



Young Leaders Transforming Science in Ghana

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6.1 INTRODUCTION

In this chapter, we explore perceptions of leadership and leadership styles in an era of change and innovation, particularly among young leaders in science in Ghana. Within the Science, Technology, Education, and Mathematics (STEM) sector, we describe the experiences of a number of male and female leaders in academic institutions, grassroots non-governmental organizations (NGOs), and business organizations. We highlight the various challenges they face and discuss how they have overcome these challenges. We also explore the different ways in which leadership skills are developed in Ghana and assess their effectiveness. This study aims to provide a detailed description of the STEM transformation currently taking place in Ghana through the eyes of those leading the transformation. By highlighting a number of key challenges and success stories, we hope not only to promote a new African narrative but also to provide some

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recommendations on how to further stimulate the development of science leaders for the future throughout Africa and indeed around the world.

This chapter is structured as follows:

- Section 6.2—“Context: Young Leaders in Science in Ghana”: Short description of economic, demographic, and political context in Ghana. Brief history of the development and status of science in Ghana.
- Section 6.3—“Case Study Data”: We describe how our data were collected.
- Section 6.4—“Perceptions of Hierarchy”: Including the national culture and aspects of organizational culture, notably characteristics of academic institutions, grassroots, and entrepreneurial organizations.
- Section 6.5—“The Need for Change”: A shift towards strategic and people-oriented leadership styles: Expectations of today’s leaders.
- Section 6.6—“Diversity of Leaders”: Gender and age/level of experience
- Section 6.7—“Leaders’ Attributes”: What leaders’ attributes were considered important? Decisiveness, candidness, doing good, honesty/Integrity, and adaptability
- Section 6.8—“The Road to Becoming a Leader: Leadership Development”: Explores determinants for success in how people have become leaders, their role models, and different initiatives for development of leadership skills and how to build confidence.
- Section 6.9—“Conclusions/Discussion”: Lessons learnt and suggestions for further development of young leaders in science in Ghana

6.2 CONTEXT: YOUNG LEADERS IN SCIENCE IN GHANA

Overall, in this book we have categorized leaders as young if they are below the age of 35, and senior above that age. However, in this Ghana case study we define leaders below the age of 40 as young. Science leadership positions are often linked to having a PhD, which most people in Ghana typically obtain at a later stage in life, as they often work for a number of years between graduate degrees. Furthermore, the general perception of leaders in Ghana is that leaders up to the age of 40 are young.

6.2.1 *Political, Economic, and Demographic Context in Ghana*

Ghana’s first President, Dr Kwame Nkrumah, famously said: “We face neither East, nor West: we face forward.” Indeed, Ghana gained independence in March 1957 and it was the first multi-party democracy in Africa. According

to its Constitution, Ghana is a Republic with an executive presidency and a multi-party political system. The national legislature is the unicameral Parliament, whose 275 members are elected by universal adult suffrage every four years. In 2000, for the first time in Ghana's history, there was a democratic transfer of power. Since then, the President, who is head of state and commander-in-chief of the armed forces, has been elected by universal suffrage for a maximum of two four-year terms (Commonwealth, 2019).

The International Monetary Fund (IMF, 2018) states that Ghana is in many ways a “modern” economy. When Google decided to open a research centre for artificial intelligence in Ghana's capital Accra—the first one in Africa—people were excited but not really surprised. The IMF (2018) further states that over the past two decades, extreme poverty levels have declined by more than two-thirds; life expectancy has increased by 10%; and real per capita income has grown by more than 80%. Ghana had a gross domestic product (GDP) growth of 14% in 2011. Though this fell to around 2.9% in 2014 it has slowly been growing out of that dip, thanks in large part to production from recently discovered offshore oil and gas fields. The country experienced 8.1% growth in 2017 (Dontoh & Van Vuuren, 2018) and these levels of growth are expected to continue over the medium term as oil and gas production is expected to increase. These are remarkable achievements and a testament to Ghana's immense potential (IMF, 2018).

Ghana has a population of 24.6 million, which represents an increase of 30.4% over the 2000 census population of 18.9 million (GSS, 2012). The results of this census show that Ghana has a youthful population, consisting of a large proportion of children under 15 years (38%), and a small proportion of elderly persons (65 years and older—5%). The age structure of the country's population is basically shaped by the effects of high fertility and a decreasing infant mortality rate. The proportion of the population living in urban areas was 55% in 2017, with a growth of 6.8% urbanization over a decade (Statista, 2019).

According to the Ghana Statistical Service (2012), agriculture, including forestry and fishing, remains the largest industrial sector in the country, employing 41.5% of the economically active population aged 15 years and older. The next major industrial activities are wholesale and retail trade (18.9%) and manufacturing (10.8%). In the urbanized Greater Accra region, larger proportions of the economically active population are engaged in wholesale and retail trade (31.6%) and manufacturing (14.8%). Data on employment status indicates that the majority (64.8%) of the economically active population is self-employed, and employees constitute 18.2%, while contributing family workers make up 11.5%. A relatively large proportion of

males (25.3%) compared to females (11.4%) are employees. Also, females are slightly more likely to be self-employed (69.4%) than males (60.0%).

Through the politically tumultuous 1990s and into the early 2000s, young people faced many difficulties, which affected their development into responsible adulthood (Hoetu, 2001). Inadequate access to public services, especially education, was a key challenge. As a result, a considerable number of youth entered the labour market unprepared in terms of education and labour market experience. This phenomenon coupled with limited employment opportunities resulted in high levels of unemployment and underemployment. There were also limited or, in some cases, no opportunities for constructive political engagement, particularly for those without personal connections. At the level of senior high schools, the gross enrolment ratio in 2008 was estimated at only 32.2%, while tertiary enrolment was only 8.6%.

The last decade has seen significant improvements in the access to education with secondary school and tertiary enrolment in 2017 estimated at 56% and 16.6%, respectively (UNESCO, 2018). Secondary school enrolment has been further boosted with the Ghana government's decision to launch a free senior high school programme, which saw a 36% jump in student enrolment over the past year (BFT Online, 2019).

