Greetings from the IIPGH team!

The Institute of ICT Professionals Ghana (IIPGH) is a non-profit professional Association which is made up of professionals in various domains of Information and Communications Technology (ICT) practice. The Institute is a connector of ICT professionals from Government MDAs, educational institutions, corporate organizations, start-ups, investors and the civil society organizations to create a vibrant ICT ecosystem in Ghana and beyond. The organization aims at using its platform to equip professionals and students with skills in emerging technologies such as Data Science, cloud computing, Cybersecurity, Software development, 4G/5G technology etc. needed for entrepreneurship, employment and business growth in today’s fast moving technological world. Over the years the institute has made tremendous progress and impact in the Ghanaian corporate and social communities. This significant contribution was made possible by the team at IIPGH.

The team consists of the executive director, 2 directors, board of directors, service personnels, technical team and the general membership of IIPGH. As a team, we welcome all readers to this maiden edition of “TheDigiMag” (A magazine on technology from the Institute of ICT Professionals Ghana). We aim at sensitizing the general Ghanaian populace on the issues of digitization and the influence of technology on our way of life as a people. Undoubtedly, we are in the digital economy in which development and transformation is mainly led by the advancement in technology. It therefore becomes imperative that if not all, majority of Ghanaians should be well equipped with skills and knowledge in the emerging technologies. In this edition of the DigiMag, we will show you all that we have, what has been going on around us in the field of technology, our coding success story, some government of Ghana initiatives in the digitization drive and the activities to expect from the institute of ICT Professionals Ghana. Once again, welcome and we hope you enjoy this digital ride with us.

IIPGH Team.

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THINGS TO EXPECT IN THIS EDITION.

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Before we can discuss any topic, we have to agree on the subject matter. What is Digital? What is Entrepreneurship? What is Digital Entrepreneurship?

Most dictionaries describe digital as having to do with digits and numbers. In fact, the SedcoWordMaster Dictionary (shameless plug here for our Sedco Dictionary) defines it as showing quantities in the form of numbers and electronic system that uses 0 and ones to store sound or information.

On its basic level that is true but to the average person it basically means Internet. You say digital and the next thing that comes up is social media, websites and invariably Internet.

An Entrepreneur is defined as a person who makes money starting a new business, especially one in which there may be some risk. (understatement of the year.) So, I will define entrepreneurship as the enterprise of being an entrepreneur.

So, concatenating the two words we have Digital Entrepreneurship to mean an enterprise on the Internet by someone or some company willing to take some amount of RISK. Now let’s take a very basic look at an attempt of digital entrepreneurship in Ghana.

How are we connecting to the Internet in Ghana?
- Satellite – still relatively expensive
- Copper / DSL – which is being slowly phased out
- Fibre – our “new” buzz word
- Mobile Internet – most common form of connection.

There are many Internet Service Providers however a few that are common include: SURFLINE, MTN, VODACOM, AIRTEL,TIGO, GLO, MAIN ONE, ZIPNET, TELEDATA ICT, COMSYS, DOLPHIN, KNET, INTERNET SOLUTION, and ECOBAND.

So now that we have internet access; what is next? Which platform are we going to use. In Ghana we are more likely to use Social media platforms than web-based platforms for sales and advertisements. Blogs and basic company web pages however still have a presence on the traditional online platforms.

Technology hubs are springing. Children are starting to be taught how to code, and there seems to be a gravitation to creating apps. Examples include Jumia (Which was recently launched on the NY Stock exchange), Tonaton, payangel, waatche locator, Tress, shypemate, just elect, etc.

Now let’s talk about challenges of going digital. The truth of the matter is that no matter how much we want to push the envelope the majority of our population is still not there.

We are not early adopters to technology, but when we decide to join a bandwagon we seem to go en masse. The cost of development is constant as there is no revenue coming in yet. Advertising will cost you. Another really big issue is your logistics / delivery options. Many companies and small and medium companies are having issues with it. This also directly influences your delivery costs. A product cost of 20 cedis with a delivery cost of 10 cedis will often deter customers. You also have the cost of marketing of your product or service on a platform. You also need to decide who you are selling to. Is it to a niche market or to the broad base?

You have created a Digital Business … now what? How do you keep it up? Like any other business, how and how often are you updating your business information. You must give users a reason to get on to your web page / app every day. You must drive “stickiness”. Slay queens on Instagram do this best. For example, a medical based app must provide more than just access to a doctor. It must provide localized news. It must provide relevant health tips and provide content that makes the user use the app every day.

Another issue you need to think about. Where are your employees? Are they local or international or just you? Your project management skills will and need to come to play.

What types of digital devices will your prospective clients be using? And finally, what methods of payments will you be using?

Payment Habits
- The main retail payment instruments used in Ghana are Cash, Cheque, Direct Credit Transfer, Direct Debit Transfer and Payment cards - debit, credit, prepaid and E-zwich cards.
- However, a recent report from ‘Better Than Cash Alliance’, an organization under the United Nations (UN) has shown that Ghanaians prefer to pay in cash rather than make payments electronically.
- The report shows that most businesses in Ghana still prefer payments in cash, but the situation is different at the government level, as the government leads in electronic payments with percent 86 percent and 14 percent in cash payments.
- The report estimates that 98 percent of payments in volume are still currently being made in cash, as individuals continue to purchase essential goods using cash.
- The strong preference for cash in Ghana is as a result of the high cost of digital payments that are passed on to users.
- Nevertheless, due to the increasing technological advancement in Ghana, online payment platforms are becoming quite popular in the country as they help make transactions easier and faster.
- Most people still prefer to pay for items bought in person in cash. However, people prefer to use their cards (VISA, MasterCard) and mobile money wallet to pay for goods purchased online.
- Ghanaians now use their mobile money wallets to make payments directly from their bank accounts. These banks are also linked to customers’ mobile money accounts for utility bills, DSTV bills, and others. Most banks in Ghana have mobile apps which allow customers to enable direct transfers into accounts.

That said we live in interesting digital times; so please go forth and take a RISK.
The Institute of ICT Professionals Ghana (IIPGH) successfully organized its maiden Tech Entrepreneurs Forum (TEF2019) at the Kofi Annan Centre of Excellence in ICT, on February 28, 2019 with the theme “Creating and capturing value for Tech Entrepreneurs in Ghana”. The Tech Entrepreneurs Forum is an IIPGH initiative to provide a platform for corporate organizations, SMEs and Startup organizations to exhibit their products and/or services in emerging technologies; identify potential technologies in delivering core services efficiently and effectively, and network with other players in the industry for possible collaborations.

The forum aims at bringing experts in some key emerging technologies to help shape the conversations on opportunities in the digital space for technology entrepreneurs. Other participants to identify employment needs of these entrepreneurs and connect with them.

The Executive Director of IIPGH, Mr. David Gowu, who gave a background of the institute and its relevance in the ICT ecosystem, opened the session and program for the day.

The event, well attended with members of the institute and the public, from varied organizations, businesses and individuals, had strategic speakers with industry experience from diverse fields of expertise.

Giving the keynote address, Mr. Ben Segbawu, Director of IT, Sedco Publishing, spoke on the landscape of tech entrepreneurship in Ghana, focusing on Digital Entrepreneurship. He discussed Unstructured Supplementary Service Data (USSD) as a service devised for financial inclusion, which remains a vital solution to many. He spoke on the cost implications on Internet services and the need to push extensively USSD solutions. “The truth of the matter is that no matter how much we want to push the envelope the majority of our population is still not there; we are not early adapters to technology; cost of development; advertising; delivery options and delivery costs”. He added that, not everyone has a steady internet connection at all times. USSDs can communicate with the service provider when there is no Internet connection and even when a user does not have phone balance left in his/her account. People usually use USSD codes to check and often recharge their phone balance. USSDs are a ground-breaking invention as they have several applications that can be of benefit to people who cannot afford a smartphone or Internet connection.

The participants had a share of live internet cybersecurity analysis by Seun Raymond Micheal, AI Cyber Defense & Security Expert from Darktrace and WASP Ltd, a managed document services organization. He focused on augmenting Cybersecurity tools with Artificial Intelligence to simulate and differentiate between network abnormality and a normal network – particularly essential in monitoring and detecting security flaws immediately and preventing malwares and attackers from infiltrating systems.

Data Science, one of the major interests of the Institute, leading to its Data Science Community build up, had its turn, presented by the founder and CEO of MineHealth and Gudra, Darlington Akogo. He took the participants through the need for data and its use for data science, juxtaposing with the future of Artificial Intelligence (AI); he pointed that Africa should be prepared for an AI Future in order to catapult our development and solve many of Africa’s grand challenges, especially connected to the Sustainable Development Goals (SDGs).

Hannah Kumah, CRTL, from TestHub, Passionate about testing and a Mentor of young girls gave an insightful presentation on Software Engineering and Quality Testing. She stated that outsourcing testing services to a software testing company as TestHub provides objectivity and allows focus on core business mandate. “Software Testing saves you the business money and ultimately makes your customers/clients happy. It reduces risk of problems and increases productivity”. She gave a profound quote “Quality is free, but only to those who are willing to pay heavily for it”.

Talking about Value Added Services, Mr. EyemeeAchah, CEO, Across Network Technologies, simplified aggregated telecom services – Providing financial inclusion with Value Added Services (VAS) by leveraging on Unstructured Supplementary Service Data (USSD) in delivering services. He narrowed on opportunities for delivering VAS which included Hosted PABX, Hosted IVR services and the use of Mobile Advertising – Narrowcasting (NOT Bulk SMS) in targeting and personalizing services.

