Bridging the Digital Divide

Africa Code Week

2015 - 2022 Impact Evaluation Report

February 2024

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Executive Summary

The future of sustainable development in Africa hinges on the education and skills development of its rapidly growing youth population. Africa is on the precipice of a promising future if it can successfully close the gap between the skills needed for future work and the educational programs to facilitate the requisite skills. With an estimated 2/3 of youth currently under or unemployed,[1] supporting programs and skilled teachers are critical to ensuring that this generation will fully and meaningfully participate in tomorrow's economy.

Bridging The Digital Divide

It is estimated that 230 million jobs in Sub-Saharan Africa will require digital skills within the next 10 years.[2] Access to technology and quality education to develop these digital and Information and Communications Technology (ICT) skills are key barriers for African youth, as internet penetration and quality education remain elusive for many countries on the continent. Policies and programs focused on ICT skill development are critical to bridging the digital divide in Africa.

Since 2015, SAP and its strategic partners have been meaningfully addressing these barriers through Africa Code Week (ACW), providing training to teachers, empowering local organizations, and working closely with Ministries of Education to integrate ICT skills programs into their core curriculum. Since its inception, ACW has engaged youth in 48 of the 54 total African countries, culminating with the integration of coding and computational thinking into 7 national curricula with 10 additional countries in the process of implementing national ICT programs.

Central to its ACW program, SAP and its partners identified several barriers to adoption. Notably, the Women's Empowerment Program (WEP) was launched to improve the engagement of girls with the ultimate goal of increasing female participation in ICT tertiary education and jobs. SAP also launched the Africa Code Challenge (ACC) to further incentivize ongoing ICT learning and coding engagement and integration into national curricula.

[1] Howard, Charles. Digital Skills for Youth Employment in Africa. 2023. Assuming 50% of program participants achieved the mid learning scenario (.125 net standard deviation learning gain in ICT skills).
[2] Howard 2023.

From 2015-2022, SAP's Africa Code Week (ACW) initiative engaged **14.6 million participants,** introducing students to key digital skills essential for tomorrow's tech workplace. SAP's gender-sensitive program reached secondary students across **48 African countries, 46% of which were girls,** and promoted the integration of coding and computational thinking into 7 national curricula, advancing **SDGs 4: Quality Education, 5: Gender Equality, and 17: Partnerships for the Goals.**

By empowering a new generation of youth with the education, knowledge, and ICT skills needed to participate in the digital future, SAP's program increases the likelihood that ACW beneficiaries will realize higher earnings during their working life. Based on future increased income, CGM estimates that **ACW catalyzed up to $1 billion in Social Value for program participants.**[1]

About SAP

SAP is a German multinational software company that develops enterprise software to manage business operations and customer relations and "help the world run better and improve people's lives." SAP is committed to sustaining the environment and engendering strategic partnerships. It is the world's leading enterprise resource planning software supplier that develops solutions to ignite innovation, encourage equality, and create opportunity globally.

Learn more at www.sap.com

About Common Good Marketplace

Common Good Marketplace is the global impact marketplace of world changers committed to delivering real, verified results to address the world's greatest problems through a strategy and process designed to advance the common good. Leveraging best practices in impact measurement and management, outcome-based finance, and impact valuation, CGM delivers verified social impact, shifting the paradigm from funding good intentions to real results.

Learn more at www.commongoodmarketplace.com

About Amplify: Phase 1 Engagement

After collectively spending decades designing, developing, and operating projects to deliver verified outcomes across multiple continents, CGM developed a simple 3-step process to support and guide any organization from discovering the impact of their current/past program(s), to designing a new program(s), to delivering verified outcomes and executing their impact program(s) through its tech and data-driven marketplace. This makes Amplify CGM's unique approach to creating a bridge between traditional and outcome-based funding.

In 2023, SAP enlisted Common Good Marketplace to conduct a comprehensive analysis of Africa Code Week's program impacts and available data spanning from 2015 to 2022. This analysis included reviewing available data from participating African countries, conducting an M&E analysis to identify gaps that could be addressed in future programs in order for SAP and partners to leverage outcome-based funding in its digital literacy education programs, and estimating the potential social value generated by the program.

The resulting report, the main deliverable for Amplify Phase 1, synthesizes CGM's findings from a rigorous Discovery process and provides an insightful overview of ACW's outcomes and social impact.[4] Besides this report, the other key deliverable is the generation of an Impact Model that uses available program data and third-party research to create a robust estimate of social value for the program.

Phase 1: Africa Code Week Goals

a) Evaluate and estimate, to the extent possible, the program impact and the social value generated;

b) Analyze the program's data and determine where gaps exist that would allow for improved measurement, valuation, and verification of program impact;

c) Enable reporting on ACW for SAP's 2022 sustainability report.

[4] While these results use historical data, peer-reviewed research and CGM's conservative methodology for valuing impacts, the figures presented here are mere projections and should not be taken as verified project results.

Africa Code Week in Context

Africa faces a serious shortage of skilled teachers in areas that are crucial for the region's development, affecting the education of young people and limiting their chances of getting good jobs in the future. According to estimates,about 230 million jobs in the region will require digital skills by 2030.[5] Sub-Saharan Africa's (SSA) low internet usage rate[6], at just 39%, falls significantly below the global average of 66% and makes the context even more challenging. This digital disparity underscores the urgent need to bridge the digital divide in the region, ensuring equitable access to education, economic empowerment, and social inclusion.

As Africa gears up for unprecedented demographic shifts, the continent faces both challenges and opportunities in harnessing its young workforce. With up to 12 million youth entering the job market annually over the next three decades,[7] there is immense potential for Africa to leverage this demographic dividend through strategic investments in education, skills development, and job creation initiatives tailored to meet the needs of its growing workforce.

[5] Howard, Charles. "Digital Skills for Youth Employment in Africa." Include Knowledge Platform, January 2023. Available at Digital-Skills-for-Youth-Employment-in-Africa.
[6] The ITU ICT SDG indicators.
[7] Africa Overview: Development news, research, data | World Bank.

Africa Code Week in Context

1) How difficult is the context or population ACW is serving?

2) How relevant is the intervention's goals to its beneficiaries?

3) How does ACW's program compare with alternatives?

4) Stakeholders may wonder, will the intervention/ outcomes last?

1 Sub-Saharan Africa has the lowest proportion of individuals using the internet (39%) out of all regions in the planet, well below the World's average (66%). Internet penetration is closely correlated to ICT skills, which are not adequately monitored in Africa.

2 Over the next three decades, Africa will experience the fastest increase in the working age population of all regions. Up to 12 million youth will enter the labor market across the region every year in the coming decades.

3 With over 14 million students engaged and 150 thousand teachers trained since 2015, Africa Code Week remains unmatched, in terms of scale and reach, in addressing digital literacy in Africa.

4 By engaging local Ministries of Education and promoting the integration of coding and computational thinking into national curricula, stakeholders can expect the program's impacts to last.

Bridging the Digital Divide

Recognizing the pressing need and potential for digital education in Africa, SAP launched Africa Code Week (ACW) in 2015 as part of its Corporate Social Responsibility (CSR) program and broader social investments aimed at driving sustainable growth on the continent.

Initially, ACW focused on leveraging the expertise of SAP employees from abroad to directly train local youth, developing unique training materials centered on computational thinking and Scratch coding. However, to maximize its impact and extend its reach, ACW transitioned to a "train the trainer" model, empowering local educators to deliver coding workshops independently.

Together with the launch of two supporting programs, the Women Empowerment Program (WEP) and the AfriCAN Code Challenge (ACC), this strategic shift not only deepened ACW's impact but also significantly increased its scale and reach, enabling the program to engage over 14.6 million students, 46% of which were girls, and train 150,000 teachers across Africa from 2015 to 2022. Moreoever, by building sustainable teaching capacity at the community level and simultaneously working closely with Ministries of Education to integrate coding into the national curriculum, ACW fostered Public-Private Partnerships to accelerate the adoption of coding skills into school curricula, laying a foundation for continued digital transformation and innovation in Africa's future workforce.

"Joining forces with the private sector has proven to result in a powerful synergy. Beyond launching a generation of future coders, we seek to develop the algorithmic mindset that will enable them to acquire logical reasoning skills and problem-solving skills they need to lead successful careers and contribute to the development of our country – and our continent."

- Ilham Laaziz, Director of the GENIE program at the Moroccan Ministry of National Education, Early Education, and Athletics

Africa Code Week Evolution

2015 – ACW Launch

2016 – UNESCO, Google, and others join as key partners

2017 – Won International Philanthropist of the Year award

2018 – Successful shift to virtual & launch of major innovations

2019 – Women Empowerment Program launched in Morocco

2020 – Initiated the transition to the Ministries of Education and launched AfriCAN Code Challenge

2021 – ACW is featured in ITU Digital Skills Toolkit. Over 40 countries participate in ACC

2022 – Won the Code.org Award for impactful Digital Literacy and Coding Awareness program

2023 – ACW Sunsetting

When launched, ACW focused on bringing SAP employees from abroad to train local youth. Unique training materials on computational thinking and Scratch coding were developed.