6.2.2 *Science in Ghana*

The first government of the Republic of Ghana recognized the importance of education to the sustainable development of the newly independent nation. In 1961, a mere four years after independence, the University College of the Gold Coast and the Kumasi College of Technology were issued with their own charters forming the University of Ghana (UG) and the Kwame Nkrumah University of Science and Technology (KNUST), respectively. The curricula of these universities featured a significant number of courses in the areas of basic and applied medical sciences and KNUST in addition featured a School of Engineering. Despite this promising start, the years of political instability and economic difficulty that followed the military overthrow of the Nkrumah government severely hampered the advancement of the universities and education sector in general. Thankfully, the political climate in Ghana stabilized around the turn of the century and the country has seen significant economic growth. This has translated to the education sector where there has been significant increase in both public and private sector investment in education.

The major public universities have been expanded and a number of private universities have been set up, providing many more opportunities for higher education.

Non-surprisingly, STEM has been a major focus of this new investment. One of the major contributors to the growth of scientific research activity in Ghana and indeed across the continent has been a revolutionary programme funded by the World Bank. The African Centres of Excellence (ACE) initiative was launched in 2014 and by the end of 2018 has allocated over US\$500 million in loans to African governments for the establishment of 72 scientific research centres within universities across Africa (Nordling, 2018b; World Bank Project Report). This project was revolutionary because not only did it provide funds to build grassroots research infrastructure (as opposed to grant funding targeted to a specific scientific project) but it also engineered a way for African governments to invest in scientific research (the governments are responsible for paying back the loans). Ghana stands out as one of the most successful countries of the ACE initiative, with the second highest number of successful applications—second only to Nigeria (a country with a population six times the size of Ghana). These centres of excellence (which include the West African Centre for Cell Biology of Infectious Pathogens (WACCBIP) (www.waccbip.org) and the West African Centre for Crop Improvement (www.wacci.ug.edu.gh)) have significantly improved the quality of scientific research capacity available in Ghana. A positive side effect of this revitalization of the public research institutions is that growing numbers of Ghanaian scientists trained and living in the diaspora are returning home (Nordling, 2018b). This is further enriching the research environment in Ghana and it is hoped that this trend will prove to be sustainable in the long run.

Besides public institutions a number of private universities have also begun to promote STEM education in Ghana. The most prominent of these is Ashesi University, founded by Dr Patrick Awuah, a US-trained Ghanaian engineer. The university opened in 2002 and has developed a multidisciplinary curriculum focused on business administration, management information systems, computer science, electrical engineering, and mechanical engineering. The stated vision of the university is “to educate ethical, entrepreneurial leaders in Africa; to cultivate within students, the critical thinking skills, the concern for others, and the courage it will take to transform the continent” (www.ashesi.edu.gh). The university has grown significantly over the last decade and now has a total student body

of over 1000; in 2017, it was awarded the World Innovation Summit in Education Prize.

The formal education sector is not the only contributor to scientific innovation and literacy in Ghana. A growing number of non-profit organizations aimed at encouraging young people to get involved in science have been established over the last few years. Mostly led by young Ghanaians, these organizations are involved in a range of activities including promoting the involvement of girls and women in STEM (e.g. Girls Can Code Ghana: www.girlscancode.org.gh; Levers in Heels: www.leversinheels.com; STEMbees: www.stembees.org), increasing scientific literacy among the general public (GhanaThink: www.ghanathink.org; Barcamp Ghana: www.barcampghana.org; GhScientific: www.ghscientific.com), and promoting open science and innovation (Global Lab Network: www.glabghana.wordpress.com; Khalmax Robotics Project: www.khalmaxsoftwaresystems.com). The emergence of these grassroots initiatives is a clear positive indicator that Ghana provides an increasingly conducive environment for science and innovation.

A common thread throughout the STEM transformation currently taking place in Ghana is the role of young leaders. In both the public and private sectors, young leaders are redefining what was previously thought possible and are using science to improve their local communities and indeed the country as a whole.

6.3 CASE STUDY DATA

Data for this case study was collected during the first half of 2019. Survey participants were sought among professional networks of leaders working in science: 120 were sent the invitation; 25, or 20%, responded. The online survey was completed by 25 leaders, 9 female/16 male, 68% young/32% senior leaders, with all except four respondents having leadership experience. One-third (8) have more than 6 years' experience and slightly more than one-third (9) have 3–6 years' experience, thus the majority (17) of respondents have more than 3 years' experience in leadership positions.

The survey was followed by in-depth qualitative interviews, which were held with nine leaders (five male/four female, five young/four senior). These science leaders were selected from a range of roles in a diverse set of STEM organizations/companies as is indicated in Table 6.1. The leaders in this chapter consented to be presented with their real names, contrary to other chapters where we have used pseudonyms.

Table 6.1 Demographic information of the Interviewees (Ghana)

| <i>Name</i> | <i>Gender</i> | <i>Young/senior</i> | <i>Role</i> |
|-----------------------|-------------------|----------------------------|--|
| Mrs Lucy Quist | Female | Senior | Engineer and business leader |
| Mrs Lynda Arthur | Female | Senior | Regional lead pharmaceutical company |
| Prof. Gordon Awandare | Male | Senior | Associate professor/director research centre |
| Dr Lydia Mosi | Female | Senior | Head of department, university |
| Dr Tom Tagoe | Male | Young | Science communicator and lecturer |
| Mr Gameli Adzaho | Male | Young | Public health specialist and science communicator and influencer |
| Dr Yaw Bediako | Male | Young | Research fellow |
| Mr Godwin Anabire | Male | Young | PhD student |
| Ms Claudia Anyigba | Female | Young | PhD student |
| Total | Five M, Four F | Four senior, Five young | |