Joel Nicco-Annan, CEO of Skypath Group then followed with his presentation on Infrastructure as a service (IaaS). He focused on the need for IaaS. To mention a few, he stated that it is perfect for scalability; less or no CAPEX; easy to manage; high productivity; less deployment time; and no hardware infrastructure expenses. He went on to state that new startups without much capital to invest in hardware or entrepreneurs starting on a shoestring budget needed to consider IaaS.

This was followed by another insightful presentation by Mr. Ransford Mensah, Digital Consultant. He took over to present the IIPGH build concept. The IIPGH build is an aggregated investment module for IT professionals. Many people have ideas for ages that they cannot develop; many also have developed ideas into solutions but cannot sell; still many have ideas but do not know the entire software development lifecycle; again, some do not have or know what it takes to involve others in their ideas to make it a product – thus, IIPGH Build. Mr. Mensah posited how IIPGH as the aggregator wants to build technology from ideas to reality; wants to support its members connect to the right skillset in ideas maturation; and to support the next big idea become a global solution.

Before closing the event filled with interactive and insightful presentations, Sumundi Ltd and Infinity Systems had the opportunity to pitch their services. Faster Than Technology, Closer to Society – Sumundi provides a lightweight, easy to use and affordable Point of Sale System with Live Sales, Inventory Management, Sales Reports, Local / Cloud Based, and Product Expiry Tracking solutions. Infinity Systems, an IBM ‘Technology’ Business Partner, believes in infinite possibilities and unlimited potential, aiming at building deep technical skills in relevant and emerging technologies like Artificial Intelligence (AI), Machine Learning, Blockchain, Big Data Analytics, Natural Language Understanding, Hybrid Cloud and Internet of Things (IoT).

The event ended with a breakout session where participants had some time with the speakers for questions and answers.
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My reason for joining the IIPGH board was clear - we need to organize ICT professionals and position them as a knowledge source for our growing economy. If that mission could benefit from my experience then I was definitely in.

That mandate includes preparing the next generation of professionals in the hope that they will achieve far greater heights than their predecessors.

The ambition to develop the next generation has led the IIPGH to foray into delivering coding classes for young people. Early exposure will set them up for future success and build a ready pipeline we can all be proud of.

When I look back at the progress made so far in empowering young people through coding, I like to see the glass as half full. Over the course of just one generation we have seen dramatic progress in enabling access to coding thanks to the effort of early believers.

One of the earliest proponents of access to computer skills in Ghana was the late Prof. Allotey. He was a brilliant mathematical physicist who could see, from his extension exposure and engagement that we had to proactively engage and create opportunities for more participation. I believe his advocacy is a reason why I received my early exposure.

It was the long vacation of form 3. A fully paid computer camp, dubbed CompuCamp, had been set up on the grounds of Achimota school. Thirty three secondary schools from across the country were asked to nominate a student each to represent their school during a 3-week long intensive residential course in coding. somehow, my school decided that I would be the representative. It was such a privilege and novelty. The 33 of us had our names published in the national newspapers and announced on GBC radio and TV (now GTV)! Imagine that? For my part I could not believe what was happening.

Today coding is no longer a novelty, it is gradually becoming a necessary empowerment tool for our young people.

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DATA SCIENCE; BUILDING ON CODING

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Today our world runs on a frontier of Data Science. I recently decided to come up to speed on Data Science; to understand what it is about because as a business leader, I am aware no business, run to scale, can survive without deep analytics. I realized my studies in coding, mathematics, statistics and decision sciences have all come to bear. It all makes sense now.

Coding is one of the key skills for the future of work. We must encourage our children to get conversant with it. To understand how it works no matter what career path they opt to take.

Will your kids be part of the coding generation?
There's a shortage of young people and in particular girls studying Science Technology Engineering and mathematics (STEM). Despite the growing demand for knowledge in STEM, college graduates with STEM degrees represent 2 percent of Africa's university age population according to a 2019 report by International Finance Corporation (IFC) on digital skills in sub-Saharan Africa. In order to close this gap and get more students especially girls to be interested in the subject, the Institute of ICT Professionals Ghana (IIPGH) in collaboration with its partners developed an initiative to create massive awareness program to promote STEM and career opportunities in Information and Communication Technology (ICT).

As part of this awareness program on Friday 14th June 2019, the women wing of the Institute of ICT Professionals Ghana in collaboration with Vodafone Ghana Women in Technology spent quality time with students of OLA Girls SHS, Ho to discuss STEM and opportunities in the ICT industry. The women technology professionals drawn from both organizations shared their technology career experience and coached the girls on career opportunities in ICT.

The program started with the headmistress Madam Regina Koffie delivering her welcome address where she gave a brief history of the school and current student population of over 1,900 girls pursuing different courses including arts and science. Prior to the welcome address, guests from IIPGH led by the Executive Director Mr. David Gowu were introduced. In order to inspire the students before the main activities of the day, Mrs. Julia Ametorwogo, a past student of OLA girls and a Vodafone Telecom engineer introduced the CTO of Vodafone Ghana, Srabasti Bhattacharjee also known as SB. The CTO in engaging the students shared a story of her career journey and emphasized the importance of STEM in the 21st century. “I started my career as an engineer then I joined the army, there I was in charge of communication which was still engineering, then later I joined Vodafone still working as an engineer” SB noted. She also stressed that the students should learn coding and aspire to become software engineers, data analyst and computer scientists.

Then came the actual presentation of the day on the topic: ICT CAREER COACHING FOR GIRLS. The first part of this insightful presentation was delivered by Vodafone Women in Technology Team led by Madam Yaa Afriyie Opoku. She passionately talked about technology as an enabler helping doctors perform surgeries through video calls, telemedicine and farmers learning about the changing weather conditions, prices of products in the market among others. The Sustainable Development Goals (SDGs) were also discussed with emphasis on quality education and a call to ensure inclusive and equitable, quality education and promote lifelong opportunities for all. Yaa then shared with the audience some practical career opportunities in technology and urged the girls to pursue careers such as Telecommunication, Software Engineering, Artificial Intelligence, Cybersecurity, Data Science, Internet of Things the students etc. She then rounded up her presentation by introducing the students to some Vodafone products tailored purposely for students: Vodafone “Bossu”, online learning platform for students to research, and the Vodafone Cash (mobile or online transaction portal) were some products presented to the students.
Part 2 of the presentation followed immediately where Madam Gifty Mottey, a past student of OLA girls and IIPGH Coding Administrator shared more insight into The Coding Project—an initiative started by the institute to train young people in computer programming and prepare them for the future. She also emphasized the need for the students to embrace technology and enroll in coding lessons which would help them develop critical thinking mindset, perseverance, and problem-solving skills. The excited students asked a lot of questions about the various coding languages they should start with and the current locations where the program currently being run. It was explained to them that the program currently runs in Dansoman, East Legon, Spintex Road, Tema among other places. In her concluding remarks, Gifty revealed that the institute is in discussion with management of OLA girls to introduce coding program in the school.

At the breakout session, Science Technology Engineering and Maths (STEM) dominated the discussions and the girls asked a lot of questions about coding, computer engineering, software engineering, telecommunications, information technology etc. Over 30 women in technology joined the girls in groups where they shared their career journey with the students and encouraged them to prepare themselves for higher education in STEM related courses by learning coding. The program was drawn to a close and the students used the opportunity to share contacts with the professionals and took lots of pictures with their visitors.
Vodafone Ghana Launches 4G Services

Vodafone Ghana has officially launched its 4G Long-Term Evolution (LTE) service—a unique and innovative technology that represents the next stage of the mobile data revolution. It is designed to work efficiently than any other before it; allowing customers to experience fast speeds, high-end network quality, faster downloads and uploads.

The LTE technology operates in the 2x5MHz frequency block in the 800MHz band as stipulated in the licence conditions agreed between Vodafone and the National Communications Authority (NCA) last December. Even ahead of commercial deployment on March 19, 2019, customers of the telecoms company are in an expectant mood of a major service boost to their experience on the network.

Vodafone is rolling out the service on the back of a reliable network and strong global expertise in deploying new technology across its major markets in the world. Launching the event, Minister for Communications, Ursula Owusu-Ekuful said: “Vodafone’s 4G launch is a timely moment for the industry. Customers and stakeholders will experience great speed, reliability and stability. The government, as a thirty per cent shareholder, is truly excited about this.

She added that “Moving forward, we will always ensure that the telecoms sector is properly regulated with the relevant policies and initiatives that only seek to enhance the sector and engender healthy competition.”

Outgoing Chief Executive Officer of Vodafone Ghana, Yolanda Cuba said: “Today, our business takes on a very different perspective – we have reinvented ourselves with the launch of 4G. Our customers – the very reason we are doing this – will get an opportunity to experience speeds that are ten times faster than any they have previously enjoyed.”

She added, “Our brand promise of an exciting future just got better and it is a tribute to the strength of our network and global expertise.”

Vodafone’s 4G comes as a standard on Vodafone Post-paid and Pay as You go offerings. Customers can test the compatibility of their phones on 4G by accessing the *700* #6 option on their handsets.

Vodafone Ghana last year won one lot out of three to begin 4G operations (2x5MHz frequency spectrum block in the 800 MHz Band) for mobile services. This followed successful financial negotiations with the National Communications Authority (NCA).
EMBRACING CODING

Technology has already started developing and embracing more human work activities and this brings a whole new dimension to the future of work and new skills required in this technological era. Considering machines cannot do everything a range of complimentary human skills from technological expertise to social and emotional capabilities in the workplace is becoming eminent. Skills like complex problem solving, critical thinking, creativity, people management, coordinating and collaborating with others, emotional intelligence, judgment and decision making, service orientation, negotiation, learning agility/lifelong learning, flexibility and cognitive thinking among others.