→

SAP's solution was shifting to a "train the trainer" model, allowing ACW to deepen its impact, while increasing the program's scale and reach.

→

Incentivizing the integration of coding into national curricula was another critical milestone for ACW, building local capacity and, thus, making its impact more sustainable in the long run.

Supporting Programs

As part of its goal to bridge the digital divide in Africa, SAP launched supporting initiatives such as the Women's Empowerment Program and the AfriCAN Code Challenge. These programs were conceived as integral components of SAP's broader strategy to empower African youth with the digital skills necessary to thrive in the evolving global economy.

Women Empowerment Program (WEP)

The Women Empowerment Program was first launched in 2019 by SAP and partners and was designed to specifically target and engage girls and young women, providing them with access to digital literacy education, coding skills, and mentorship opportunities.

By actively encouraging and supporting female participation in these activities, SAP aims to dismantle barriers to entry and create pathways for girls and women to pursue careers in technology-related fields.

When ACW first launched in 2015, only 18% of participants were girls. Through WEP and the commitment to improving female engagement through the program, female participation rose steadily, reaching 48% in 2020, where it remained at this near-parity level through 2022.

Key components of SAP's Women Empowerment Program include tailored coding workshops and training sessions designed to cater to the unique needs and interests of female participants. These workshops not only focus on technical skills development but also emphasize the importance of confidence-building, leadership, and self-empowerment. Additionally, the program facilitates mentorship and networking opportunities, connecting female participants with successful women in tech who serve as role models and guides.

By integrating the Women Empowerment Program into the broader ACW initiative, SAP demonstrates its commitment to promoting gender equality and empowering women and girls through education and skills development. Through targeted interventions and partnerships with local organizations and educational institutions, SAP strives to create an inclusive and supportive ecosystem where women and girls can thrive and contribute meaningfully to Africa's digital transformation and economic growth.

WEP

WEP demonstrates SAP's commitment to empowering women and girls through education and digital skills development.

Supporting Programs

As part of its goal to bridge the digital divide in Africa, SAP launched supporting initiatives such as the Women's Empowerment Program and the AfriCAN Code Challenge. These programs were conceived as integral components of SAP's broader strategy to empower African youth with the digital skills necessary to thrive in the evolving global economy.

AfriCAN Code Challenge (ACC)

The AfriCAN Code Challenge was first launched in 2020 by SAP and partners to celebrate the creativity and technical skills of African youth and is an integral component of the ACW initiative.

Designed to further incentivize ongoing learning and engagement in coding and digital literacy beyond the core program activities, the challenge serves as a platform for participants to showcase their coding skills, creativity, and problem-solving abilities.

These activities not only reinforce the coding concepts introduced during ACW workshops but also provide participants with real-world challenges and scenarios to tackle, enhancing their practical skills and confidence in coding. Moreover, by connecting participants with industry experts, mentors, and peers, ACC creates a supportive ecosystem where aspiring coders can learn from each other, share ideas, and grow together.

Since its inception, thousands of participants, from dozens of African countries, have submitted games designed with Scratch coding to a panel of judges who select top submissions for international recognition.

ACC creates a supportive ecosystem where aspiring coders can learn from each other, share ideas, and grow together.

Theory of Change

A Theory of Change (ToC) explains how a given intervention is expected to lead to a specific development outcome, drawing on a causal analysis based on available evidence. The below Theory of Change traces key activities engaged and tracked by SAP to near-term outputs, longer-term outcomes, and broader impact specific to how the activities will result in sustainable improvements in participant's lives.

ACW Theory of Change

CGM's approach to social valuation is based on its Impact Framework, developed from best practices in both impact quantification and impact monetization to create a broad view of the change an organization creates.

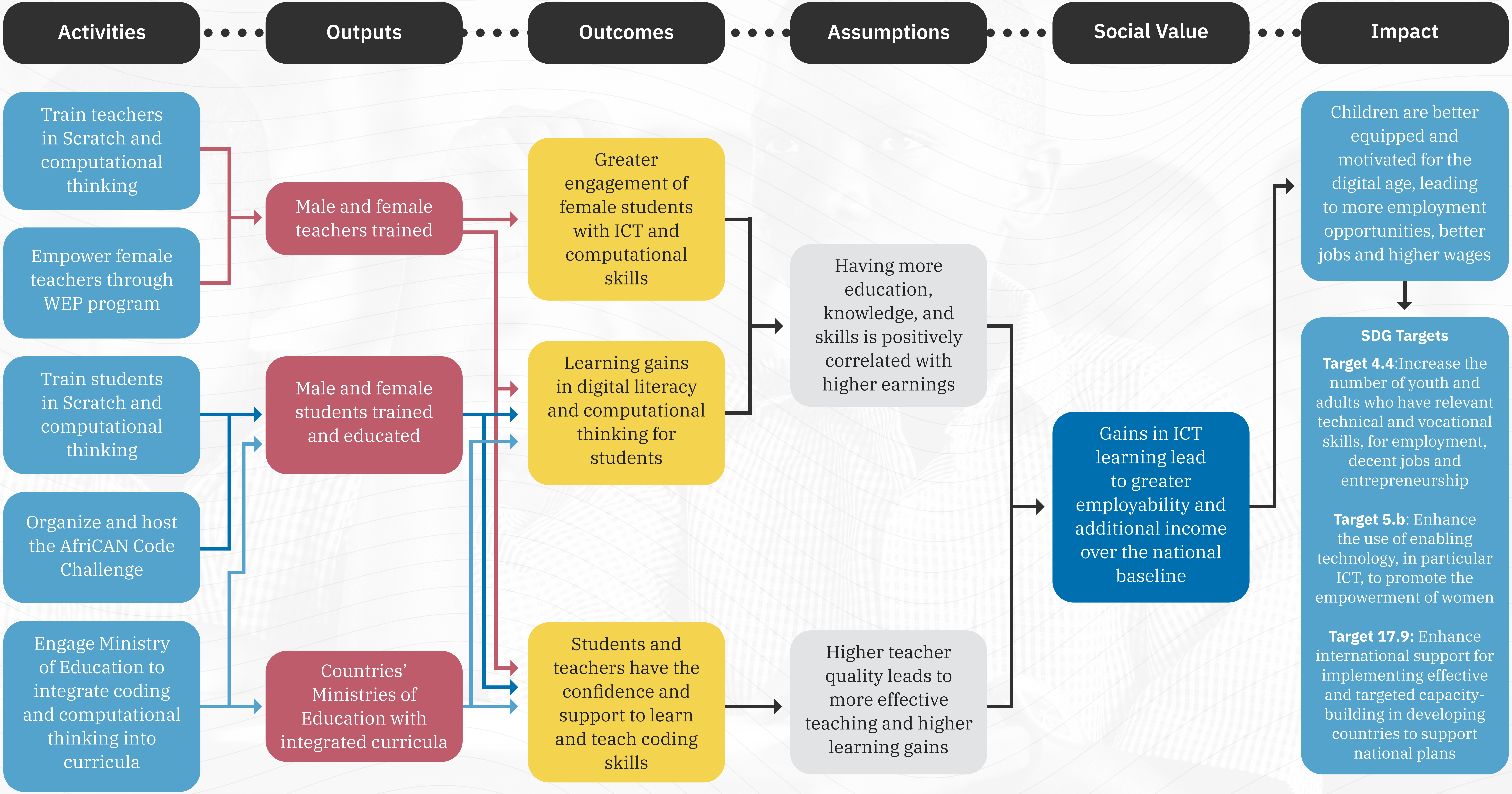
To determine the impact and social value of Africa Code Week from 2015 to 2022, CGM reviewed available data and program materials. Based on this review, a Theory of Change was created to reflect the program activities and goals and to create a causal link between program activities and near and long-term impacts that the program may expect to create.

CGM measures and quantifies outcomes by establishing a clear causal chain between the program's activities and their impacts, allowing the organization's broader activities to be subsumed in, and linked to, a few key measured goals. By identifying and isolating the most significant changes, it becomes possible to generate an evidence-based approach to demonstrate, compare, and create monetary valuations of these impacts.