Table 6.2 Coding frequencies by attributes (Ghana)

| Code Category (5) | Codes (15) | Number of times coded (144) | In how many different interviews (9) | Attributes of interviewee (Number) | | | | Number of interviewees, by attribute, who mentioned the coded issues two or more times | | | |
|-----------------------------|----------------------------|-----------------------------|--------------------------------------|------------------------------------|--------|--------|-------|--|--------|--------|-------|
| | | | | Age | | Gender | | Age | | Gender | |
| | | | | Youth | Senior | Man | Woman | Youth | Senior | Man | Woman |
| 01-Perceptions of hierarchy | General | 6 | 3 | 2 | 1 | 3 | 1 | 2 | 1 | 2 | 1 |
| | Organization Specific | 3 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 02- Leadership Style | Strategic Leadership | 9 | 4 | 2 | 2 | 3 | 1 | 1 | 2 | 2 | 1 |
| | People Oriented Leadership | 14 | 9 | 5 | 4 | 5 | 4 | 1 | 4 | 2 | 3 |
| 03_Leader Diversity | Women leaders | 6 | 4 | 1 | 3 | 4 | 4 | 2 | 4 | 2 | 2 |
| | Youth | 14 | 7 | 4 | 3 | 3 | 4 | 3 | 1 | 3 | 1 |
| 04_Leadership Attributes | Candidness | 6 | 4 | 2 | 2 | 3 | 1 | 1 | 1 | 1 | 1 |
| | Decisiveness | 4 | 3 | 1 | 2 | 1 | 2 | 1 | 1 | 1 | 1 |
| | Integrity | 6 | 4 | 2 | 2 | 1 | 3 | 2 | 1 | 1 | 1 |
| | Doing Good | 19 | 8 | 4 | 4 | 4 | 4 | 3 | 1 | 3 | 1 |
| | Adaptability | 9 | 6 | 3 | 3 | 3 | 3 | 2 | 1 | 3 | 1 |
| 05_Leadership Development | Leadership determinants | 13 | 9 | 5 | 4 | 5 | 4 | 1 | 2 | 2 | 1 |
| | Role Model | 9 | 6 | 3 | 3 | 2 | 4 | 1 | 1 | 1 | 1 |
| | Skills Development | 17 | 9 | 5 | 4 | 5 | 4 | 3 | 2 | 2 | 3 |
| | Confidence | 9 | 5 | 3 | 2 | 4 | 1 | 1 | 2 | 2 | 1 |

Five of the interviewees also responded to the survey. Thus overall, this chapter represents the views of a total of 29 (12 female/17 male, 59% young, 41% senior).

Table 6.2 shows the coding scheme used for the case studies (see the Methodology chapter for an explanation) along with the coding frequencies, which are also disaggregated by attributes of age and gender, and number of interviewees who mentioned coded issues two or more times

The following sections (Sects. 6.4, 6.5, 6.6, 6.7, and 6.8) report the findings from both the survey and interview data, organized by the interview coding categories.

6.4 PERCEPTIONS OF HIERARCHY

Ghana as a nation encompasses many different ethnolinguistic groups, several of which are represented among our respondents and interviewees. However, in our research we do not distinguish the data between different ethnolinguistic groups. It is also influenced by its colonial past and rapid urbanization. An important aspect of leadership that is influenced by cultural values is the norms and beliefs around hierarchy. In our survey, we recorded both the perceptions of current *practice* and respondents' personal *preferences* towards hierarchy. The leadership cultural context includes the national culture and also aspects of organizational culture, notably characteristics of academic institutions and other grassroots and entrepreneurial organizations in the STEM sector.

The results in Fig. 6.1 are positioned in four quadrants; the respondents in two of these could be considered broadly satisfied (the green quadrants), and the respondents in the remaining two quadrants could be considered broadly dissatisfied (the red quadrants):

Broadly dissatisfied:

- *Lower right quarter*: The largest group of 12 respondents (50%) considers the current practice as very hierarchical and would personally prefer less hierarchy than they currently witness in the society. Another four respondents consider the current practice as quite hierarchical and would personally prefer much less hierarchy.
- *Upper left quarter*: No respondents consider the current practice not very hierarchical and would prefer more hierarchy than currently witnessed in the society.

Broadly satisfied:

- *Lower left quarter*: Five respondents consider the current practice not very hierarchical, and this corresponds mostly with their preference.
- *Upper right quarter*: One respondent considers the current perception on hierarchy as very high, which corresponds with a slightly higher preference.

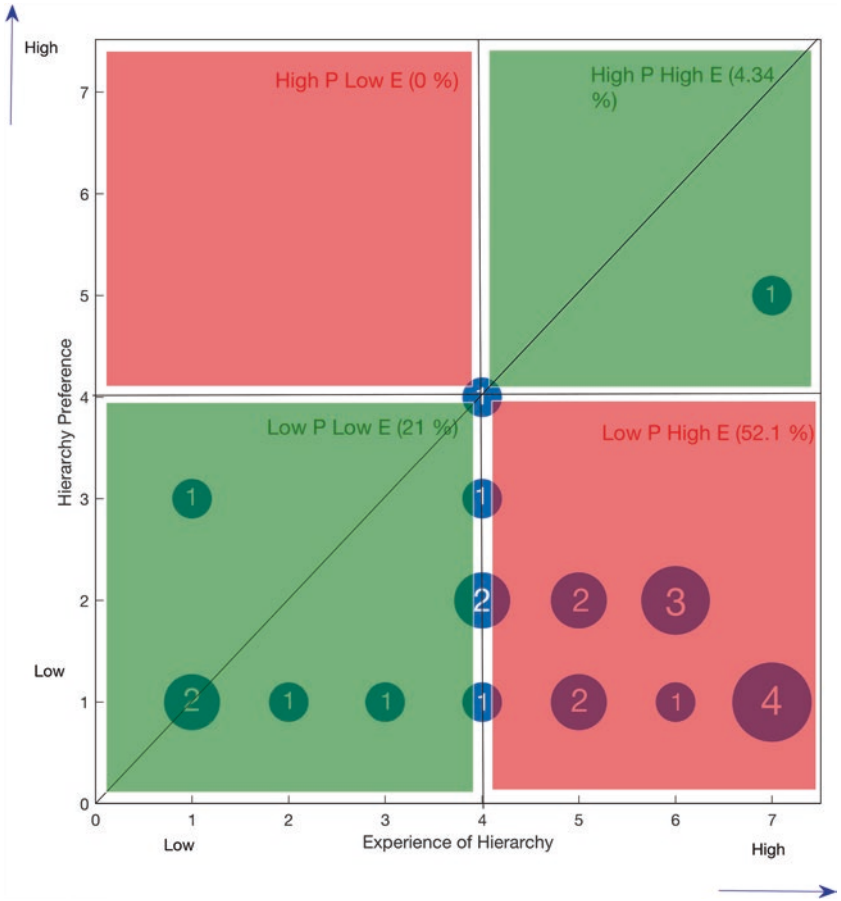


Fig. 6.1 Experiences and preferences towards hierarchy (Ghana)

If we look at this in more detail, the closer a respondent’s answer is positioned near the diagonal; the happier this person is as the practice and preference are identical; if far from the diagonal, the level of satisfaction is lower. In this case, three of the respondents are on the diagonal and another two are close to the diagonal—so five in total. Twenty respondents (80%) are placed below and far from the diagonal, and thus prefer a reduced hierarchy, in other words less enactment of power differences, than they currently witness in the society. One respondent is placed above the diagonal, and would thus prefer more enactment than currently witnessed.