These skills are being cultivated directly and indirectly through the IIPGH Coding for kids programme. The programme I believe sets the stage at a very early age for STEM Entrepreneurship for young Ghanaian girls and boys and the students from this programme I am certain will contribute to improving the way that local companies do business as well as their own revenue-generating business or money-producing ventures in the near future.

Technology and change occurring at a very fast pace is making the future of work less predictable and less structured, yet provides immense and endless opportunities for humanity that can be capitalized. There are still a lot to be explored in technology to provide easier access to information, better innovation, convenience, improved lifestyle, efficiency and productivity, improved entertainment, convenience in education, improved health, social networking among others. I am encouraged that IIPGH’s initiatives will enable this and I will urge all members and member volunteers to do our bit to create the future that we want for our beloved country through the power of technology.

As children learn to code, they become better thinkers. You learn to break complex problems into simpler parts.

– Mitchel Resnick (Software Developer - known for Scratch)
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International Girls in ICT Day is an initiative backed by all ITU Member States in ITU Plenipotentiary Resolution 70 (Rev. Dubai, 2018) that aims to encourage and empower girls and young women to consider studies and careers in the growing field of ICTs, enabling both girls and technology companies to reap the benefits of greater female participation in the ICT sector.

The international Girls in ICT Day is celebrated every year on the fourth Thursday of April, with this year’s theme as “Expand Horizon, Change Attitude”.

On the 25th day of May 2019, the Institute of ICT Professionals Ghana (IIPGH) as part of its Digital Education drive decided to celebrate the International Day of Girls in ICT with the Girls from two (2) notable educational institutions in Ghana. Namely, Adonten Senior High and Sunyani Senior High School (SUSEC).

The workshop at Adonten senior high school was in collaboration with the MTN women in Tech wing and the Sunyani High School workshop was held by the Brong Ahafo regional chapter of IIPGH. The aim of these workshops was to encourage girls to take up the IT/ICT courses during their Senior High School education seriously and also pursue higher education in Computer Science/ IT and be the change the world wants to see.

Both team (IIPGH and MTN) arrived at Adonten Senior High school and paid a courtesy call on the assistant headmaster for Academics, Mr. Nathaniel Duku at 10:55am.

In attendance were the assistant head of academics - Mr. Duku; Executive Director of IIPGH - Mr. David Gowu; Director of Learning & Development at IIPGH - Mr. Richard Amanfu; supporting team from IIPGH, Core Network Engineer - Muniratu Musah and her team from MTN and the administrative staff of Adonten Senior High School.
Giving the opening address, Mr. Duku indicated that usually in Ghana, among certain sects, whenever anything relating to ICT is mentioned, it is synonymous with “Sakawa”, local name for internet fraud or scam. He posited that this mentality must be changed especially when girls get involved in ICT other than boys. He went ahead to motivate the girls to develop interest in studying ICT.

Muniratu Musah, the leader of the MTN Women in Tech team presented on the 4th SDG (Quality Education) with focus on the use of technology. She practically interacted with the girls and mentored them through questions and answers. At the apex of the questions and answers flowing from the students during her presentation, it was decided that the students be segregated into smaller groups for more effective personal engagement, thus a breakout session that lasted close to an hour.

During the breakout session, students tried to find out how relevant technology is to the various career options they have in mind. Some asked if technology was in anyway linked to being a chartered accountant, medical doctor, farmer, etc., and most of the girls also tried to find out the possible entry points available to them if they decide to join the technology field.

The team from MTN surprised the students with lots of MTN branded souvenirs during and after the question and answer session. There was something for every girl that participated in the International Day of Girls in ICT workshop.

Mr. David Gowu, the Executive Director of the Institute gave the closing remarks and emphatically said that the active involvement of the girls in technology in the 21st century gives them higher chances of success and impact. He went on to encourage the girls to appreciate ICT and said that the Institute of ICT Professionals Ghana will come back later to organize more of such programs to educate and train the girls and other interested students.

Zanetor Emmanuella, the girl's prefect gave the vote of thanks followed by the Chaplain of Adonten school, Rev Philip Kusi Asiamah, who said the closing prayer and finally brought the entire event to an end.
Teaching Computer coding in schools is necessary to expose students to technology and reveal skills needed to develop computer applications. This will help reduce the number of foreign national Information Technology experts importation for implementation of IT solutions in Ghana and also create more jobs in the IT computer programming field.

Computer coding in addition to providing technical skills also provides abilities and skills such as critical thinking, persistency, problem-solving, mathematical inclination, processing skills, determination, creativity and innovation. These abilities when developed at an early stage in students in pre-tertiary levels will help develop students in a better way to be more productive in the workforce and in their future career. Introducing coding at an earlier stage of students’ academic curriculum will help to demystify Information Technology as an intimidating area and an area for males only. The expansion of the IT sector has been a critical factor in global economic and social growth. From financial markets to healthcare sector, the efficiency improvements catalyzed by developments in the IT sector has been critical. Hence, it is of no surprise that emerging economies such as China have invested immense amounts of capital in the development of IT infrastructure to compete with that of the developed world. Developing Countries, through the harnessing of IT-related skills, such as coding in schools, can leap frog into higher levels social and economic progression.

Encouraging coding also offers an avenue for promoting gender equality and women empowerment. By targeting young girls in primary and secondary schools with the provision of computer programming studies, governments across the globe can work towards increasing female participation in the Science, Technology, Engineering and Math (STEM) field. This will have the cascading effect of leading to an increase in the number of female entrepreneurs and women-run businesses.

In emerging markets, this will also provide both new and established IT businesses with a diverse pool of technically proficient personnel to recruit from. The success chalked by organizations such as Rails Girls, Girls Who Code, Black Girls Code and Google’s Made with Coding indicate the potential that can be harnessed. Hence, it is essential for schools, especially ones with low female participation in STEM subjects, to accommodate the introduction of such initiatives.

The coding for students initiative taken by the Institute of IT Professionals Ghana (IIPGH) is a laudable idea to serve as a pilot test implementation of coding in schools in Ghana.

Creating a conducive environment in our schools for the study of coding should be pivotal for all interested stakeholders – parents, school officials and governments. Hence, efforts have to be made to facilitate higher levels of interest amongst students.

Veronica Boateng (Mrs.)
CEO & Principal Consultant, Pinnacle Logic Technologies
Board Member, Institute of ICT Professionals Ghana

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ICT EDUCATION: THE IMPORTANCE OF CODING IN SCHOOLS
Author: Veronica Boateng – (CEO & Principal Consultant, Pinnacle Logic Technologies and Board Member: Institute of ICT Professionals, Ghana) For comments, contact author: vboateng@hotmail.com
The Institute of ICT Professionals Ghana (IIPGH) in collaboration with the Department of Computer Science and Informatics at the University of Energy and Natural Resources (UENR) have celebrated this year's ITU international day for Girls in ICT at the Sunyani Senior High School (SUSEC), Sunyani, the Bono regional capital. The theme for the 2019 event was "Expand Horizon, Change Attitude". The participants were over 300 students (only girls) drawn from SHS1 and SHS2.

The chairperson for the occasion, Mr. Oppong Ansu, the Assistant Headmaster – academics of SUSEC, delivering an open address stated that, digitization is essential in the growth of the economy of every nation so the participants must position themselves to embrace the use of technology and then focus on acquiring the right skill in ICT to help the nation to achieve the sustainable development goals (SDGs).

Mr. Owusu Nyarko-Boateng, the chairman of IIPGH – BA Chapter, who is also a lecturer at the department of computer science and informatics, UENR, delivered the keynote address. In his speech, Mr. Owusu advised the participants not to shy away from IT and other technologically related disciplines, because technology has become the engine of growth in any industrialized nation. He encouraged the participants to develop a strong passion for pursuing ICT programs. Mr. Owusu further stated that the passion the participants develop would drive them to learn or improve their skill in ICT, irrespective of the course they are studying at the SHS level. In addition, the keynote speaker said that the few women in the IT sector are performing exceptionally well and they have established a good name for themselves.

A guest speaker, Mrs. Vivian Agyepong, a member of IIPGH and a lecturer at the Department of Computer Science and Informatics, UENR, reiterated that there is the need for the participants to play a pivotal role in achieving SDGs through the use technology. Another guest speaker Mrs. Bawah Faiza, a member of IIPGH and a lecturer at the Department of Computer Science and Informatics, UENR, encouraged the participants to consider choosing computer science and I.T, which lays a strong foundation in their career development in ICT.

Mr. Elvis Agyepong, the secretary of IIPGH, BA Chapter, who was the moderator for the occasion encouraged the participants to demystify the notion that ICT is a profession for only boys.

Mr. Danny Daniels moderated the question and answer session, and led the participants in a group discussion on how to acquire the right skill set to meet the expectations of the employer.

The chairperson in his closing remarks asked the participant to be serious with their studies if they really aspire to excel in the field of IT, as other women in technology have exceptionally distinguished themselves.

Report by IIPGH- BA Chapter

If we are serious about ICT, every school needs to be connected to the Internet, with computer labs accessible to students, teachers and administrators. We need to teach kids early on about programming—how to use and create technology. We need to teach coding from high school level. All kids need to have some basic understanding of how this works. – Patrick Awuah, Founder and President, Ashesi University
The IIPGH women, led by Mrs. Juliana Ametorwogo, Telecom Specialist at Vodafone Ghana, organised free workshops for girls in the Adenta and Spintex communities. They spoke to girls from the East Airport International School and the Adenta Community School.