When valuing Education Outcomes, such as those delivered by SAP's ACW initiative, the underlying assumption is that, by empowering teachers and students with greater education, knowledge, and ICT skills, programs can be expected to increase the likelihood that these beneficiaries will realize higher earnings during their working life, due to greater employability and wage returns.[8]

CGM's Social Value Theory of Change leverages the traditional ToC approach of concatenating activities and outputs but focuses on the "Monetizable outcomes" (those that will be monetized through CGM's methodology) and connects them to specific SDG indicators advanced. The main goal is to outline how the activities and outputs were linked to the key measured outcome(s).

8) Returns to education studies, based on the Mincer Earning Function, are widely used and supported with extensive evidence. Broadly, these models show a roughly 10% return for each additional year of schooling. These findings have remained consistent and relevant for over [50 years of continuing research. 50 years after landmark study, returns to education remain strong.]

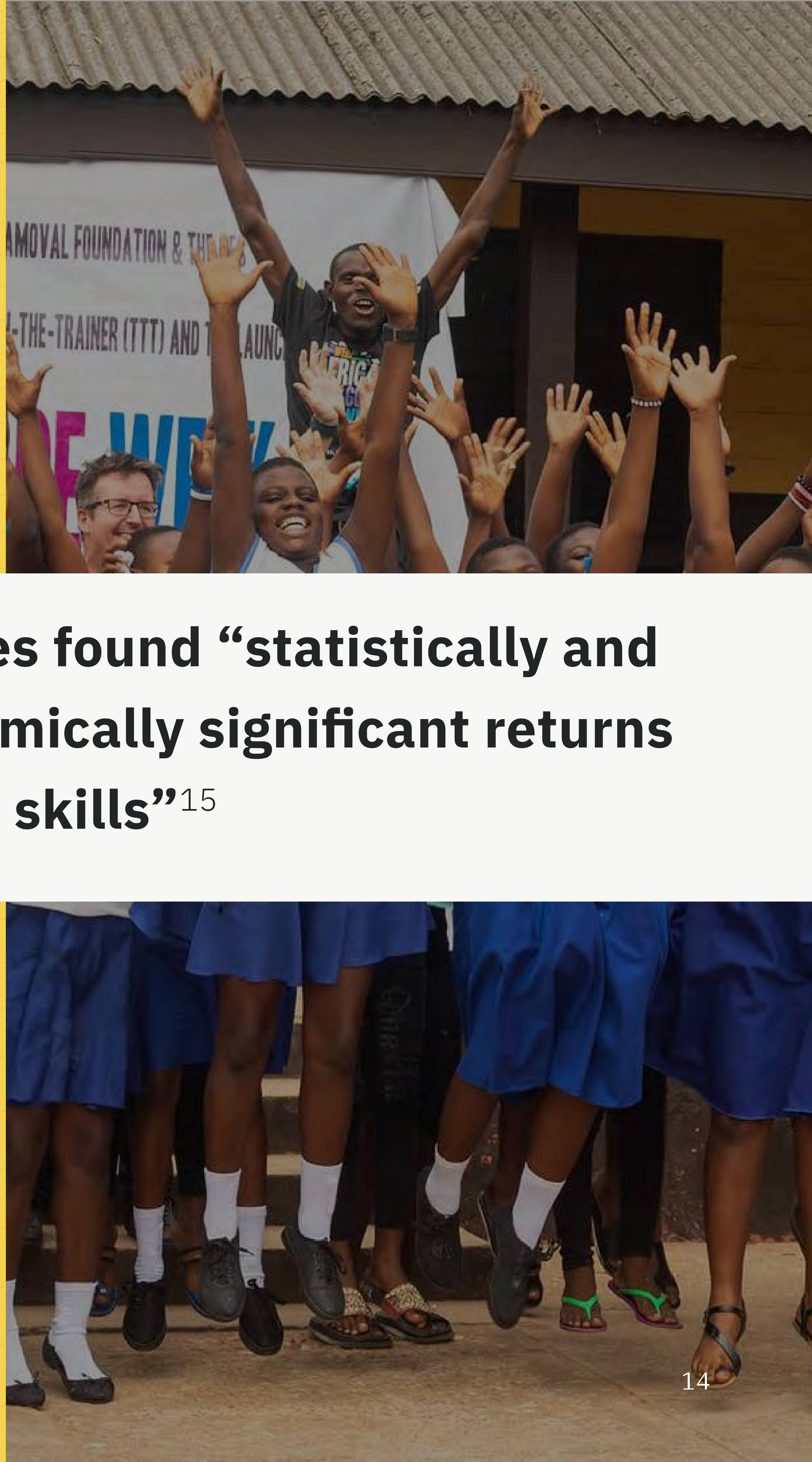


Activities
Outputs
Outcomes
Assumptions
Social Value
Impact
Train teachers in Scratch and computational thinking
Empower female teachers through WEP program
Train students in Scratch and computational thinking
Organize and host the AfriCAN Code Challenge
Engage Ministry of Education to integrate coding and computational thinking into curricula
Male and female teachers trained
Male and female students trained and educated
Countries' Ministries of Education with integrated curricula
Greater engagement of female students with ICT and computational skills
Learning gains in digital literacy and computational thinking for students
Students and teachers have the confidence and support to learn and teach coding skills
Having more education, knowledge, and skills is positively correlated with higher earnings
Higher teacher quality leads to more effective teaching and higher learning gains
Gains in ICT learning lead to greater employability and additional income over the national baseline
Children are better equipped and motivated for the digital age, leading to more employment opportunities, better jobs and higher wages
SDG Targets
Target 4.4:Increase the number of youth and adults who have relevant technical and vocational skills, for employment, decent jobs and entrepreneurship
Target 5.b: Enhance the use of enabling technology, in particular ICT, to promote the empowerment of women
Target 17.9: Enhance international support for implementing effective and targeted capacity-building in developing countries to support national plans

Calculating ACW’s Social Value

CGM’s Impact Framework leverages a human capital approach to value project impacts, homing in on changes to beneficiary well-being that can be shown to pertain to future production potential, calculated through the present value of future expected labor earnings. As CGM uses this approach, it is intended to be a proxy for well-being using a proven methodology grounded in established economic theory.

CGM’s valuation framework does not aim to generate a complete and exhaustive picture of the full potential social value of the goods and services an organization creates. Rather, it uses available rigorous research to model changes to the lifetime income potential resulting from the project. This approach enables a conservative representation of overall social value, grounding project impacts in established data sources and credible valuation models.