6.4.1 *Changing Perceptions*

In our survey and interviews, a common thread was how values around hierarchy are changing, with clear examples of this in certain University departments due to young and innovative leaders who make change happen.

Young male leader, Personal experience: “Change from the top”

At my department in the university we just got a new head of department and also a new dean. Both are young and like innovative ways to get things done. This has impacted many changes—we have regular department meetings, sometimes students even attend and responsibilities are shared. My head of department has an open-door policy and is very open to suggestions and doing new things. Likewise, the dean is very open and innovative—he came from running a lab in USA. Last year alone, he organized two town hall meetings where all faculty got together to be updated on ongoing projects as well as have questions addressed. **Dr Tom Tagoe, Science Communicator and Lecturer**

Several examples of cultural values impacting on leadership were mentioned by our interviewees:

- We are usually brought up to prioritize getting along with everybody, rather than being effective and competitive. Also people have a tendency to complain, feel helpless, and hope that things will change naturally, instead of taking steps to make a change. (Prof. Gordon Awandare)
- The older generation of academic leaders is more hesitant, not as eager. In my view these leaders are more focused on their own personal growth and own achievements, and as such display a sort of tunnel vision focused on what I need or I want, and not seeing the benefits of reaching out. Thus a bit more single-minded and self-interested approach. If the whole unit grows, it is much better than if only they grow—but they do not see it this way. (Dr Tom Tagoe)
- Respect for older people is important; one has to very circumspect with people in higher positions. In the UK, students were not always very respectful to the lecturers. (Dr Tom Tagoe)

Some of the interviewees also mentioned specific organizational innovations that are contributing to the transformation of science in West Africa, such as the example below:

Senior male leader, Personal experience: “Machinery for scientific innovations is in place”

Only nine years ago, I left a promising career in the United States to return to Ghana. Back at the University of Ghana, the Department of Biochemistry, Cell and Molecular Biology (BCMB) I began applying for every grant I could find, hoping to establish a lab that could host lots of students. It took me two years, but then I managed to get two international grants. In 2014 I set up the West African Centre for Cell Biology of Infectious Pathogens (WACCBIP) and appointed four master’s students and one PhD candidate, created a lab, and set up field sites to collect samples. Within only five years, there are currently 45 master’s students, 64 PhD candidates, and 16 postdocs associated with the centre, as well as 40 local faculty and more than 70 regional and international contributing scientists. WACCBIP is doing cutting-edge research and attracting collaborators from around the world. It is my vision that WACCBIP will drive the scientific innovations of the future and help tackle the problems associated with infectious diseases in sub-Saharan Africa. **Prof. Gordon Awandare, Associate Professor/Director Research Centre**

6.5 THE NEED FOR CHANGE: LEADERSHIP STYLES

A common theme among the survey respondents and interviewees is the need for or evidence of a change in leadership styles. This relates to both strategic leadership style and people-oriented leadership style.

6.5.1 *Strategic Leadership*

Survey respondents (six) indicated the need for more strategic leadership as something their leaders would need to improve, with the need for communicating a clear vision to the team being a common thread, such as: *Speak of the vision more, Giving a clearer picture of objectives. Better com-*

munication of vision and approaches to attain it, need for clear articulation of vision and direction. It was also mentioned as the most important quality (five), for example: *Vision, The modern Africa leader must be able to craft a compelling and inspiring vision with which she/he can rally followers.*

Among the interviewees, a shared vision for most young Africa leaders in science and STEM relates to the role of science in Africa and beyond, and what is needed to realize this vision. For example, it is phrased as follows:

Young male leader, Personal experience: "Science by Africans, for Africans..."

We need to get African governments to invest more in science, instead of relying on outside funding. African scientists should not be beggars but be able to choose what to work on and who to work with. We need to become stronger and more dynamic, capable of collaborating with other scientists as equals. Carrying out Africa-centred science by Africans, for Africans, while working with others where possible. There are brilliant African scientists living and working abroad. Africa deserves credit for who they are. We need to shift the narrative from undernourished children covered in flies to a dynamic African scientific community that is useful to the world, not only Africa. In order to achieve this, we need to also get scientific literacy in Africa up to a point that local people start to support this and see its value. **Dr Yaw Bediako, Research Fellow**

Survey respondents indicated the need for leaders to achieve results and operate strategically given the numerous constraints posed by the socio-economic context in Ghana. Examples they mentioned included the following:

- *Inefficiency among subordinates and other agencies (especially government agencies)*
- *Lack of adequately trained personnel to fill in vacancies due to lack of mentorship and training*
- *Making up for the huge gap in development across all sectors*

- *In my field availability of resources is the biggest challenge. Funding for research and appropriate infrastructure seriously limits what we can do and creates several other challenges.*

6.5.2 *People-Oriented Leadership Styles*

The main challenge mentioned by survey respondents related to people management, with 10 out of 25 respondents referring to this. Specific comments included:

- *Dealing with staff who don't meet deadlines*
- *Consistently motivating my followers to remain focused on the goals*
- *When your followers don't take initiatives and expect you to come up with every idea*
- *Disrespect for my leadership and lack of compliance*
- *An inability to fully entrust duties and responsibilities to those I lead*
- *Communicating authority without being dictatorial*

The same people management challenge was mentioned even more often (14) in respect to how their own leaders could improve their leadership. Specific comments centred on the need to be listened to, the need to be involved in decision-making and an expectation of fairness. We present a few of the comments below:

- *Listen to opinions of subordinates*
- *To be fair to all team members equally*
- *Seek for advice from people with the necessary expertise*
- *Ability to delegate more, be more respectful and listen to my opinions*
- *Lack of equal sanctions, favouritism and nepotism*
- *Involving subordinates in decision-making*
- *Giving subordinates flexibility to work especially in technical areas where they may have more expertise*

Respondents rated how frequently they have experienced Redeker et al.'s (2014) eight leadership styles and indicated the most and least suitable leadership styles to address the challenges that leaders face. Combining these two questions in one figure, with the styles ranked according to their suitability, we see the following pattern emerging (Fig. 6.2).