Mrs. Juliana Ametorwogo interacted with the girls from Adenta Community School. Her presentation was on the theme: Working towards the Dream; (Practical things to do) and she shared her experience with the girls to motivate them.

Mrs. Thelma Efua Quaye, Head of Netguard Group & former CTO of Airtel Ghana, also interacted with the girls from East Airport International School. The girls were so enthused as they were introduced to the cyberspace and its numerous options.

She is calling on all technology inclined women out there to join the institute and help reach out to the girls with technology.

“Learning to write programs stretches your mind, and helps you think better, creates a way of thinking about things that I think is helpful in all domains.” — Bill Gates, Co-Chairman, Bill & Melinda Gates Foundation, Co-Founder, Microsoft
The fourth industrial revolution is here with us and we must all be prepared to embrace it. One of its key requirements is digital skills that open the door to participate and take advantage of this advanced technological era. The world is witnessing the fastest industrial revolution since the first revolution, thanks to the rapid technological advancement particularly in the 21st century. Artificial Intelligence (AI), Robotics, Software Engineering, Internet of Things (IoT), Virtual Reality (VR) and a host of new and emerging technologies are shaping our world and how we conduct our businesses.

Another very important technological invention in the 20th century is the Internet. It is a connecting infrastructure on which most of these emerging technologies ride and has also been going through transformation with the introduction of Smart phones and other smart devices connected via broadband internet service. The real game changer is the much talked about 5G technology which promises high download and upload speed. It is expected that the high speed being offered by 5G will power driverless cars (autonomous vehicles) and big data processing for industries that would help in automation.

Conversations about these advanced technologies are fascinating but there is a huge skills gap globally when it comes to commercial deployment of some of these new technologies. Technology companies are constantly in search of people with expertise to innovate, develop and improve their products and services in their quest to commercialize some of these new technologies. According to a recent report by business insider, organizations such as Google, Apple and Netflix don't require university degrees to hire engineers into their companies. All is an attempt to remove barriers that would prevent them from getting highly skilled individuals with the required digital skills.

Apart from high demand of experts with the technical know-how to develop these technologies, there is also a big gap in the digital skills required for users or consumers of these products and services. Technology is not useful if the intended market does not know how to apply it. This shortfall in digital skills is inhibiting the rapid deployment of technology for accelerated development according to a recent survey by International Finance Corporation (IFC) on sub-Saharan Africa. The report indicated that there is a limited access to digital talent although demand in digital skills is expected. Which means if there is no corresponding growth in digital skills workforce, Africa's economies will weaken in the face of global push for digitization.

The government of Ghana (GoG) has been making effort in its digitization drive with initiatives such as; the launch of the National Property Addressing System to provide digital addresses for parcels of land and properties in the entire country, the implementation of the E-Justice system at the shipping harbor to improve efficiency, the implementation of the E-Procurement all attest to the fact that GoG is committed to transforming the economy from an agrarian to a knowledge-based technologically driven one for rapid development. Communication sector has also been diversified which allows private sector participation and investment. There are at least five (5) privately owned fiber optics submarine cables terminating at the shores of Ghana which provides internet and connects Ghana to the rest of the world. There are multinational telecommunication and internet service providers such as MTN, Vodafone, AirtelTigo. Busy etc. providing fixed/mobile telephony and internet services to consumers across the country with mobile phone penetration above 100% according to the National Communications Authority (NCA).

Despite the infrastructure deployment by both GoG and private sector investments, the digital skills gap is still a major concern to employers. According to IFC 2019 report; “Nearly 20 percent of Ghanaian companies surveyed recruit only internationally for digital skills, largely because they cannot find skilled local talent”. The report noted that people in Ghana and other sub-Saharan African countries would require digital skills training to bridge the demand-supply gap and ensure employers can hire locally, find suitable training for employees, and help workers keep pace with new technology in their industries.

There are three (3) major areas of Digital Skills acquisition programs that would help people to participate and benefit from the technologically advanced world and find decent jobs. They are: Basic Digital Skills, Intermediate Digital Skills and Advanced Digital Skills. The basic digital skill is required by everyone to be able to access and use all the services and digital devices available. This includes the ability to use the internet to search for information, operate your phone and use online portals and applications. Intermediate Digital Skills are generally considered the soft skills for employment which includes: ability to use office tools such as Microsoft word, excel, PowerPoint, emails etc. In addition, ability to use the internet for research and all other basic digital skills. Although most graduates include these computer skills in their resume while applying for jobs, most employers complain that even graduates struggle with intermediate digital skills which slows down their productivity. Advanced digital skills category is the skill required for specialists in ICT and it is considered their core occupation. For the advanced digital skills, the individual must be given specialized training with practical experience in a particular domain or field of ICT. Some of the domains are software engineering, cyber security, web development, big data analytics, cloud computing, and search engine optimization etc.

There are available jobs especially for the intermediate and advanced digital skills, however they require hands on experience to be eligible. The youth in particular should embrace Science, Technology, Engineering and Math (STEM) as most digital skills jobs are based on these foundational knowledge areas.

David Gowu  
Executive Director,  
Institute of ICT Professionals Ghana (IIPGH)
In today’s workplace, digital knowledge is a minimum requirement for everyday work. Although employers expect prospective employees to have a basic knowledge of standard office software programs, they prefer to see a higher level of competency beyond the basics. Digitally literate employees are efficient and productive, they help to save costs and generate revenue, minimize negative brand exposure and contribute to innovation.

IIPGH trains the youths in digital skills; high school students, tertiary students, employed and unemployed graduates willing and ready to learn new skills that will give them an extra edge in the world of work. Several training programs have been held in this regard, notable among them is the Digital skills, BPO and Digital Marketing training of students, employed and unemployed graduates at the Accra Digital Center in 2018 in partnership with InnoHub and the Ghana Tech Lab. Over 200 young Ghanaians benefited from this arrangement at the Accra Digital Centre. At IIPGH, we use our skills acquired over many years of work to impart knowledge and skills to the youth and help them with Digital Skills required for employment.

“one area that has not been fully explored—particularly in emerging markets—are the digital skills that will enable people to live and work well in an era of rapid technological change.”

Sergio Pimenta, IFC Vice President, Middle East and Africa
Creating Career Perspective for Young Africans!

Every year Maxim Nyansa intends to train at least twenty (20) young IT graduates from underprivileged backgrounds from tertiary institutions in Ghana to become professionals in required areas in the field of Information Technology. So far, we have trained 45 graduates. These training sessions are tailored to enable them become empowered and job ready for the IT industry at a level of the international job market. Some trainees will be absorbed by Maxim Nyansa for Integrated High School IT projects in Ghana, some in virtual scrum teams with companies in Europe, others also in IT firms across the country Ghana. Since 2016, we have been successfully getting them into ICT jobs.

The training cost and all logistics are funded by a revolving fund by donor partners from the Netherlands, as well as companies who intend to hire some of the trainees on a freelance bases or employ them fully for specific skills. The trainee is expected to pay back the cost for the training as will be spelled out in a contract after being employed by a company that hires him/her after the training to cover for the costs of the training program on soft loan conditions.

A Learning Transformation!

Maxim Nyansa provides integrated IT solutions for High Schools in the form of equipping IT laboratories with equipment such as computers, smartboards, projectors and other ICT teaching and learning equipment. Teachers in all subjects are trained on how to integrate ICT in the teaching and learning process, maintenance of school IT equipment, etc. As an NGO we keep the costs for these projects limited. Maxim Nyansa collaborates with our partners in Europe for the shipment of slightly used donated hardware through a campaign dubbed “Computer 4 Schools Ghana Campaign”. Public schools are not billed for the cost of equipment, but for operational and out of pocket costs.

International IT Certification!

Do you want to further your professional development? EXIN is the global independent certification institute for ICT-professionals. With more than 30 years at experience in certifying the competences of over 2 million ICT-professionals, EXIN is the leading and trusted authority in the IT-market.

EXIN International as their Exam agency has accredited Maxim Nyansa for International IT Certification in Ghana and West Africa. Therefore, EXIN international certification is the new strategic business unit of Maxim Nyansa IT Solutions Foundation.

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As part of its mission of promoting capacity building in emerging technologies, IIPGH embarked on an initiative to build a community of Data Science experts.

The main aims of introducing the Data Science Community initiative are to help bring together experts, enthusiasts, and students to learn how to use tools for acquiring, cleaning, analyzing, exploring, and visualizing data; making data-driven inferences and decisions; and effectively communicating results. A major component of this initiative will be learning how to use python-based programming tools to apply these methods to real-life datasets.

This is being carried out in the form of webinars, workshops and practical classroom trainings in Data science. Career guidance being offered to Professionals willing to switch to Data Science with beginner’s course in Python programming. The first cohorts completed the Python programming training in November 2018 and the second cohort just completed the intensive Python programming lessons in March 2019.
CODING
The skill of the future...

WHAT IS CODING?:
Coding or Computer programming is what makes it possible for us to create computer software, apps and websites. Your browser, your Operating System, the apps on your phone; Facebook, WhatsApp etc. are all as a result of coding. IIPGH provides computer programming training to the general public; focusing on kids, teens & adults.