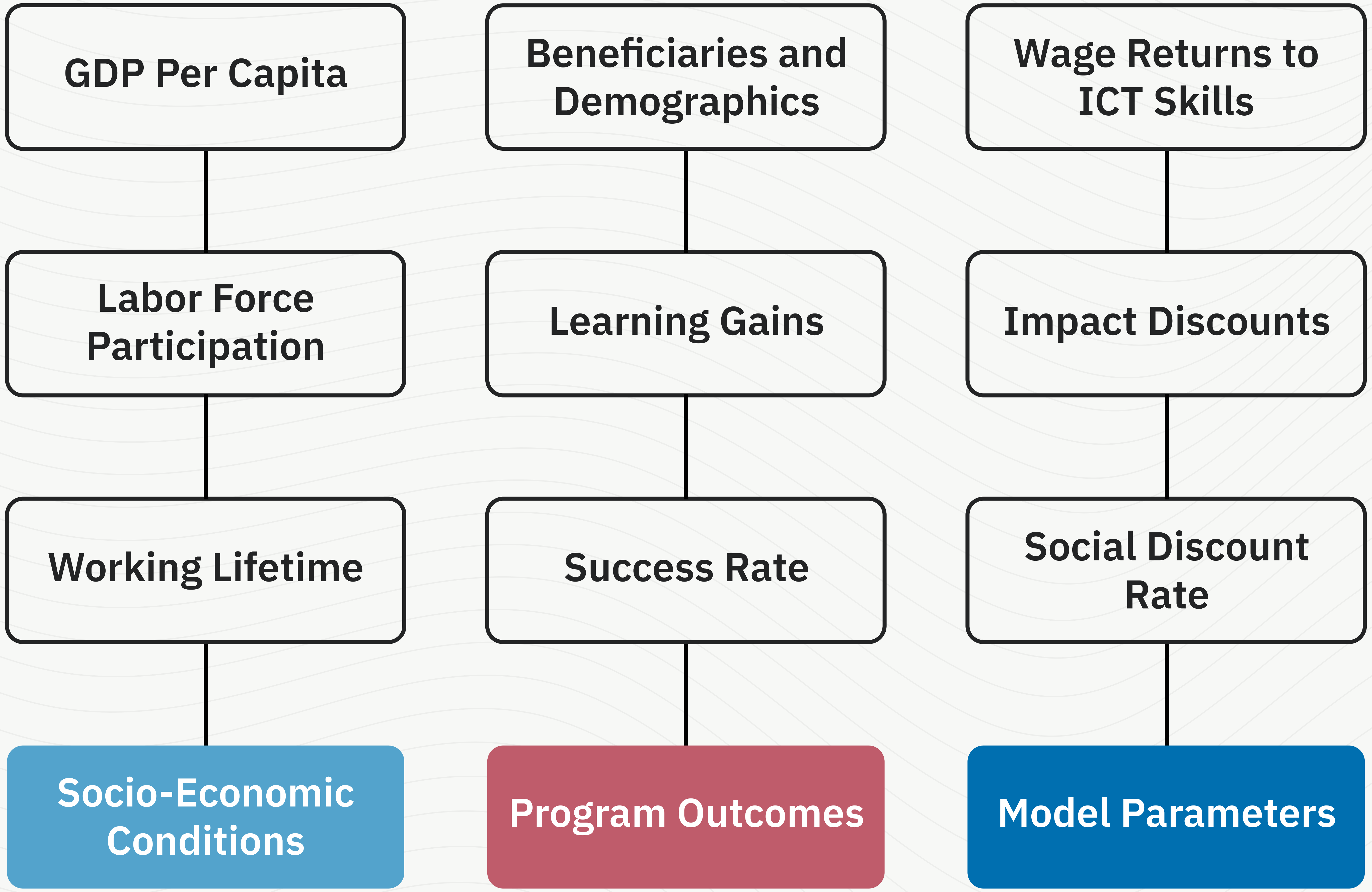


Studies found “statistically and economically significant returns to ICT skills”[15]

[15] Oliver Falck, Alexandra Heimisch-Roecker, and Simon Wiederhold. “Returns to ICT Skills.” Research Policy. Elsevier, vol.50(7). 2021.

Social Value Calculation

The table on this page summarizes all the parameters needed for ACW's social value calculation, divided into four groups according to the source of the underlying data. In the model, these parameters can be applied individually or combined to create different analyses and data sets, such as the baseline socio-economic conditions of each country, the financial proxy, the scale of the intervention, and the impact discounts.



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ACW's Impact Model is grounded in ACW's directly monitored program participants, disaggregated by gender. Total enrollment for ACW is broken down by country, year, and gender of participants. World Bank socio-economic data for each country, year, and gender is applied to these values to provide weighted socioeconomic conditions for the basis of social valuation.

While there was complete data regarding the number of students reached in the period, there was no available data on baseline skills or learning gains for either students or teachers, and thus the estimated social value represents a range of possible outcomes using available data and research on broader ICT skills and technology penetration in Africa.

CGM's model converts participants and socio-economic data into social value through a financial proxy. The financial proxy is grounded in the baseline economic conditions of the country and converts the project outcome into a monetary value using anchor studies. In situations where beneficiaries experience and benefit from this outcome after the intervention is complete, the financial proxy is projected into the future based on positive cash flows and brought back to present value using a Social Discount Rate.[9]

To measure true program impacts as learning gains, an assessment of baseline and endline skills would be required on a statistical sample of program participants. In the absence of these data, CGM created conservative assumptions of learning gains and the program success rate to allow for modeling the social value.

Finally, to provide a meaningful, net measure of impact achieved, CGM applies additional discounts to determine not only the change over the baseline, following best M&E practices in the sector, but also the amount of change that would have happened in the absence of the project, or the counterfactual scenario. Thus, the financial proxy is subject to at least 4 Impact Discounts:

- Deadweight or Counterfactual: the change that would have happened without the project. For ACW, this was modeled based on youth ages 15-24 who are already coding in a specialized programming language.
- Displacement of other positive outcomes or negative effects generated by the project. ACW was assessed as a low-risk program through CGM's Framework.
- Attribution, or the proportion of social value that can be directly attributed to ACW, excluding access to potential alternative sources of ICT skills development and other external contributions to overall program impacts.
- Duration and Dropoff, or the expected deterioration of the outcome over time. For ACW, this is based on broader research on the expected durability of learning gains and wage returns to ICT skills.

Socio-Economic Conditions

Where available, CGM uses data sets from the World Bank Indicators (WDI) collection, published through the World Bank's Open Data Bank to provide socio-economic data for the target year and country.[10]

GDP per capita (2022 US$)

To calculate social value in 2022 US$ denominated values, CGM used two World Bank data sets:

- **GDP per capita (constant 2015 US$)**[11]
- **GDP per capita (current US$)**

The two datasets above were used to create a GDP per capita (constant 2022 US$) series. The base year in the original WDI constant series (2015 US$) was updated to the most recent data available, 2022, for the purpose of calculating the SV.

The GDP per capita (constant 2022 US$) is used as a proxy for one year of production potential for an average, national, working citizen. Specific country data was used for all countries that participated in the program and generated SV.

Labor Force Participation

The labor force participation rate[12] is used to make the calculations more conservative by adjusting the GDP per capita value, depending on gender. This allows the model to account for those that would be economically active and discount those that would not. This approach is based on mainstream, broadly adopted economic concepts and is coherent with the choice of using the GDP per capita as a proxy for future positive cash flows.

Working Lifetime

The Working Lifetime is defined as ages 15-64, following the World Bank's definition of a working lifetime. CGM uses the World Bank data on life expectancy, disaggregated by gender, to adjust working lifetime in countries where the life expectancy is less than 64.

The age range, along with the expected duration of benefits (which are considered to persist for the full working lifetime in the ACW model) are used to set the beginning and end of the annual income benefits that are brought to present value in the social value calculation.

[10] The World Development Indicators (WDI) is the primary World Bank collection of development indicators, compiled from officially-recognized international sources. It presents the most current and accurate global development data available, and includes national, regional and global estimates. World Development Indicators.
[11] The GDP per capita is gross domestic product divided by midyear population. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products.

[12] The labor force participation rate is the proportion of the population ages 15-64 that is economically active. It includes people who are currently employed and people who are unemployed but seeking work as well as first-time job-seekers. It does not include people who are outside of the working age or who are not actively seeking work.

Program Outcomes

Modeling ACW's impact requires direct monitoring of the scale and depth of the intervention. CGM uses demographic data on participants and a measure of successful implementation (such as completion of a program) to determine the scale and depth of impact achieved during the period.[13]

Beneficiaries & Demographics

Key demographic information used in the ACW Impact Model includes the number of participants by year, country, and student gender. Age was also a key component of the model to determine the start and duration of benefits modeled over the working lifetime. For all countries except Morocco, 12 was used as the average participant age. In Morocco, where the program focused on younger children, an average age of 10 was used.

ACW's Impact Model is based on the increased wage returns for each standard deviation (SD) gain in learning among the program participants. Learning gains are measured with a standardized assessment at the start and end of the program, comparing direct changes in knowledge and/or practices in the period.

In statistical literature, a standard deviation of 0.2 is considered a minimal effect, and a standard deviation of 0.8 is considered a large effect size. In education programs, it is common to see effect sizes of impactful programs at or below the 0.2 SD benchmark.[14]

Learning Gains

For Africa Code Week, the baseline learning gain is set at 0.0625 based on a 2021 assessment of PIAAC data assessing adult ICT skills.[15] This article notes that students gain 0.5 SD in ICT skills throughout the course of lower and upper secondary school (i.e., 8 years of formal education). CGM divided the total SD gain by the referenced years of education (i.e., 0.5 divided by 8) to find an average 0.0625 SD gains per year of formal education..

Due to the absence of directly monitored data, learning gains were estimated as a multiple of this baseline SD gain (1.5x, 3x, 5x), and modeled through a sensitivity analysis. The baseline learning gains are deducted to set the net SD learning gains for each modeled scenario.

Success Rate

The success rate defines the percentage of beneficiaries served by the program that experienced improved well-being. Depending on the type of intervention, this might relate to the uptake rate of a product or the successful completion of an activity, such as a course of study or a coding bootcamp. In some cases, it may be directly related to some specific change that demonstrates a certain benchmark has been achieved.

In ACW's Impact Model, the success rate is used to conservatively reduce overall impacts in order to account for potential repeat students, student dropout, and to exclude those students who did not achieve a positive effect size in learning gains.

Due to the absence of directly monitored data, the success rate was modeled through a sensitivity analysis.

[13] This section and the data included within are those elements of program data that would be required for outcome-based funding through CGM's Marketplace. For the purposes of estimating the social value of ACW, reasonable and conservative estimates were used for these parameters.
[14] Kraft, M.A. (2018). "Interpreting Effect Sizes of Education Interventions." Educational Researcher, 49(4), 241-253. Accessible in an earlier version at Interpreting Effect Sizes of Education Interventions. Brown University Working Paper.

[15] Falck, Heimisch-Roecker, and Wiederhold 2021. "Returns to ICT Skills." Research Policy. Elsevier, vol.50(7). 2021.