Actual Styles Versus Perceived Suitability

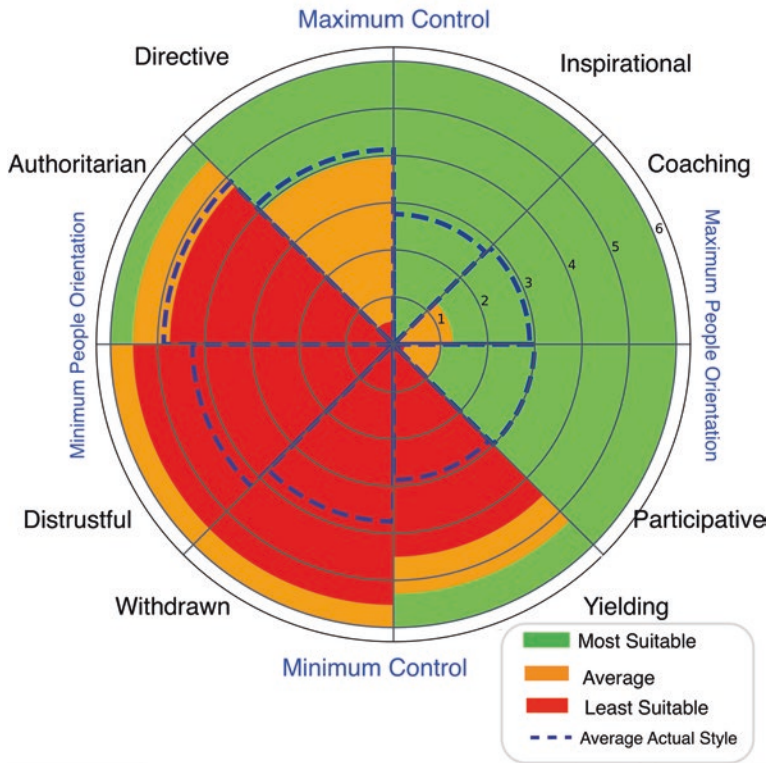


Fig. 6.2 Actual leadership styles versus perceived suitability (Ghana)

What transpires from this graph is that people-oriented styles such as inspirational, coaching, and participative were considered most suitable styles, with Inspirational considered most suitable. However, these are among the four least commonly used styles. In contrast, authoritarian, withdrawn, and distrustful leadership styles were considered least suitable, especially withdrawn and distrustful. However, authoritarian was rated as the most common style, followed by distrustful. Directive style is in the middle—it is relatively common and considered averagely suitable. The yielding style is not very common and considered not suitable.

In terms of control, styles with more control by a leader are clearly favoured compared to the two styles with minimum control: withdrawn

and yielding. Inspirational is considered most suitable as this style has more control but remains people-oriented. Responses thus indicate that instead of the most commonly used leadership styles that are less people-oriented, leaders expressed a preference for a change towards more people-oriented leadership styles. People orientation not only relates to people within their own teams, or organization, or company, but also to people beyond in the wider society.

Senior female leader, Personal experience: "Good leaders promote growth and development"

I believe good leaders are those who promote the growth and development of those they are charged to lead. Such growth at times comes at the expense of the leaders own ambitions, but a good leader takes pride and satisfaction from seeing those they lead flourish and develop into leaders themselves. **Dr Lydia Mosi, Head of Department, University**

Senior female leader, Personal experience: "Empathy is important"

I have learnt to be more empathetic as a leader. Understanding that my team members have challenges (some personal) that you may not be aware of. To properly connect with your team, you need to "walk in their shoes". Do not discard your values but understand the challenges that your team members face. Acknowledging your privilege is even more important in the African context. **Mrs Lucy Quist, Engineer and Business Leader**

Senior female leader, Personal experience: "Setting realistic expectations"

Often your team may not have had the same level of exposure and international experience as you. It is important that you set realistic expectations. At times, it is challenging when their work ethic and general attitude does not match up to yours. Acceptance of mediocrity and a lack of thoroughness is often a source of frustration. **Mrs Lynda Arthur, Regional Lead Pharmaceutical Company**

Senior male leader, Personal experience: “Being a nice guy is not enough”

Working with me—being a nice guy is not enough. So over the last 4–5 years I have seen people come and go, and we have built our “machine” with people who fit. Ultimately it is the mindset—the confidence of young people that will make the difference. **Prof. Gordon Awandare**, Associate Professor/Director Research Centre

All leaders interviewed (nine) indicated the need for a change towards a range of people-oriented leadership styles. It was mentioned more than once by senior (four) and by female leaders (three), who also indicated their own personal challenges with using these styles. We present a few examples below:

A central aspect in people-oriented leadership is the importance of building up trust. This was mentioned many (15) times by survey respondents, both in relation to trust in their own ability as a leader, as well as trusting their followers or team. In addition, we saw that the distrustful leadership style of some leaders is quite common.

6.6 LEADERS’ DIVERSITY: GENDER AND AGE

6.6.1 Gender

Women leaders indicate that they face constraints regarding their leadership in science that men do not face. All female science leaders we interviewed acknowledged facing gender stereotypes and gender-specific challenges which have not held them back to take up leadership roles but have made their journey more difficult.

Young female leader, Personal experience: “Sexism is a big problem...”