BENEFITS OF CODING;
Enables critical thinking
Builds Persistence and perseverance
Helps acquire problem solving skills
There is enhanced mathematical skill set.
Gives the chance for creating highly paid jobs

WE TEACH THE FOLLOWING;
Design of Games and Animations (using MIT Scratch software)
Web development (HTML, CSS, JavaScript and WordPress)
Database management (MYSQL and PHP)
Python programming
Etc......
To become competitive going forward, one needs what has become known as the 21st Century Skills, and coding is one compact skill that sets the tone for a lot of the other 21st century skills.

The Institute of ICT Professionals Ghana (IIPGH) a professional association in Ghana in collaboration with its partners across the country has embarked on a major program to get children, teenagers and graduates to learn Computer Programming. The first phase of the initiative was named “Project 500” and it aimed at training 500 children, teenagers and adults in computer programming that would give them practical skills in website development, games design and other software applications. Classes were organized at many coding centers including Pioneers International Academy in Tema Comm.25, Educase Literacy Consult at East Legon, Alpha Beta School at Dansoman, East Airport International School at East Airport / Spintex, Rosharon Montessori School at Tema, University of Mines & Technology at Tarkwa, Manet Court Estate, Spintex, The Light Academy in Adenta and Peculiar International School at Kasoa. Details of these activities can be found on www.iipgh.org.

IIPGH started the first coding program at its office at East Legon, Accra. The program which started with only 6 students has now expanded and impacting many children across the country. The Institute of ICT Professionals Ghana (IIPGH) achieved another milestone by introducing its flagship ICT skills development program for children “IIPGH Coding for Kids” program at East Airport International School (EAIS).

The fourth industrial revolution presents opportunities in emerging technologies such as robotics, artificial intelligence, blockchain, The Internet of things, quantum computing, big data, cloud computing, machine learning, mobile applications, nanotechnology and 3D printing among others. These technologies are disrupting industries and changing how we work making it impossible for people with “20th century education” to thrive in the world of work.

Our children should be taught how to program the computer rather than being programmed by the computer through computer-aided learning.

— Seymour Papet 1980

www.iipgh.org
CODING SKILLS: ESSENTIAL FOR NEW TECHNOLOGY JOBS

The world has gone digital, and across all industries the benefits of this transformation are being exploited to the maximum. The need to conduct business across the Internet, the benefits of automating processes, and the necessity to gather intelligence from data, among others, have made digitalization even more compelling. The invisible hand behind this revolution is coding – a popular term used to refer to computer programming.

It is noteworthy that coding is no longer a preserve of the computer scientist. For instance, the quest to make all things intelligent by embedding sensors, eventually ushering in an Industrial Internet of Things (IIoT) as a key part of Industry 4.0 means that every technology area is now impacted in a way by computing. New opportunities are opening which will ride on the wings of coding. Lacking such skill will put the 21st century technology-job-seeker at a disadvantage.

Besides, industries are either being transformed or disrupted. The only way to survive then becomes business model reconfiguration which may involve introduction of new technologies necessary for diversification. A typical example of this is in the Telecommunications sector where voice revenue has dwindled significantly, and data is seen as the cash cow and a survival machinery. Selling data effectively to meet new human needs have necessitated developing new services such as Mobile Money, Bills payment, enterprise solutions and other novel services. At the same time, new ways such as deploying Self Organizing Networks (SON) through which some jobs are automated to cut down on operational cost have been introduced in many networks.

Furthermore, vertical integration has disintegrated, giving rise to new entities such as Towercos, Content Providers, Value-added Service Providers, Managed Services operators, to mention just a few. Additional reduction in cost and efficiency are being driven by the use of cloud computing, machine learning and artificial intelligence. These are reducing labour force and giving opportunity to those who can work with these new systems. The bare truth is that all these new systems are driven by computer programming or coding and only those who have prepared themselves can seize these emerging openings.

Mr. GATSI has over 15 years experience as an ICT Professional. Spending 6 of those years as a Senior RAN Integration Consultant, he has an indepth understanding of the interplay among technology, business and policy. Now in academia, he is focusing on Communications and Physical Computing, among others.

Looking at it more widely, developing coding skills is a must for a society that aspires to become a producer of ICT products and services instead of being a consumer (user of tools developed elsewhere). Countries such as the US, UK and India have become exporters of ICT products and services because they have invested in the development of such skills. In India, for example, coding starts from a very early stage in their educational curriculum. Consequently, they are rather focused on application and advanced knowledge when they get to the university level.

Building a cadre of professionals that are poised to take up jobs in emerging areas such as Big Data, Analytics, Machine Learning, Internet of Things, and Software Defined Networks, require a careful orchestration. Until we adopt the ‘look-ahead strategy’ of determining which jobs are going to define the course of the future and preparing our workforce for it, this revolution may as well elude us as a nation, leaving us to gather the pieces just as other revolutions have done to us.

For this goal to materialize, we need to start from an early stage in our educational curriculum. Firstly, training the teachers who can impact coding knowledge with hands-on. It is not possible to give what you do not have. There must be a massive investment into training teachers at all levels. They need to acquire the requisite skills they seek to impact. This training should be practically oriented and not mere head knowledge.

The clarion call to develop fluency in coding as an essential skill is now too loud to be ignored; it is now a must-have skill for technology and allied jobs irrespective of the specialization. We need to nurture a new generation of coders who know how to use it to solve problems as they grow up. Both at individual and national levels, a more practical approach is needed. It is against this background that it is intuitive to support efforts by the Institute of ICT Professionals Ghana and other players in the coding eco-system to catalyze this revolution.

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IIPGH CODING IN PICTURES
The fourth industrial revolution presents opportunities in emerging technologies such as robotics, artificial intelligence, blockchain, The Internet of things, quantum computing, big data, cloud computing, machine learning, mobile applications, nanotechnology and 3D printing among others. These technologies are disrupting industries and changing how we work making it impossible for people with “20th century education” to thrive in the world of work.

To become competitive going forward, one needs what has become known as the 21st Century Skills. According to the World Economic Forum, the 21st century skills which are also widely known as “soft skills” can be categorized into foundational literacies, competencies and character qualities.

A key foundational skill is ICT literacy. According to the International Telecommunication Union (ITU), digital skills exists in a continuum and coding or computer programming is part of these skills. They range from basic skills such as using Microsoft Word to intermediate skills such digital graphic design and advance skills in areas such as Data Science and The Internet of Things. You also require soft skills that will help you confront challenges with confidence. At the Institute of ICT Professionals, Ghana (IIPGH), we use coding as a tool to help young people acquire these 21st century skills.

Part of the 21st century skills is focused on building competencies such as critical thinking and problem solving, creativity, communication and collaboration. Therefore, every coding project is focused on using digital skills to solve problems. Usually, the coding projects are introduced early in the programme so that the children will concentrate on the problem they are required to solve.

We live in an era where things are changing rapidly. For those who wish to make an impact, in addition to the competencies mentioned above, certain time-tested qualities must become second nature to them. Characteristics such as curiosity, initiative, persistence, adaptability, leadership and social and cultural awareness are crucial to personal achievement because the world has become complex, dynamic and uncertain. You need an inquisitive mind to unlock the complexities of the wicked problems such as poverty and climate change that confront us. Solutions will not come easily because things keep changing quickly. To succeed we must be persistent and adaptable.

At the start of our coding programmes, the children usually want to sit quietly and follow instructions. However, as they become comfortable with coding, they take the initiative and try out new things. Some of them even guide and direct their peers without the assistance of the tutors. We encourage this because we are convinced that Ghana needs leaders who can take initiative.

Our web development course starts with an introduction to the internet and the opportunities it offers for personal development. With the internet, one does not need to travel “physically” in order to be culturally and socially aware of today’s global village. Every part of the world is within reach with just a click. All the skills mentioned above accounts for why I insist that coding is good for every child irrespective of his or her future career aspirations.

As Ghanaians we cannot deny that our current educational system does not provide these skills. It is time to pay attention to the 21st Century Skills and coding is an excellent tool to use. Making coding a mainstream subject in our schools is no longer an option.

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PROFILE OF KIDS

Since its inception in 2017, the Institute of ICT Professionals Ghana (IIPGH) has trained over 300 participants (children, teens and graduates) in basic and intermediate programming skills in Ghana. The coding program officially started at the IIPGH office located at East Legon. Few kids enrolled and started learning how to code. Notable amongst our trained students are Selase Kofi Gowu, Elikem Gador and Ryan Kpodo. These kids were among the foremost young people that joined the first IIPGH coding program. They have been consistent with the classes, graduated from modules to modules and have really shown much enthusiasm, energy and perseverance beyond their age. We decided to engage them and find out more about their adventure with coding. Below are their responses after we asked them some few questions. We hope that their story motivates you to also bring the kids in your family or neighborhood to start coding with IIPGH.

**Selase Gowu**

IIPGH: What is your full name?
SG: My name is Selase Kofi Gowu.

IIPGH: What is your current academic level?
SG: My current academic level is class 5.

IIPGH: What time and at what age did you start to learn coding?

IIPGH: What/who inspired you to start learning how to code?
SG: My dad inspired me to learn coding.

IIPGH: Overall, do you find coding interesting and fun?
SG: I find coding very interesting and fun.

IIPGH: What makes it fun/interesting?
SG: The fact that it can be used to make human life comfortable and easier.

IIPGH: Do you find anything difficult in coding?
SG: Yes

IIPGH: What are some of the challenges you encounter when coding?
SG: I have some challenges with the algorithm of some programming languages like PHP.

IIPGH: What have you been able to code/develop so far?
SG: So far I have been able to develop four (4) websites; domain, music, e-commerce and IT information website.