Model Parameters

The below parameters are used to generate the financial proxy, represented as additional annual wages projected over the beneficiary's lifetime. The financial proxy is used as an estimate of increased well-being and economic opportunities resulting from students' participation in ACW.

Wage Returns to ICT Skills

ACW's modeled social value is based on the acquisition of ICT skills, represented by the effect size (or gains in standard deviations) in learning for students who participate in ACW. These learning gains are compared to estimated ICT learning gains among similar students who did not participate in the ACW program (baseline learning gains).

The primary study used to determine the counterfactual and project learning outcomes, as well as their social value, is "Returns to ICT Skills."[16] This study links one SD gain in learning outcomes to a 23.6% increase in annual income. Because this study is limited in scope and focused on OECD countries, CGM has applied its Data Quality Assessment (DQA) to conservatively adjust this measure to a 9.4% wage increase per SD gained.[17]

[16] Falck, Heimisch-Roecker, and Wiederhold 2021. "Returns to ICT Skills." Research Policy. Elsevier, vol.50(7). 2021.

[17] A detailed summary of the anchor study and its DQA and model applications can be found in Annex 2: Research Summary.

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Impact Discounts

Attribution

Attribution is an assessment of how much of the outcome was caused by the contribution of other organizations or people. Attribution is calculated as a percentage (i.e. the proportion of the outcome that is attributable to your organization). Through the program data provided and interviews with key SAP/ACW staff, the attribution was set at 75% for the ACW program. This means that “Other organizations and people have some minor role to play in generating the outcome” (see Annex 1: Social Value Calculation.

Displacement

Displacement is an assessment of how much of the outcome displaced other positive outcomes or if the intervention is known to have created negative externalities elsewhere or to other groups of stakeholders. It is calculated as a percentage.

CGM applied a rate of 5% as a way to account for potential, indirect, unforeseen negative impacts that might occur as a result of the project. This is CGM’s standard rate for projects assessed as “low-risk.”

Dropoff

ACW participants are expected to experience and benefit from increased ICT skills throughout their working life. Research on the durability and attribution of education programs for lifetime earnings argues that the impacts of education do not diminish over time, even as work experience increases.[18] Consequently, CGM set the dropoff value to 0%.

Deadweight

Deadweight is a measure of the amount of outcome that would have happened even if the activity had not taken place (also known as the “counterfactual”).

For the Deadweight parameter, CGM assessed the weighted average of participants aged 15-24 who are coding in the baseline. This is based on ITU ICT data for international reporting on progress towards SDG 4.1.1 and tracks the percentage of the population who have recently executed a particular ICT task as a proxy for skills levels, disaggregated by age and gender.

Only 6 of the 48 ACW countries had reported ITU ICT data, many for only a single year ranging from 2014-2018. To account for this limited data and based on broad research linking internet penetration to the acquisition of ICT skills, CGM created a proxy calculation based on World Bank data on internet penetration by year, creating a weighted deadweight value averaging roughly 7.5% for all program years.

Social Discount Rate

In addition to Dropoff, used to account for project-specific diminishment or increase in outcomes over time, CGM uses a Social Discount Rate, based on socioeconomic classifications, in its Net Present Value (NPV) calculations. The goal is to further account for economic uncertainties and broad differences in context and attribution that may affect outcomes over time.

Aligned with best practices in Social Impact and Social Value frameworks, CGM applies a Social Discount Rate, used to bring social value over a beneficiary’s lifetime to present value, based on the country’s GNI per capita and the World Bank’s lending classification groupings.

CGM’s Social Discount Rate is a graduated discount rate based on the World Bank’s Country and Lending Groups classification.

[18] Psacharopoulos, George, Patrinos, Harry Anthony. Returns to Investment in Education: A Decennial Review of the Global Literature. Policy Research Working Paper No. 8402. 2018.

Social Value Findings and Results

This section presents the estimated social value generated by the Africa Code Week program from January 2015 to December 2022, as well as other key findings from the analysis.

Due to the large differences in populations served, CGM grouped its findings into three main geographies: Morocco (the country that contributed most to the social value generated and student engagement), Cameroon (the second largest contributor in many years of the analysis), and all the other countries grouped together (due to their smaller contributions, in terms of both social value and engagement, these countries were combined for this analysis).

The social value is calculated using CGM's Impact Model, which leverages a human capital approach to value the projected future income attributable to the program and uses demographic data and direct program measures to quantify outcomes. Given data limitations on ACW program outcomes, conservative assumptions and sensitivity analyses were used to inform the estimated social value.

Africa Code Week Data at a Glance

2015 - 2022

(*2023 data was collected after the commissioning of this report)

14.6m

Enrolled participants, 6.7 million of which were female (46%)

17

African Ministries of Education integrating ICT curricula. 7 have implemented the curriculum and 10 are in process

48

African countries

150k

Teachers trained (~1 teacher : 100 students engaged)

$131.76

per participant who successfully completed the program

Findings and Results

Table 1 presents the breakdown of beneficiaries and social value generated by the Africa Code Week program across three geographies: Morocco, Cameroon, and “Other Countries.” The table delineates the total number of participants enrolled by country and year of analysis, along with the corresponding social value generated.

By examining the proportional contribution of individual countries relative to the overall program, stakeholders can assess the relative significance of each country’s involvement in driving program impacts, highlighting the contributions of Morocco and Cameroon compared to other participating countries.

		2015	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**Total**
Morocco	Beneficiaries	33,589	165,352	378,825	1,018,880	2,075,258	1,455,008	1,586,314	1,378,986	**8,092,212**
	Social Value	$ 3,411,304	$ 10,890,197	$ 26,451,828	$ 72,755,415	$ 145,627,387	$ 86,976,340	$ 106,431,398	$ 93,916,518	**$ 546,460,386**
Cameroon	Beneficiaries	645	62,918	390,046	895,589	816,295	858	24,526	897,799	**3,088,676**
	Social Value	$ 34,531	$ 3,563,351	$ 21,494,089	$ 49,387,785	$ 43,776,908	$ 42,909	$ 1,231,415	$ 46,116,670	**$ 165,647,657**
Other Countries	Beneficiaries	54,529	198,488	522,474	1,008,708	965,982	60,041	259,970	363,551	**3,433,743**
	Social Value	$ 5,138,955	$ 15,103,645	$ 44,590,437	$ 71,460,281	$ 69,155,224	$ 3,333,237	$ 16,247,696	$ 25,694,698	**$ 250,724,173**
Total	Beneficiaries	88,763	426,758	1,291,345	2,923,177	3,857,535	1,515,907	1,870,810	2,640,336	**14,614,631**
	Social Value	$ 8,584,790	$ 29,557,193	$ 92,536,354	$ 193,603,481	$ 258,559,519	$ 90,352,487	$ 123,910,509	$ 165,727,885	**$ 962,832,216**

