer data access needs, security violations and programming changes	IC	NC	PC
Monitoring current reports of computer viruses to determine when to update virus protection systems	IC	NC	PC
Modifying computer security files to incorporate new software, correct errors or change individual access status	IC	NC	PC
Monitoring use of data files and regulate access to safeguard information in computer files	IC	NC	PC
Performing risk assessments and executing tests of data processing system to ensure functioning of data processing activities and security measures	IC	NC	IC
Encrypting data transmissions and erecting firewalls to conceal confidential information as it is being transmitted and to keep out tainted digital transfers.	IC	NC	IC

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# APPENDIX E

## TERMS OF REFERENCE

### CALL FOR CONSULTANT- ILO RESEARCH TO IDENTIFY SKILLS GAP IN BELIZE

**Location:** Belize

**Background:**

At a Regional bi- bipartite meeting in Grenada November 3rd-5th 2015, the Belize Chamber of Commerce and Industry the Employers representative for Belize requested the assistance of the International Labour Organization to conduct a research that would identify the skills gap that exists in Belize.

**Objectives:**

The main objective is to review the training curriculum in the fields of Tourism, Agriculture and ICT and identify gaps in the competencies that are being sought in the labour market. The research should also propose recommendations for addressing these gaps.

**Task:**

- 1 Identify the broad skills/competencies available in the labour market
- 2 Identify the core skills needed in the labour market specifically in the fields of tourism, agriculture and ICT
- 3 Make recommendations for addressing the gap broadly and specific recommendations in relation to tourism, agriculture and ICT
- 4 Develop an advocacy strategy outlining the process and key stakeholders (Government (Minister of Education, TVET, ETES, Minister of Agriculture, Minister of Tourism,) Unions, The National Tripartite) the BCCI should lobby to influence changes to the curriculum
  - (a) Make presentation of findings to the BCCI
  - (b) Make presentation at a National Tripartite workshop

**Duration:**

The anticipated duration of the entire process is 60 days, starting 1 December 2016

**Required Qualifications:**

- 1 Masters Degree in the Social Sciences, Education, Economics, Statistics or related fields relevant for the assignment.
- 2 At least 5 years relevant professional experience
- 3 Proven experience in research and writing analytical papers
- 4 Familiarity with Belize's skills landscape, the current National development processes, priorities and challenges.

**Application:**

Interested applicants should send a detailed proposal outlining how the research will be conducted and the methodology to be deployed including a budget to the CEO, Belize Chamber of Commerce and Industry. 4792 Coney Drive, Belize City, Belize.