I was keen to return to Ghana after my studies, I turned down post-doctoral fellowships in the US and returned home without a job in hand. After a number of setbacks, where I was overlooked for post-doctoral positions (at times for reasons of being a newly married woman with a potential for maternity leave), I was selected for two positions. In my experience, sexism is a big problem. There are very few female head of departments in the college of health sciences—I am the only one. As such one is always in the minority and some older male colleagues prove difficult to work with. **Dr Lydia Mosi**, Head of Department, University

One interviewee indicated the same experience, but indicates that she sees a change in this regard.

Senior female leader, Personal experience: “Gender inequality is a bigger issue than age...”

In my experience, gender inequality is a bigger issue than age. In the recent past, women were not always as easily accepted as leaders as male counterparts. However, this is changing rapidly with a number of prominent positions in Ghana filled by women—such as the chief justice, attorney general, electoral commissioner, and CEOs of a number of banks. **Mrs Lynda Arthur**, Regional Lead Pharmaceutical Company

The example below likewise indicates that the combination of being both female and a young leader can result in certain challenges.

Young female leader, Personal experience: “Opposition from both men and women”

I am the leader of my church choir. It is somewhat unusual to have a young leader, especially a young female leader. Interestingly, I have had to deal with opposition from both men and women, but for different reasons. The men didn’t like the idea of having a female leader, while the women felt I was too strict and didn’t give them preferential treatment as women. **Ms Claudia Anyigba**, PhD student at University of Ghana

6.6.2 Youth

Young leaders were the majority in both our survey and interviews, and their leadership journeys are a specific focus of this case study, since it was commented on often, mostly by young male leaders.

Young male leader, Personal experience: “Young people need to be empowered”

As a teacher I experienced the challenges students and youth are facing, especially in science, and this awareness created my urge to foster a change. I believe that empowering young people and giving them the right skills to solve their own problems can create change. **Mr Gameli Adzaho**, Public Health Specialist and Science Communicator and Influencer

Also senior leaders commented on their experiences with being young or how to support young leaders.

Senior female leader, Personal experience: "Ageism exists"

As a younger leader it is sometimes difficult to be heard. Bullying is common and older colleagues tend to show contempt towards me. Young African leaders often have to contend with colleagues and superiors who are not necessarily best qualified or placed to be leaders. Such people tend to stand in the way of positive change and can present a great source of frustration. **Dr Lydia Mosi**, Head of Department, University

Giving opportunities to youth is also an important motivator for some of the leaders we interviewed.

Senior male leader, Personal experience: "Giving a chance to young talent"

I just felt that people needed to have opportunity here in Ghana, a chance, like the one I have had in the US. A lot of people can succeed if they get a chance, most do not get a chance. There is a lot of talent here, which remains untapped. I wanted to create an environment similar to the one I got when I went abroad. This in a nutshell is: to do research, be happy and motivated to work together and find solutions together. **Prof. Gordon Awandare**, Associate Professor/Director Research Centre

During a recent launch of her book *The Bold New Normal*, Lucy Quist emphasized that there are still people who do not believe in young talent in Africa. As such she states that there is a need for a new narrative, and for young leaders to be bold about change in Africa (Lucy Quist, 2019).

6.7 LEADERS' ATTRIBUTES

In the survey responses and interviews, several leaders' attributes were mentioned and considered important. In other words, several qualities or features were regarded as a key characteristic or an inherent part of being

a good leader. The following attributes were mentioned by several survey respondents and interviewees:

Candidness: Several interviewees (four) mentioned candidness as an important factor in mentoring others, but that being straightforward in giving feedback is not really the way things are done in Ghana. One leader explains:

Young male leader, Personal experience: “Be gentle with words in Ghana”

In Ghana people can be very sensitive, it is very important how you say things—to be gentle with words—and that you show respect at all times. In Ghana, if you disagree with someone in authority you have to be very careful, as people do not separate the task and person, and a disagreement might affect the personal relationship. I feel it is better if one can differentiate ideas from the person. **Dr Tom Tagoe**, Science Communicator and Lecturer

The same leader then went on to explain how he experienced a different approach in the UK, which he had to get used to, but ultimately was of benefit to him:

Young male leader, Personal experience: “Tough love...”

In the UK, people can be very blunt, very straightforward. My supervisor in the UK was very beneficial to me. She provided me with a “leader template”. She would be very hands-on: Sit down to discuss with me, reason with me, and coming up with solutions. She was very encouraging, but sometime pushing too far—at least that was how it felt at that time. Now I am grateful for that. I am now copying her example with students and volunteers. The motto is “*You can do more than you are doing now. With the right approach, you can achieve much more*”. At the time, I experienced this as expectant, demanding, tough, and not always reasonable—now I think it helped me a lot. Thus in the UK you could have a very open discussion with your supervisor, even a task-focused fight—but this would not affect the personal relationship. **Dr Tom Tagoe**, Science Communicator and Lecturer

Decisiveness: Decisiveness was often mentioned in the survey responses. It was then also linked to having a clear vision, and taking initiatives to make change happen. It was also mentioned by interviewees (three), such as in the below example.

Senior male leader, Personal experience: “No excuses. just get it done!”

My motto is: **“No excuses. Just get it done!”** which features on my Skype account and also on my office door. There is a tendency among Africans to complain and to feel helpless. As a consequence they are mostly passive and do not take steps to challenge the status quo or fight for change. Instead, I am fearless and determined to do something about it, to make a change. I was determined to build my own lab and kept applying for grants after I moved back from the US and have succeeded. **Prof. Gordon Awandare**, Associate Professor/Director Research Centre

Fig. 6.3 Picture of office door



Doing good: Survey respondents (five) indicated selflessness as the most important quality of a leader. “Doing good” was the attribute mentioned most often by eight interviewees, both male and female, young and senior. These leaders indicated “doing good” as a central and important motivation to work as a leader in science in Ghana. Many returned to Ghana for this reason after being educated in the UK or USA, turning down job offers or opportunities abroad. We present a few examples below.

Senior female leader, Personal experience: Community-based health programmes

My work experience as a community and hospital pharmacist after my relocation to Ghana from the UK exposed me to gaps in health-care delivery. This ignited my interest in development work, particularly neglected tropical diseases and maternal and newborn health. I found a mentor who worked in the area of development and with some guidance and support established a non-profit organization to run community-based public health programmes, build local capacity of healthcare providers and advocate for improved maternal healthcare delivery in Ghana. **Mrs Lynda Arthur**, Regional Lead Pharmaceutical Company

Senior female leader, Personal experience: “1983 drought changed my life...”