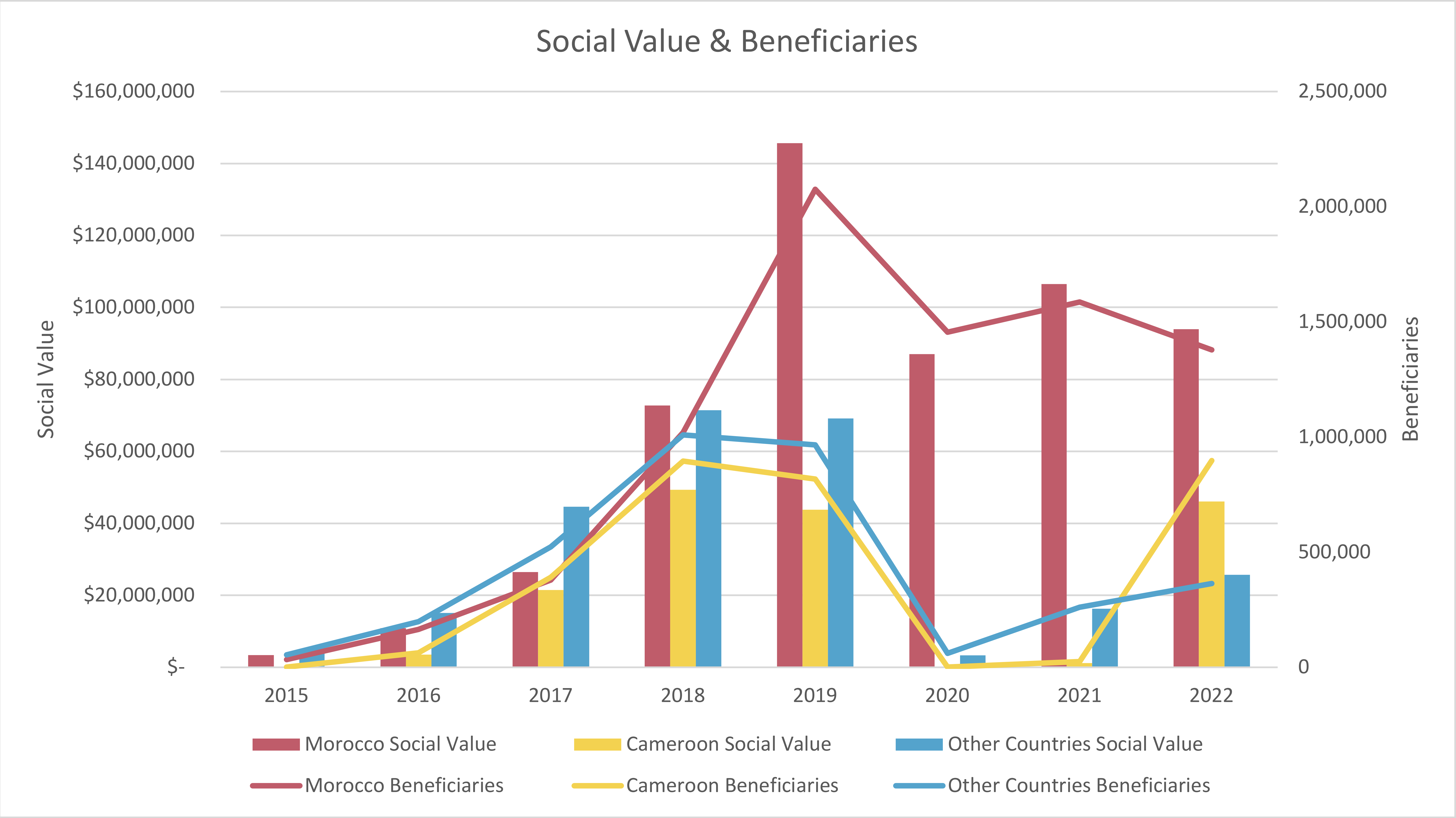
*All values in 2022 Constant USD

		2015	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**Total**
Morocco	Beneficiaries	37.8%	38.7%	29.3%	34.9%	53.8%	96.0%	84.8%	52.2%	**55.4%**
	Social Value	39.7%	36.8%	28.6%	37.6%	56.3%	96.3%	85.9%	56.7%	**56.8%**
Cameroon	Beneficiaries	0.7%	14.7%	30.2%	30.6%	21.2%	0.1%	1.3%	34.0%	**21.1%**
	Social Value	0.4%	12.1%	23.2%	25.5%	16.9%	0.0%	1.0%	27.8%	**17.2%**
Other Countries	Beneficiaries	61.4%	46.5%	40.5%	34.5%	25.0%	4.0%	13.9%	13.8%	**23.5%**
	Social Value	59.9%	51.1%	48.2%	36.9%	26.7%	3.7%	13.1%	15.5%	**26.0%**

Findings and Results

Graph 1 also showcases the program's growth trajectory over time but provides a visual representation of its increasing reach and impact across different years. It also exemplifies how the social value reflects the scale of the intervention, especially in the absence of other monitored program data.

By examining trends in participant enrollment and comparing them to the launch of the supporting programs (WEP and ACC) and other relevant milestones, stakeholders can better understand the programs' effectiveness in attracting and engaging youth in digital education initiatives.



Graph 1: Total beneficiaries and social value by geography (2015-2022)

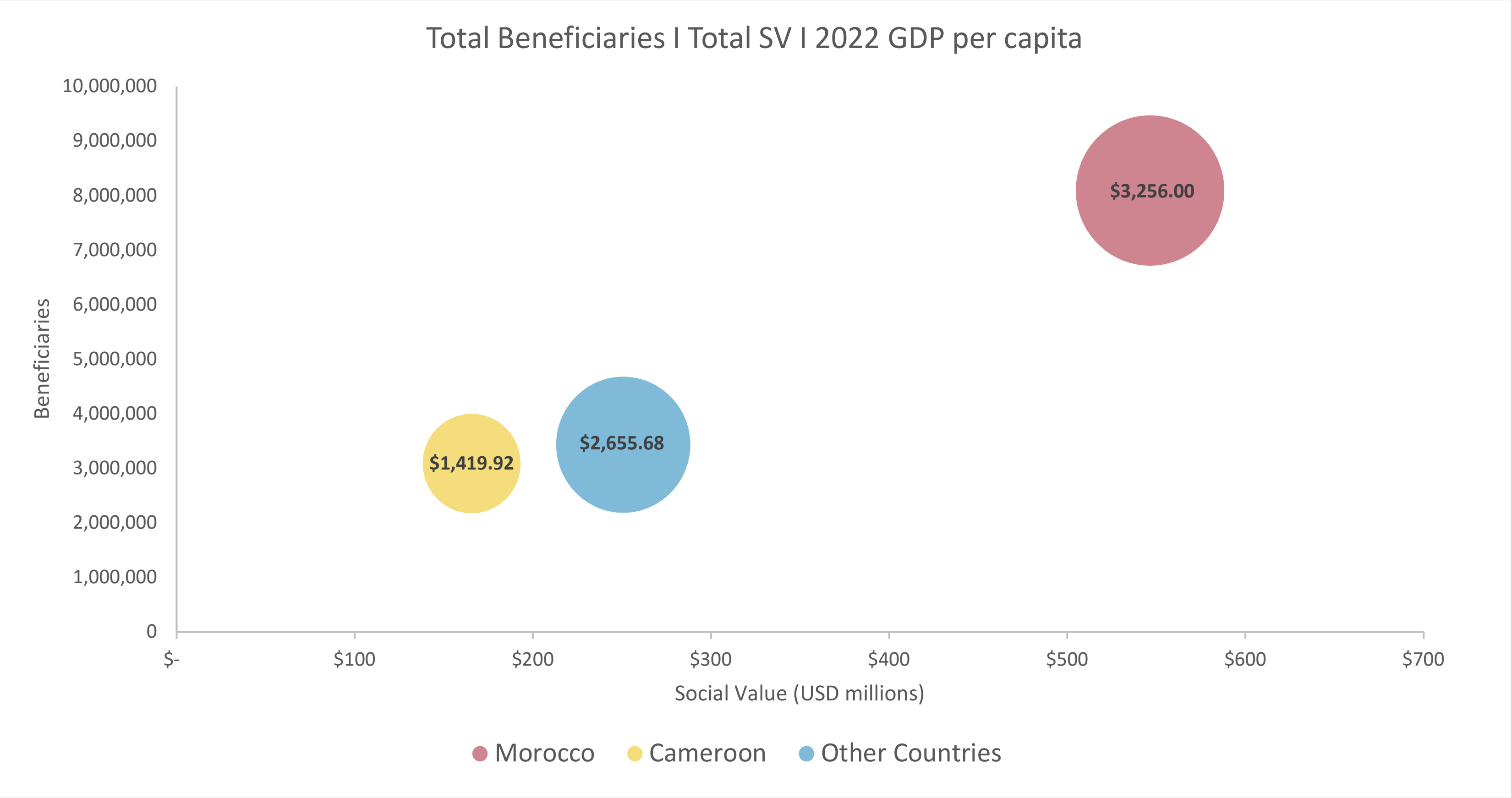
Findings and Results

Due to the absence of directly monitored data (namely, learning gains and success rate), CGM conducted a sensitivity analysis to model a range of social value generated through Africa Code Week since its inception.

Table 3 presents this analysis, considering variations in learning scenarios and success rates. The table compares three learning scenarios (low, moderate, and high) and three success rates (20%, 50%, and 80%) to model a range of potential social value outcomes.

Assuming 50% of program participants achieved the moderate learning scenario (0.125 net standard deviation learning gain in ICT skills), CGM estimates that ACW catalyzed up to $1 billion in Social Value for program participants.

In Graph 2, the Y-axis represents the total number of beneficiaries, while the X-axis signifies the total social value generated. Each bubble on the graph corresponds to one of the three geographies, with the size of the bubble indicating the GDP per capita of the respective region (for "Other Countries," it shows the weighted average of all countries, except Morocco and Cameroon), demonstrating the relative importance that the economic conditions of each country have on the social value generated in CGM's Impact Model.



Graph 2: Social Value, Number of Beneficiaries, and GDP per Capita

Sensitivity Analysis

SD Gain / Success Rate	20%	50%	80%
Low	$ 96,283,222	$ 240,708,054	$ 385,132,887
Mid	$ 385,132,887	$ 962,832,216	$ 1,540,531,546
High	$ 770,265,773	$ 1,925,664,433	$ 3,081,063,093

Future Research and Recommendations

The process of systematically planning and developing activities to collect data from beneficiaries, as well as monitoring and assessing potential changes to quantitative and/or qualitative indicators that affect the targeted population is key to monetizing outcomes through outcomes-based finance mechanisms.