IIPGH: What other skills or habits have you been able to develop since you started coding?
SG: Coding helps improve my thinking skills; I think faster especially when coding in PHP.

IIPGH: What is your most preferred career option?
SG: I want to become a computer scientist.

IIPGH: Would you want to continue learning how to code? Why?
SG: I would love to continue coding, because it is fun and interesting.

IIPGH: What one amazing system would you want to develop and why would you want to develop that?
SG: I would like to develop a coding language called “SelaScript”.

IIPGH: Do you recommend coding to your friends out there?
SG: Yes, I do, I hope you do the same too.

“Coding skills are useful not just for computer scientists but for everyone, regardless of age, background, interests or occupation.”

-Mitchel Resnick (Software Developer - known for Scratch)
IIPGH: What makes it fun/interesting?
Elikem: I realized there is always something new to learn.

IIPGH: Do you find anything difficult in coding?
Elikem: Yes, I do find some things difficult!

IIPGH: What are some of the challenges you encounter when coding?
Elikem: Few of the challenges I encounter are; the ability to notice minor mistakes and correct them, also I try to give my projects a perfect outlook which does not come easy - because I need more advanced knowledge before being able to do that.

IIPGH: What have you been able to code/develop so far?
Elikem: I have been able to develop a personal blog from scratch and a travel and tour website.

IIPGH: What other skills or habits have you been able to develop since you started coding?
Elikem: Aside the coding skills, I have also made significant improvement in my typing skills; I can type faster now as compared to before. Also, my focus and attention to projects has improved.

IIPGH: What is your most preferred career option?
Elikem: I want to become a surgeon.

IIPGH: Would you want to continue learning how to code?
Elikem: Yes! I would want to continue coding to have an advanced knowledge in how systems work.

IIPGH: What one amazing system would you want to develop and why would you want to develop that?
Elikem: I would want to develop a website for sick people to get information on the ailments they are suffering, possible causes and treatments and this is because it would help the community to have an improved health.

IIPGH: Do you recommend coding to your friends out there?
Elikem: Yes! I want all my friends and age mates in Ghana to start learning coding because they will all need it regardless of their profession.

PROFILE OF KIDS

Elikem Gabor

IIPGH: What is your full name?
Elikem: My name is Elikem K. Gador

IIPGH: What is your current academic level?
Elikem: I am a Primary pupil

IIPGH: What time and at what age did you start to learn coding?
Elikem: I started coding in March 2018 when I was 9 years.

IIPGH: What inspired you to start learning how to code?
Elikem: I had enough encouragement from my parents which fueled my personal desire to learn how to create websites.

IIPGH: Overall, do you find coding interesting and fun?
Elikem: Coding is very interesting and fun.

"Coding also helps children to learn mathematical and computational ideas, they are also learning strategies for solving problems, designing projects and communicating."

--Mitchel Resnick (Software Developer - known for Scratch)
IIPGH: What is your full name?  
REK: My name is Ryan Edem Kpodo

IIPGH: What is your current academic level?  
REK: Primary class 3

IIPGH: What time and at what age did you start to learn coding?  
REK: Spring 2018 at age 7

IIPGH: What inspired you to start learning how to code?  
REK: The idea of making games and solving problems

IIPGH: Overall, do you find coding interesting and fun?  
REK: Yes, I do.

IIPGH: What makes it fun/interesting?  
REK: When you code something and it does what you want.

IIPGH: Do you find anything difficult in coding?  
REK: No, I don’t

IIPGH: What are some of the challenges you encounter when coding?  
REK: Sometimes is not easy recalling a code for a command

IIPGH: What have you been able to code/develop so far?  
REK: I have been able to code two websites: a food recipe and a real estate website

IIPGH: What other skills or habits have you been able to develop since you started coding?  
REK: I’ve learnt and still learning a lot of keyboard shortcuts

IIPGH: What is your most preferred career option?  
REK: Computer scientist

IIPGH: Would you want to continue learning how to code? Why?  
REK: Yes! Because it is needed

IIPGH: What one amazing system would you want to develop and why would you want to develop that?  
REK: A security system to make and alert when there is an intruder or unknown person in an area.

IIPGH: Do you recommend coding to your friends out there?  
REK: Yes! I want all my colleagues to learn coding.

PROFILE OF KIDS

Creating a conducive environment in our schools for the study of coding should be pivotal for all interested stakeholders – parents, school officials and governments.

Mrs Veronica Boateng.
At the 2018 Korea-Africa Economic Cooperation (KOAFEC) Conference, held in May this year, in Busan, South Korea, the theme was “Africa and 4th Industrial Revolution: Opportunities for Leapfrogging?”.

Korea was the perfect setting for the inspiration an African needs, indeed, having leapfrogged into the first world in such a short time, its devastating civil war just a few decades ago.

The keynote speaker at the event was Dr. Ngozi Okonjo-Iweala, famed Economist, the first female Minister of Finance as well as Foreign Affairs of Nigeria, former Managing Director of the World Bank (2007-2011) and Chair of the Board of the Global Alliance for Vaccines and Immunization (GAVI) and the African Risk Capacity (ARC).

She shared many insightful facts, 4 of which really stand out to me. That, AI will lead to net job losses of about 5% globally. However, the countries which will avoid this squeeze are those who will lead in AI adoption and capacity building.

Further, she said that Africa faces a two-pronged human capacity building problem – inadequate education of its citizenry and inadequate relevant education for the times.

So, it is heartwarming to see the introduction of Free SHS in Ghana. In fact, virtually all developed countries have this setup. Also, government’s refocus on technical education should be supported and accelerated. Finally, the Ministry of Education and Ghana Education Service need to work hard to ensure our curriculum is one which is in tune with modern times and development.

For, underpinning all these truths about the present and future being dominated by ICT from such a credible source, is the capacity of the citizenry, especially the youth, to embrace the kind of education and training which will help Ghana leapfrog and master the 4th industrial revolution and bring about accelerated development.

Therefore, the efforts of the government and non-governmental institutions like IIPGH to “catch our children young” in this area will go a long way towards the bright future we envision for our nation. Individuals, parents, families and governments should all get aboard this express train.
IIPGH FAMILY CODING

The coding drive of the Institute of ICT Professionals Ghana is not only limited to schools but has also cascaded into families and communities through our massive media engagements and publicly held workshops. IIPGH has proceeded to train individual members of families from different parts of Accra.

Just recently the institute trained a complete family of 4; a mum, dad, daughter and son in digital skills and introduction to web development at Cantonments, Accra. This trend in our training validates the fact that many and more people are becoming increasingly conscious of the need and benefits of acquiring effective digital skills. The Olusoji family is one notable example. Follow us on our social media handles for an up-close with the Olusoji family on why the entire family decided to learn coding.
WHAT TO EXPECT NEXT ON IIPGH CODING ACTIVITIES?

As a futuristic plan of the institute of ICT Professionals Ghana, the coding initiatives of the institute are held in and out of season (during academic period and on vacations). The classes are held only on weekends (Saturdays) during the school period and on Mondays, Wednesdays & Fridays when the kids are on vacation. In 2019, the coding initiative of the institute is dubbed, “The Coding Project”.

The coding project will ensure that students that sign up for the coding lessons at our various coding centers are adequately trained and groomed within the stipulated time frame after which some students (best practicing students) will be selected to participate in the climax event of the coding project which is a coding competition among the selected kids at the AITI – KACE Kofi Annan Center of Excellence in ICT, Ridge. This will be awesome and terrific! Do well to enroll your young ones now. Follow us on Facebook @iipgh.org and on our website for updates www.iipgh.org/coding.

OUR CODING CENTERS

Educase Literacy Consult (East Legon)
Alpha Beta School (Dansoman)
Int. Community School (East Legon)
Pioneers Int. Academy (Tema Comm. 25)
Manet Court (Spintex Road)
Hatua Tech (Comm. 20 - Lashibi)
Jack n Jill School (Roman Ridge)
Redwood Universal (Dzorwulu)
Shield Int. School (Adenta)
Kids Club house (Tema Comm. 25, Devtraco)
West Hill School (New Bortianor)
Maxim Nyansa (Tantra Hill)
Angels Specialist School Int.
Skypro Institute (Adenta SDA)
University of Mines & Technology (Tarkwa)
CODING AROUND
THE WORLD

Tim Cook: Learning to code is more important than learning English

If you’re a young student looking to learn a new language, you might want to consider Swift before learning how to speak English, according to Apple CEO Tim Cook. During his trip to France, Cook sat down with Konbini to talk about how apps have changed the world. When it comes to expressing yourself, Cook says that Swift and other coding languages are the only way to communicate with over 7 billion people in the world.

In the interview with MSNBC and Recode for the “Revolution: Apple Changing the World” special, due for broadcast on April 6, Cook suggested programming was an important tool to learn. “You don’t need a four-year college education to learn to code,” he insisted, but added the existing focus on coding needs to be widened to add creativity.

Watch the full interview here [https://www.cultofmac.com/507747/tim-cook-learning-code-important-learning-english/]

AFRICA CODE WEEK - BRIDGING
THE DIGITAL SKILLS GAP IN AFRICA

Franck Cohen - President SAP Europe, Middle East & Africa | Africa Code Week

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This year we are even more ambitious. During Africa Code Week 2016, that will run from October 15 to 23, we hope to train more than 150,000 children and youth aged 8- to 24-years in 30 countries across Africa. The fact that Africa Code Week 2016 was launched today during The World Economic Forum (WEF) on Africa in Kigali, Rwanda, shows how meaningful this initiative has become.