Crucial year in my leadership journey was 1983 when we returned to Ghana. The country was in the midst of a drought and food was very scarce. There was no bread, no matter how much money you had. A number of people died. Seeing these problems, I was determined even as a young teen that I needed to find a way to make a difference—This stands out as the point I began to develop a true sense of leadership and I was convinced that STEM would be important and any career or business I would pursue needed to have relevance to STEM. **Mrs Lucy Quist**, Engineer and Business Leader

Integrity: This value was commented on a lot by the survey respondents. It featured first (nine times) in the most important quality for a leader, and was also often mentioned as the most important challenge facing African leaders. One survey respondent was particularly outspoken on the challenges for Africa's leaders, notably its political leaders: *Well, I think most African (political) leaders do not have the necessary expertise to lead. Most are undisciplined, power drunk and gluttons. They lack moral values such as honesty and truthfulness. So, until African leaders walk the talk, nothing will ever change. African leaders will continue to face insubordination; since what they understand is riots, demonstrations, and protests.*

Interviewees also commented on it. It was mentioned by four interviewees, slightly more women, and it featured as an important characteristic for a good leader, as is indicated in example below, which also describes the importance of respect.

Young male leader, Personal experience: "Important not to think you are above those you lead"

Growing up in a slum a lot of people now look up to me. I try to live my life to be an inspiration for others and I make a conscious effort to be someone that people can look up to. A good leader must also be "in the trenches" with his/her team. For example, when I go on fieldwork trips with a driver. I make a point to eat with the driver and other support staff. It is important not to appear to think you are "better" than those you lead. **Mr Godwin Anabire**, PhD student

Another interviewee connected lack of integrity to lack of a vision.

Senior female leader, Personal experience: "..."

Corruption is a by-product of a lack of vision and transparency. Vision enables a leader to work towards impact that will outlive him/her. **Mrs Lucy Quist**, Engineer and Business Leader

Adaptability: The ability to adapt to and manage change was most often mentioned (12) by survey respondents as a challenge facing leaders in Africa. Some examples of their comments were the following:

- *Getting subordinates to move out of their comfort zone—accept and move with the changing times and think outside the box.*
- *Managing change and be open to innovative ideas and suggestions from subordinates.*
- *Managing the fast changing technological environment.*
- *A thorough understanding of the changing global dynamics with respect to Fourth Industrial Revolution (4IR) and the nature of the world of work. Also there are challenges with understanding cultural shifts including millennial attitudes and expectations.*
- *Introducing change into a society or community that may be well opposed to it due to pre-established norms and expectations.*

Adaptability was also mentioned often in the interviews (six) and mentioned more than once by young male leaders.

Young male leader, Personal experience: “Innovation in science education”

When I became a science teacher in my old high school, I brought innovation into my classroom and my approach. I tried to develop curiosity and critical thinking through my high school chemistry and integrated science classes. Hands-on practical sessions complemented the theory lessons. I further explored avenues to engage students through various roles including form master, club patron (writers and debaters club), and current affairs committee member. Some of the inspiring educational programmes I helped organize include a digital literacy camp, debate competition, and career mentoring sessions. In addition, I was part of a project to introduce mobile learning to students and teachers in my school. A specific focus was my initiative on the constructive use of ICT in Education, involving both the students and also the other teachers. This project was an initiative of the Austrian NGO ICT4D.at. In 2012, I set up Global Lab Ghana Community, aimed at connecting students to access extra educational content and mentors who can provide answers and guidance they may need. Global Lab started as a Facebook group for students and teachers in my school. Interestingly, many more people started joining this group. It was meant for a group of about a 100 people, but more people joined. Today we have a community of over 1000 people, and today we are still growing. **Mr Gameli Adzaho**, Public Health Specialist and Science Communicator and Influencer

6.8 THE ROAD TO BECOMING A LEADER: LEADERSHIP DEVELOPMENT

This section explores how people have become leaders, their role models, and different initiatives for development of leadership skills.

6.8.1 *Leadership Determinants of Success*

All of the leaders we interviewed indicated that their parents, other family members or their network had played an important role in getting started on a leadership journey in science/STEM.

Senior female leader, Personal experience: “My journey to become an engineer”

My parents had a big role to play in shaping who I am today. I learned to dream from my mother and my father (an engineer) taught me to be confident in my own ability. He provided me with practical exposure to engineering—experience that nurtured my curiosity and got me started on a journey towards becoming an engineer myself. **Mrs Lucy Quist**, Engineer and Business Leader

Senior female leader, Personal experience: “Depending on my network and mentors led to success”

After completing my master’s degree in Public Health and upon returning to Ghana, I was approached to lead a Gates Foundation and Pharma research initiative seeking to improve access to medicine for non-communicable diseases. This was a challenging assignment, with a steep learning curve; however, it was ultimately successful because I had learnt to depend on a good network of mentors and colleagues. **Mrs Lynda Arthur**, Regional Lead Pharmaceutical Company

A genuine interest in science and medicine also functions as a strong motivator in the leadership journey for young scientists, as we see below.

Young female leader, Personal experience: “fascinated with cancer research”

I graduated with a bachelor’s degree in Biochemistry. Following my first degree, I took up an internship at a research institute and became fascinated with cancer research. I am attracted to challenging questions and situations and cancer stands out as one of the biggest challenges facing modern science and medicine today. **Ms Claudia Anyigba**, PhD student

6.8.2 *Role Models and Mentors*

As some of the previously described comments also indicate, many leaders (six), slightly more women than men, emphasized the importance of role models and mentors in their leadership journey. Below are three examples of how mentorship supported their leadership journeys.