The most common challenges that interventions face and hinder their capacity to properly collect and assess project-related data are: (a) not appropriately planning the execution of data-gathering activities in the project schedule, including before the intervention starts and after important milestones of the intervention; (b) not forecasting the needed resources to develop monitoring activities; (c) choosing the wrong data collection approach for the result you want to verify.

Recommendations

1

Core program data collection can be enhanced to include key demographic parameters such as student age, teacher gender and repeat participation in coding bootcamps (for students) and training programs (for teachers).

2

Meaningful assessment of learning outcomes should be captured on a statistical sample of students to enable robust impact reporting and to create enhanced transparency and accountability around program effectiveness in each location.

3

SAP could conduct a longitudinal study to understand longer-term impacts of its programs, such as increased retention and completion in secondary and tertiary education (especially for girls) and impact on direct employment or wage outcomes compared to a control group.

Because ICT programs are not yet standard in educational settings, SAP has an opportunity to help craft assessment tools that may shape international standards for early ICT education.

Data Collection

1

With a large training program focusing on teachers, detailed assessment and data collection for teachers would help SAP understand baseline knowledge and skill acquisition, as well as the durability of knowledge gained, to enable refinements to the training program to maximize teacher learning and retention, thus facilitating student outcomes.

a) Teacher gender, experience level, grade(s) taught and subject expertise should be key demographics recorded for all participants.

b) Baseline and endline skills involving a direct measure of knowledge and practice should be assessed for a statistical sample of teachers.

2

New and repeat teacher participation should be recorded and tracked.

a) Similar to the WEP program, a model of teacher training and progress towards facilitation would deepen the knowledge gained and lead to a sustainable transfer of knowledge at the local level, ensuring further dissemination of the ACW model.

3

For the goal of future workforce participation and continued acquisition of ICT skills, a small sample of students could be followed to:

a) Assess the continued use of ICT skills and further skills acquired compared to peers who did not complete the ACW workshop.

b) Determine if ACW workshop participation impacts secondary school completion and tertiary education enrollment and completion.

Complementary Research

Current survey methodology and assessment tools for ICT skills focus on practices as a proxy for knowledge. An enhanced Knowledge, Attitudes, and Practices (KAP) survey would provide more detailed information related to barriers to ICT skills acquisition, attitudes that will lead to continuing engagement with ICT skills resulting in retention and improvement of knowledge, as well as key practices that foster ICT use.

Conclusion

Africa's pursuit of sustainable development is highly dependent on the educational advancement and digital skills of its youth population. Unfortunately, a significant portion of the population faces unemployment or underemployment due to a lack of alignment between skills and available job opportunities.

Moreover, the demand for digital skills continues to grow, especially in Sub-Saharan Africa, as the world becomes more digitized and connected. However, inadequate access to technology and quality education has widened the digital gap, exacerbating the problem.

SAP's ACW initiative, launched in 2015, aims to address this issue by enhancing digital literacy across Africa through teacher training and collaboration with Ministries of Education to promote the integration of coding into national curricula. The program spanned across 48 African countries and, since its inception, has reached over 14.6 million participants and trained more than 150,000 teachers, representing a significant milestone in advancing digital education across the continent.

SAP has taken additional steps to address the challenges surrounding the adoption of digital education through initiatives such as the Women's Empowerment Program and the AfriCAN Code Challenge, which aim to increase engagement and participation.

ACW equips participants with ICT skills, enhancing their employability and potential earnings in the digital economy. ACW's social value was assessed using CGM's Impact Framework based on future labor earnings potential. Although data gaps exist, the estimated social value represents a combination of various outcomes using available research.

Based on future increased income, CGM estimates that ACW catalyzed up to $1 billion in social value for program participants.

ACW's impact evaluation underscores its role in fostering economic empowerment and social inclusion through digital education. Moving forward, strategic partnerships and innovative approaches can further amplify its transformative potential.

COMMON GOOD MARKETPLACE

[20] For a detailed breakdown of social value by individual country, see the "Detailed Analysis" tab of the Impact Model.

Annex 1: Social Value Calculation

In CGM's Impact Model, the Social Value (SV) is calculated as:

$$SV = \Sigma\left(\frac{P}{(1+i)^t}\right) * Participants * (1\text{-}Deadweight) * Attribution * Success\ Rate$$

&

$$P = (GDP * labor_{m,f}) * SD * r$$

Where:

P = Additional annual income a participant may expect to earn during their working lifetime as a result of participating in Africa Code Week

i = CGM's Social Discount Rate

t = working years, adjusted for age at participation and life expectancy

Participants = total participants in ACW for the period, disaggregated by country

Deadweight = weighted average of people age 15-24 who are coding in the baseline

Attribution = the assumed contribution that ACW has to the overall outcome

Success Rate = the assumed percentage of participants who experience the stated outcome

GDP = the 2022 constant GDP per capita for the period

$labor_{m,f}$ = the labor participation rate for the country and period, disaggregated by gender

SD = The net standard deviation learning gain for ACW participants

r = annual wage returns to ICT skills for 1 SD increase in net learning outcomes

P is the additional annual income a participant may expect to earn during their working lifetime as a result of participating in Africa Code Week.

- Working lifetime is defined as ages 15-64, following the World Bank definition of working lifetime.
- Income earned is accrued beginning at age 15 (deferred for 3 years for all countries except Morocco, where it is deferred for 5 years to account for the younger average participant age) and is subject to the Net Present Value calculation.

i is CGM's Social Discount Rate, which is a graduated discount rate based on the World Bank's Country and Lending Groups classification.

- The 2022 constant GDP per capita for the period is used to classify each country and set i in the SV calculation.
- Based on data availability and methodologies available through the World Bank, CGM used the available GDP data series in order to update the figures to 2022 constant values.

Country Classification	GDP per capita, min	GDP per capita, max	Discount (%)
Low income	$ -	$ 1,085.00	5%
Lower middle income	$ 1,086.00	$ 4,255.00	7%
Upper middle income	$ 4,256.00	$ 13,205.00	9%
High income	$ 13,206.00	$ 1,000,000.00	11%

Source: World Bank Country and Lending Groups

Attribution is an assessment of how much of the outcome was caused by the contribution of other organizations or people. Attribution is calculated as a percentage (i.e. the proportion of the outcome that is attributable to your organization). For ACW, CGM used the Australian government's SROI filter to set an attribution discount of 25%, accounting for other organizations and people who played a minor role in generating the outcome.

Deadweight is the weighted average of participants aged 15-24 who are coding in the baseline. This is based on ITU ICT data for international reporting on progress towards SDG 4.1.1 and tracks the percentage of the population who have recently executed a particular ICT task as a proxy for skills levels, disaggregated by age and gender.

- There is only data available for 6 of the 48 countries participating in ACW, so this parameter was modeled based on available data from the World Bank on internet penetration by year.
- Based on the small available ICT data, 3 bands were created as a proxy for coding in the baseline: if internet penetration is greater than 75%, then 11% deadweight is used; if internet penetration is between 41% and 74%, then 7% deadweight is used. If internet penetration is less than 40%, then 2% deadweight is used.

The **SD** parameter estimated the net learning gains for ACW participants. The baseline learning gain is set at 0.0625 based on Falck, Heimisch-Roecker, and Wiederhold 2021 2021 anchor study.

- This study demonstrated that, on average, students gain 0.5 SD in ICT skills throughout the course of lower and upper secondary school (i.e., 8 years of formal education). CGM divided the total SD gain by the referenced years of education (i.e., 0.5 divided by 8) to find an average of 0.0625 SD gains per year of formal education.
- Learning gains are estimated as a multiple of this baseline SD gain (1.5x, 3x, 5x). Also, the baseline learning gains are deducted to set the net SD learning gains for each modeled scenario.

Category	Discount (%)
The outcome is completely a result of the activity and no other programs or organizations contributed	0%
Other organizations and people have some minor role to play in generating the outcome	25%
Other organizations and people have a role to play in generating the outcome to some extent	50%
Other organizations and people have a significant role to play in generating the outcome	75%
The outcome is completely a result of other people or organizations	100%

Source: Australian Government - SROI Filters

Annex 2: Research Summary

Anchor Study used to determine social value:

The primary article used to set the counterfactual and project learning gains, as well as the returns to ICT skills acquisition, is Falck, Heimisch-Roescker, and Wiederhold 2021. This article:

- Uses data from **19 OECD countries**' PIAAC tests assessing adult skills, extrapolating wage gains through a Mincer earnings model
- Concludes that there are "statistically and economically significant returns to ICT skills," that link **increases in SD gains to better wages**
- "One SD increase in ICT skills attributable to a historically larger fixed-line network leads to a 23.6 percent increase in wages"
- **Counterfactual** is set based on the learning progress made by school-attending respondents between lower secondary and upper secondary education
- The **measured SD difference** between the worst-performing country (Poland) and the highest-performing country (Japan) is 0.6 SD
- The development of ICT skills and their correlation to earnings are **dependent on the dispersion of broadband internet access**

Model applications:

- Counterfactual ICT SD gain is 0.0625 (0.5 SD gain over 8 years). This represents the annual SD gain of students without ACW participation
- Due to the applicability of the study to the African context, the wage returns per SD gain are discounted to 9.4% per year, using CGM's Data Quality Assessment tool
- Program benefits are expected to last for the working lifetime without deterioration

[21] Falck, Heimisch-Roecker, and Wiederhold, 10.
[22] Duration of baseline learning gains is set at 8 years to represent the age span from lower to upper elementary school, conservatively measured as from 11-19 years. Ages and definitions were taking from ISCED levels of education.