SAP and hundreds of partners spanning local governments, NPOs, NGOs, educational institutions and businesses organize the train-the-trainer sessions, coding workshops and online trainings. I truly believe that there is no better way for SAP to ‘give something back’ than to equip Africa’s rising generation with job-relevant digital skills.

AFRICA has the largest and youngest workforce in the world, yet many companies present on the continent today are struggling to fill IT-related positions with local, qualified workforce. Currently, only one percent of African children leave school with basic coding skills. This is the reason why SAP and our partners launched the Africa Code Week initiative for the first time last year. Africa Code Week is a continent-wide initiative to foster digital literacy and to spark the interest of African children, teenagers and young adults in software coding.

I am proud that 89,000 young people across 17 African countries joined and received basic coding training during Africa Code Week in 2015. When I traveled to Nigeria in September, I joined a coding workshop at the Ojodu Junior Grammar School in the Ikeja Suburb of Lagos State and saw first-hand how quickly and skillfully the kids picked up the coding. I am convinced that coding is the pass to the digital world for young people in Africa.
OTHER ACTIVITIES
IN 2019

IIPGH GET-TOGETHER (1st February, 2019)
The institute of ICT Professionals Ghana officially commenced its busy year with a general gathering of its members at the forecourt of the institute’s office located in East Legon on Friday, the 1st of February 2019.

The 3-hour social engagement event of the institute which lasted from 6pm to 9:20pm brought members across the nation together to network and strategize for the new year, have fun and make merry. There were a lot to eat and drink.

Members could be seen standing in groups and discussing projects and initiatives to enhance the development and deployment of ICT education as well as the businesses that people can leverage on as a result of the advancement of technology.
Notable is our recent coding workshop at the International Community School (ICS), Ogbojo – East Legon, which was part of celebrating 2 years’ anniversary of the Institute of ICT Professionals Ghana (IIPGH) on 7th of March 2019. This year’s IIPGH Day was dabbed Tech Volunteers’ Day with the theme, “Building Resilient Communities”. The non-profit professional body was set up two years ago to serve as a connector of ICT professionals from educational institutions, corporate organizations, start-ups, Government (Ministries, Departments & Agencies) and the civil society organizations to create a vibrant ICT ecosystem. The organization aims at using its platform to equip professionals and students with skills in emerging technologies needed for entrepreneurship and employment in today’s fast moving technological world.

The aim of the workshop was to introduce and get as many of the students to appreciate and start learning how to code as that provides a firm foundation in education in the 21st century.

In attendance were David Gowu the Executive Director, and Kafui Amanfu, Learning & Development Director of IIPGH; Director of Administration and HR, Gifty Mottey, Netguard Group; Administrative Head of ICS, Mr. Diaba; and the technical team from IIPGH. During the workshop, students were briefed on the practical benefits of learning how to code. Two groups of classes were taken through both block-based and text-based coding structures using the MIT Scratch application (block-based) and fundamental web programming (text-based).

The students were much excited to learn more of the programming and showed much enthusiasm to study it full time. They realized there is a wide range of things they could do with the skills of coding. Some of them were just excited when they discovered coding was not that difficult. The females also understood that coding is not a preserve for males only, hence were encouraged to learn. They confessed that one only needs to be committed, determined and curious to learn more.

Learning coding empowers you to do many things you would not otherwise be able to do. These things include handcrafting your own websites, becoming a career coder or even starting a technology business. Most importantly, you will be able to understand the technology shaping your world.

Coding offers the opportunity to communicate ideas in a logical and structured manner; it gives the chance for creating highly paid jobs; and it enables the individual to be resourceful and versatile. It helps in other areas such as enabling critical thinking; building persistence and perseverance; helps acquire problem-solving skills; and it enhances mathematical skill set.

The Institute of ICT Professionals Ghana believes in celebrating its day with the young ones as part of sharing knowledge and building capacity in technology. In March 2018, the Institute had the opportunity to share knowledge in a coding workshop with the students and staff of East Airport International School (EAIS), during its first anniversary.
To equip professionals and students with skills in emerging technologies, the Institute aims at using its platform to augment teaching and learning, entrepreneurship and employability in today’s fast moving technological world.

It hopes to achieve this by focusing on giving young people from primary to university an early start to enable them take up ICT as a profession, promoting innovation that would solve our basic societal problems, and improving lives.

To know more about the institute, kindly visit our website www.iipgh.org
As a licensed VAS provider, we deliver solutions such as Bulk Messaging, Shortcodes and USSD. In 2019 we launched the dynamic USSD which enables individuals to create their own USSD. Our Platforms team boasts of both off the shelf and customized robust web and mobile applications.

In 2017, we launched two flagship products in the fields of data science, Machine Learning and Artificial Intelligence. Maame, a virtual assistant and Snwolley, our machine learning application, noted for enabling high level data analytics at the click of a button. Snwolley (available on www.snwolley.npontu.com) can predict customer churn, fraud and give you an idea of how well your brand is doing through sentiment analysis.

As a home-grown solution built from scratch, we have available open API’s for use by any company. Most importantly snwolley is created to serve two broad categories of end users; the highly skilled as well as the ordinary user.

Our solutions serve the banking and insurance sectors, trade and industry, communication, educational and religious sectors just to mention a few.
GOVERNMENT INITIATIVES (DIGITAL OR ICT RELATED)

Some achievements of the Ministry of communications

1. Establishment of NCA Telecommunications industry
2. Establishment of Bank of Ghana (BoG) Computer Emergency Response Team (CERT)
3. Auction of 800MHz spectrum to propel broadband growth
4. Establishment of 4 type approval and conformance laboratories
5. FM Broadcasting Audit
6. Implementation of the National Digital Terrestrial Television Project
7. Establishment of Public Key Infrastructure (PKI)
8. Developed National Government Cloud Infrastructure (G-Cloud)
9. Emergency upgrade of E-Government Infrastructure
10. Implementation of Digital for inclusion (D4I) – smart community
11. Implementation of the Rural Telephony Project
12. Implementation of the satellite TV project for 300 villages
13. Initiation of cyber laboratory programme
14. Trained 700 teachers nationwide in senior high schools on the use of ICT to effectively teach science, technology, Engineering, and Mathematics (STEM) programmes.
15. Four hundred and seventy-six (476) youth were trained in Digital Marketing
16. One thousand (1000) digital and ancillary jobs have been created at the Accra Digital Center for the youth and vulnerable persons.
17. Implementation of Mobile Application Labs (mLab) and Innovation Hub (iHub) Projects
18. 500 youth trained under the ADC’s impact sourcing program
19. Trained six hundred (600) girls from selected public basic schools in six districts of the Ashanti Region in coding as well as an ICT mentorship program.
20. Launched the National Digital Property Addressing System (NDPAS)
21. Installed Synergy and Satellite receiving dish for Ghana Meteorological Agency to aid in effective climate analysis to ensure reliable public weather forecast and strengthen aeronautical weather reporting services to the aviation industry.
22. Establishment of weather Forecast Production Studio
23. Procured and installed ten (10) automatic weather stations for Ghana Meteorological Agency
24. Procured and installed a message switching system for data communication for Ghana Meteorological Agency
25. Acquired a new and accessible accommodation for Data Protection Commission and scaled up its operations by 23 DTT transmission sites in 6 regions namely: Eastern, Western, Central, Volta, Greater Accra and Ashanti region.
26. Upgrade of Data Protection Software to enable renewal of operators are providing employment for about 1,000 Ghanaians on full time basis.
27. Establishments of the eGates at the airport.
28. E-parliament: Aims at supporting parliament of Ghana to electronically conduct parliamentary processes that will allow a paperless flow of information within parliament.
29. E-procurement currently being rolled out in 6 MDAs, (VRA, Ghana Health Service, TMA, Dpt. Of Feeder Roads, Koforidua Technical University and COCOBOD).
30. E-Justice to roll out electronic case/court management and administrative system at the 43 high courts in Accra. The system has been fully developed and rolled out as of November 2018. It will be officially launched by the president on March 20th.
31. Establishment of the National Cyber Security center to coordinate cyber security activities both in Government and the private center.
32. Implementation of a cyber-security awareness month (NCSEM) programme dubbed “A safer Digital Ghana” to educate the citizenry on the dangers associated with the use of technology and the need to take cyber-security issues seriously.
33. Modernization of post offices
34. Inauguration of Central Analysis and Forecasting Officer (CAFO)
35. Procurement of Calibration equipment for Ghana Meteorological Agency
36. Repair of GMET radar
37. Deployment of Universal Mobile Telecommunication System (UMTS – 900)
38. NCA successfully managed the merger between Airtel and Tigo
39. The ministry has completed the provision of dedicated power to 23 DTT transmission sites in 6 regions namely; Eastern, Western, Central, Volta, Greater Accra and Ashanti region.
40. Smart workplace / Microsoft Enterprise Agreement
41. Commercialization of NITA’s network infrastructure
42. NITA has increased the number of Government websites being hosted at the National Data Center from 95 in 2017 to 240 in 2018
43. GIFEC provided a computer laboratory and laptops with assistive technology for visually impaired undergraduates of the University of Cape Coast in 2018.
44. Afi Annan Center of Excellence in ICT provided consultancy services for the National Youth Authority (NYA) by developing curriculum and an M&E platform to access an online marketing and digital media entrepreneurship training for 2,600 youth nationwide.
45. The ADC is now fully equipped and has allocated 100% of its space and has achieved 80% occupancy rate
46. The coding for kids’ project was implemented in 150 schools across the country
47. GIFEC has trained about 10,000 artisans from the informal sectors such as beauticians, seamstresses and tailors, carpenters, mechanics, etc. as at 2018
48. 500 disadvantaged youths in the Greater Accra region have been trained in call center skills, basic IT training, Microsoft office suite, BPO skills and digital marketing.
49. Approval of Post codes
50. The Postal and Courier Services Regulatory Commission has licensed 131 new operators in 2018. These 131 new operators are providing employment for about 1,000 Ghanaians on full time basis.
51. Implementation of National Cyber Security Policy and Strategy
52. Ghana successfully hosted the West African Postal Conference (WAPCO) in 2018
53. In November 2018, Ghana was re-elected to the administrative council of the International Telecommunications Union following the active role being played in promoting ICT development
54. Ghana is also serving as a co-chair of Commonwealth ITU group to help identify and adopt decisions that are of common interest to Commonwealth members
55. Ghana successfully hosted the ITU Regional Development Forum and Spectrum Monitoring Workshop
56. Ghana is the leader of Anglophone Africa Network for Data Protection
57. Ghana is the Vice President of all Africa Network for Data Protection.