Senior female leader, Personal experience: “fantastic mentors”

My development as a leader has been largely facilitated and defined by fantastic mentors. My PhD mentor (an American woman) and my post-doc mentor (an African man) have been instrumental in supporting my growth and development. **Dr Lydia Mosi**, Head of Department, University

The below example shows the impact of having a mentor displaying effective leadership behaviour:

Young male leader, Personal experience: “my mentor taught me the importance of patience and humility”

From my first mentor I learned the importance of patience and humility. I saw my mentor patiently deal with lab staff that was being extremely rude and insubordinate. Instead of angrily confronting them, my mentor chose to humbly listen and diffuse the situation. **Mr Godwin Anabire**, PhD student

Young male leader, Personal experience: “my father and other proud African academics mentored me”

I benefited from solid academic career guidance, first and foremost from my father, who passed away ten years ago. My father held doctorates in both French literature and theology and set up an institute in Ghana. He had trained abroad before returning to Ghana and turned **down** several lucrative job offers to work abroad in order to contribute to science in Ghana. Through my father and his colleagues and friends, I was exposed to a culture of proudly African academics. This mentorship continued throughout my academic experience abroad. **Dr Yaw Bediako**, Research Fellow

In turn, many of the senior leaders now are role models or mentor young people.

6.8.3 *Skills Development*

A whole range of skills development initiatives are available for young leaders in science in Ghana, with the majority of these initiatives focusing on the technical aspects. A particular focus is on skills development through the grassroots movement to engage young people in STEM activities and achieve positive change. Examples are bar-camps (informal scientific literacy sessions at local bars or restaurants), Facebook groups, secondary school outreach programmes, women in STEM initiatives, and many more. Some of these activities simultaneously develop a variety of leadership skills, mostly through practice, taking on responsibilities in project teams.

Young male leader, Personal experience: “young people need guidance and encouragement”

My natural inclination is that people learn and discover by themselves. Now I am convinced that a bit more guidance is needed to speed up the learning process and achieve the goals set. Now when I engage with students I try to let them know that they can achieve way more than they know. This I would call an encouraging style. I see you are at 50—my expectation is that you reach 80, but possibly you can exceed that with time, and we are working on this together. **Dr Tom Tagoe**, Science Communicator and Lecturer

Some survey respondents (four) indicated as a key challenge their development as a leader, including the following: *fully asserting myself, acquire the necessary expertise, getting clear direction from above, and lack of support from managers.*

Skills development was commented on by all interviewees and mentioned slightly more often by women and young leaders. Some leaders interviewed argued that leadership is best learned by doing, and also that some aspects of leadership are more innate than learned, as the opinions below indicate.

Senior female leader, Personal experience: "leadership is learned by practice"

One needs to practise leadership in order to grow as an effective leader, and so it is important to take leadership opportunities when they present themselves. I took such an opportunity when working at a motor company. I put myself forward for a leadership position even though I was not the most experienced in the team. **Mrs Lucy Quist**, Engineer and Business Leader

Young male leader, Personal experience: "leadership training only partially effective"

A lot of what I learned I learned on my own. I have had only occasional leadership training opportunities, such as short workshops or one-day courses. However, I believe that some leadership skills cannot be taught—especially vision and charisma. I believe these are innate, you are born with them. Certain other areas of leadership skills you could benefit from some training. **Dr Yaw Bediako**, Research Fellow

6.8.4 Confidence

Leadership Development requires confidence. Survey respondents also indicated this, stating the need for *independence and respect from bosses*, and being able to *accept constructive criticism*. It was mentioned by five interviewees, predominantly by men.

Senior male leader, Personal experience: “young people need to have confidence in themselves”

I try to improve young people’s values and mindset into one of confidence; having confidence in their own abilities and believe they can do great things. They should not accept the status quo, but instead switch their thinking and believe in themselves and be competitive; believe they can be the best, compete with anybody in the world and achieve great things. **Prof. Gordon Awandare**, Associate Professor/Director Research Centre

6.9 DISCUSSION AND CONCLUSION

One of the interviewees shared the following insight, which resonates with many of our case study findings:

Senior female leader, Personal experience: “impact and opportunities”

The platform or potential for impact of an individual leader is bigger in Africa. There are also many more leadership opportunities than anywhere else in the world, provided you are willing to do the work. **Mrs Lucy Quist, Engineer and Business Leader**

The insights from the leaders in this case study show all of them are willing to take on the leadership challenges and manage the changes required.

Young male leader, Personal experience: “scientists need to be entrepreneurial and self-motivated”

To succeed in Africa, you have to be the kind of person who is excited about building something new and is willing to put up with the frustration and difficulties because you want to be part of something bigger than yourself. This is perhaps true for scientists the world over, but Africa’s particular challenges—lack of funding, old-fashioned administrative systems, and poor infrastructure, to name but a few—make it many times harder. In Africa, scientists have to be entrepreneurial and self-motivated to the **point of being almost crazy**. **Dr Yaw Bediako, Research Fellow**

While many challenges do exist in Ghana, the narrative surrounding this country is shifting. In his blog on the 2016 election, Atsu Ayee (2016) describes Ghana as a beacon of democracy and economic development in Africa. In the same vein, Al Jazeera (2012) reported that “Ghana is often described as a beacon of functioning democracy in West Africa. It has had free and fair elections since the end of military rule in 1992, following a referendum that made law its multi-party system.” As conditions have begun to improve, a new generation of young leaders is rising to prominence across many segments of Ghanaian society. The STEM ecosystem in particular is growing rapidly and much of this growth can be credited to the vision, courage, and hard work of young men and women committed to leading their country towards a more prosperous future. It is important, however, not to become complacent. Our survey suggests that significant barriers remain. In addition to the issues relating to gender and age-related hierarchy, financial instability stands out as the major threat to scientific advancement in Ghana. The majority of initiatives (both public and private) are heavily dependent on international sources of funding. Sustainability will depend on a significant increase in local support, both from government and locally based philanthropy (Nordling, 2018c).

In conclusion, though much work remains to be done it is clear that young leaders are beginning to have a significant positive impact: improving health and general quality of life, providing educational and employment opportunities for the youth, and contributing significantly to the growth of Ghana’s economy. The positive impacts are not limited to Ghana and many of these young leaders are committed to making their mark in other parts of Africa and indeed globally. Sixty-two years since independence, the words of Dr Kwame Nkrumah continue to ring true: “We face neither East, nor West: we face forward.” Indeed Ghana’s new generation of STEM leaders is not only facing forward but marching forward. As such insights and experiences from Ghana, as described in this chapter, could serve as an example for the rest of the continent.

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