Data Quality Assessment

- **Quality of study (15/30 points):** This study uses available data from PIAAC results to regress a correlation between ICT skills and wages. Because it uses a single data set (rather than a meta-analysis) without a comparison group and does not involve direct data collection on the parameters of interest, CGM discounted this score by 50%.
- **How directly is the study linked to the project (10/40):** This study focused on relatively wealthy nations with strong economic opportunities and technology penetration. It is assessing adult skills and not connecting these skills with any training program. The project targets low-income countries with limited technological penetration and directly training participants on key ICT skills. Given the large difference in context and intervention, CGM discounted this score by 75%.
- **Income group (5/20):** The study is focused on OECD countries, whereas the project is focused on African countries. The large disparity in income groups led CGM to discount this score by 75%.
- **Context (10/10):** Both the study and the ACW program operate nationally across broad geographical context (urban, peri-urban, and rural). Given the large scope of ACW and the anchor study, CGM did not discount this value.
- **Total score (40/100):** CGM uses the total DQA score as an adjustment factor for the target value, in this case, the annual percentage increase in income for each SD gain in skills. Capturing only 40% of the estimated possible value enables CGM to conservatively adjust the social value to account for the many limitations and differences between the study and the ACW program.

[23] "Likewise, one SD in ICT skills is roughly twice the learning progress made by school-attending PIAAC respondents between lower secondary and upper secondary education, which amounts to 20 PIAAC points across the countries participating in the study." Falck, Heimisch-Roecker, and Wiederhold, 10.

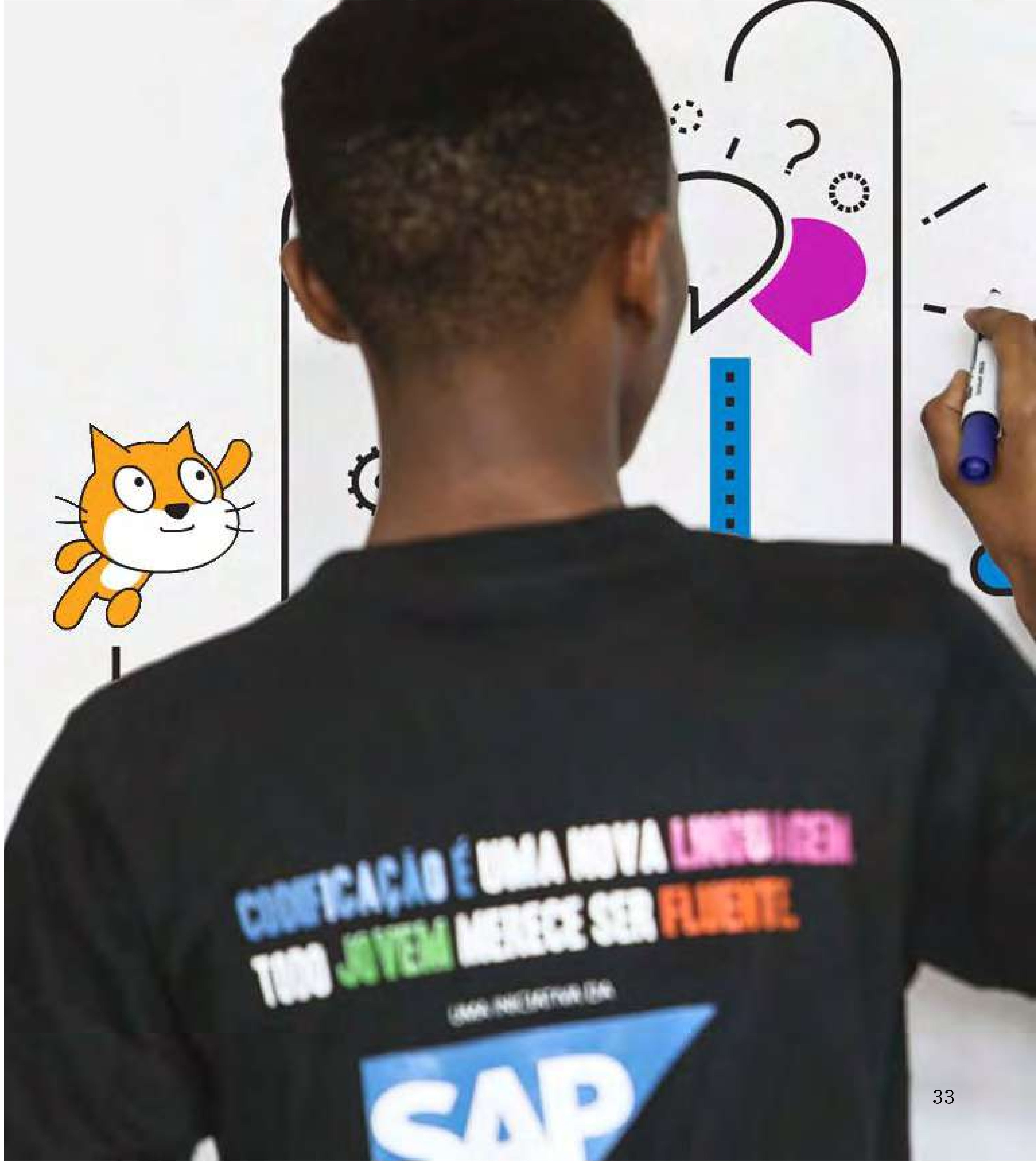
Additional Research

Summary of key findings:

- Evidence suggests that computational thinking is more important than direct ICT skills.
- Current research links ICT skill acquisition and associated income gains with broadband dispersion, arguing that basic ICT skills are quickly acquired when access to technology is readily available.

The prevalence of broadband internet access increases the demand for digital skills and facilitates the adoption of these skills. Education programs focusing on digital skills for students will more successfully lead to employment when these employment opportunities are bolstered by internet-enabled workplaces that both facilitate continuing skills development and provide resources for deploying these skills.

While there is limited evidence related to income gains correlated to the acquisition of computer skills, there are other studies, also focused on developed countries and the rise of internet access and/or computer use in the workplace, that roughly correspond to a 10% increase in income for those with more advanced ICT skills.



Annex 3: Key datasets provided to CGM

2022 Ambassadors survey

- No data was reported from Angola, Chad, or Djibouti. These countries were removed from the analysis and reporting
- Integration into the national curriculum is reported for primary and secondary school, classified as “Yes”, “No”, or “In process”.
- Note: Data from Morocco was not available through the ambassador’s survey and was provided directly from the TICE dashboard and ACW Compiled Results.

ACW Compiled Results

- Data is available on the total number of students and their gender from 2015 to 2022.
- No data was reported from Angola, Chad or Djibouti. These countries were removed from the analysis and reporting.
- No data was provided for Burkina Faso or Mauritius in 2022, both of which submitted Ambassadors Surveys showing students and teachers trained. These data were added to the total compiled results.
- Data from Sao Tome and Principe in 2020 report more girls trained than total students participating. Female students were reduced to match the total number of participants for 2020 (70 participants).
- Key data points used were the number of students and the student gender.
- No age data was available. CGM used 12 as the median age from 8-16 (the age range for Africa Code Challenge eligibility) for all countries and 10 for Morocco (based on SAP feedback) for modeling purposes.
- Note: for the purposes of the social value calculation, children with special needs were treated as all other students. The only data disaggregation done was by gender.

2022 WEP data

- Given the small number of participants and limited data on effects, these data were not used for the social value calculation.

Africa Code Week Workshop Report

- Underlying data for the report was requested, but not available. These data were not used in the social value calculation.

Data adjustments

1. Labor participation rates for the Seychelles are not available. Given the small number of ACW participants (15 total students in 2021 only), no social value is calculated for the Seychelles.
2. GDP per capita for South Sudan, 2022 current figures, were not available. The 2015 GDP per capita was brought into the 2022 column to create an adjustment factor of 1, effectively using the 2015 value.

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