Source: https://www.facebook.com/moc.gov.gh/
The Institute of ICT Professionals, Ghana (IIPGH) is a non-profit professional Association which is made up of professionals in various domains of Information and Communication Technology (ICT) practice. The Institute is a connector of ICT professionals from Government MDAs, educational institutions, corporate organizations, start-ups, investors and the civil society organizations to create a vibrant ICT ecosystem.

The organization aims at using its platform to equip professionals and students with skills in emerging technologies needed for entrepreneurship and employment in today’s fast moving technological world. In addition, use the expertise at its disposal to advice government and other stakeholders on best practices and public policies that would enable the use of ICT in achieving the Sustainable Development Goals (SDGs).

Visit our website: www.iipgh.org for more information

Vision:
To become the most reliable partner in ICT development in Ghana and beyond.

Mission:
To mobilize all ICT professionals under one professional body to positively influence the development, standardization and delivery of Information and Communication Technology (ICT) across Ghana

Objectives
In order to fulfil our vision and mission, the objectives shall include:

I. Providing a platform for all ICT professionals to converge and network.

ii. Building a credible database of all ICT professionals in the different domains of ICT in Ghana.

iii. Partnering government and businesses for new areas of job creation for ICT professionals.

iv. Advocating for the deepening of local participation in ICT sector activities.

v. Providing professional services and publishing journals on ICT development and strategy in Ghana.

vi. Promoting innovation that would solve our basic societal problems.

vii. Supporting members to take advantage of ICT job opportunities.

viii. Providing education to the general public on ICT and how it can help improve lives.

ix. Training and certifying ICT professionals in various domains of ICT.

x. Becoming the voice of ICT professionals across Ghana.

THE STRUCTURE OF THE INSTITUTE
In order to achieve the objectives of the Institute, it shall be organized under four main divisions, local chapters and domain leadership. These divisions will serve as vehicles for all the activities of IIPGH. They are:
1. Professional Membership
2. Academy
3. Professional Services
4. Foundation


Sample copies of official membership cards
The Institute of ICT Professionals Ghana (IIPGH) in the past 2 years made significant progress and chalked some successes, below the summary:

• **MOBILIZATION OF PROFESSIONALS:** IIPGH has mobilized over 1,400 registered members comprising of professionals, students and corporate organizations. 90% of members are professionals from all domains of ICT practice.

• **CODING (COMPUTER PROGRAMMING) PROJECT:** The institute started this initiative to introduce to children, teenagers and adults to coding, an essential skill for the future. Since March 2018, over 300 students have been trained and awareness program extended to over 5,000 students across Ghana.

• **EDUCATION, AWARENESS & ADVOCACY PROGRAMS:** Professionals provide education on ICT such as weekly articles published in the newspaper, TV talk show on Technology etc. Over 80 articles on ICT published in the newspaper since November 2017.

• **DIGITAL SKILLS TRAINING FOR EMPLOYMENT:** Develop ICT skills development programs in intermediate and advanced Digital Skills for employment. Over 200 graduates trained in digital skills at Accra Digital Centre (ADC) in December 2018.

• **SEMINAR, WORKSHOPS & TRAINING SESSIONS:** Delivered value to professionals by organizing seminars, workshops and other training sessions as a form of continuing professional development (CPD). 25 programs on entrepreneurship, communications, Cybersecurity organized for members since April 2017.

• **DATA SCIENCE AWARENESS PROGRAM:** this encompasses Artificial Intelligence, machine learning, data analytics and was introduced through webinars & Python training. So far, 3rd cohort of Python training students have graduated since it started in November, 2018 in Accra. Over 1,000 members and other data science enthusiast participated in our Webinars.

• **CURRICULUM REVIEW:** Professionals from the institute reviewed IT curriculum of a private University and a public Technical University in Accra & Kumasi Respectively. The BSc. Information Technology curriculum of Academic City University College was reviewed in March 2019 and BTech Data Mining & Web Development and Mobile Computing for Kumasi Technical University.

• **NETWORKING & INFORMATION SHARING:** Social Media being used for networking and advocacy for the deepening of local participation in ICT sector activities. Platforms created on social media (WhatsApp, Facebook, Twitter, Telegram, LinkedIn & Instagram) for members to network and share information with the public.

• **PROMOTING ICT CAREER AWARENESS PROGRAM FOR GIRLS:** The Institute started another initiative to sensitize and coach young girls from primary, JHS and Secondary schools to take up courses and careers in ICT for higher chances of landing technology jobs in the future. IIPGH in collaboration with MTN Women in Technology organized ICT awareness program for girls of Adonten Senior High School on 25th April 2019 (International Girls in ICT Day). The Institute in collaboration with Vodafone Women in Technology again organized ICT career coaching workshop OLA Girls Senior High School, Ho.

• **PROMOTING LOCAL INNOVATION:** Highlighting local innovations that would solve our basic societal problems. Organized Tech Entrepreneurs Forum in February 2019 to harness innovations that can solve our problems.

• **STAKEHOLDER ENGAGEMENT TO PROMOTE ICT:** Working with other stakeholders to grow the Association in terms of size, positive impact and influence in the ICT space. Over 22 corporate partners working with the institute from various technology companies, media, Civil Society Organizations, educational institutions.
We unveil the Executive Council (Board of Directors) of the Institute of ICT Professionals Ghana (IIPGH). The council is the highest decision making body of the Institute. IIPGH is looking forward to collaborating with all stakeholders in the ICT industry in Ghana and beyond to create a vibrant ICT ecosystem.

Member: Mrs. Amma Benneh-Amponsah
Human Resource Executive, MTN Ghana

Member: Mrs. Lucy Quist
MD - Morgan Stanley, UK

Member: Mrs. Veronica Boateng
CEO & Principal Consultant, Pinnacle Logic Technologies

Member: Mr. Prince Ofosu Sefah
Deputy Director General, NCA

Member: Ing. Kenneth Ashigbey
CEO, Ghana Chamber of Telecoms

Member: Mr. Francis A. Gatsi
Lecturer, Ashesi University College

Member: Abraham K. Sam
Director Professional Services, IIPGH

Mr. David Gowu
Executive Director, IIPGH

Board Chair: Dr. Fred McBagonluri
President, Academic City University College

EXECUTIVE COUNCIL

The Executive Council (Board of Directors)
The Institute of ICT Professionals Ghana has taken another bold step forward. The first local chapter of the institute was officially launched after an exciting digital conference at the University of Energy & Natural Resources (UENR) on March 28, 2019.

The conference which was organized by IIPGH BA Chapter brought together IIPGH members, technology professionals from industry, Professionals from Academia, Security Service Professionals and students.

The program started with presentations from The Dean, School of Sciences Prof. Adekoya followed by HoD Computer Science Dr. Weyori of UENR. Their presentations focused on digitization in Ghana for the attainment of the sustainable Development Goals (SDGs).

The Executive Director then followed with activities being done by the institute to build capacity for the digitization agenda. Mr. Gowu added that digitization offers huge opportunities for young graduates but he added that would only be possible if students get the right training in emerging technologies such as Data science, Cybersecurity, Software Engineering etc.

Mrs Vivian Akoto-Adjepong was the next to present and she reminded the audience of the importance of getting girls and women involved in technology for the attainment of the SDGs. She indicated that only 28% of women are in Tech although women make up more than 50% of our population.

She encouraged stakeholders to focus on getting more girls to learn STEM (Science Technology Engineering & Maths).

Then came the launch of the chapter, the Executive Director congratulated the BA Executives for working hard to setup the first local chapter of the institute.

A short ceremony then followed and the BA chapter was officially launched.

The Chairman of the BA Chapter Mr. OwusuNyarko-Boateng in his remarks thanked everyone who supported them in establishing the local chapter and promised to mobilize more professionals.

Mr. Chris McQuansah the Vice Chairman of BA Chapter who was also the MC for the event brought proceedings to an end after the closing remarks.
Quick links to other IIPGH published articles in the B&FT

https://iipgh.org/using-technology-to-support-flipped-learning-2/
https://iipgh.org/using-technology-to-support-flipped-learning-1/
https://iipgh.org/%E5%88%BF-how-to-use-technology-to-improve-student-engagement/
https://iipgh.org/key-elements-in-cybercrime-investigations-part-1/
https://iipgh.org/computer-forensics-and-information-security-what-are-the-differences/