



A Supervisory Model for Emerging PhDs in Basic Medical Sciences on the African Continent: A Perspective

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Author's contribution

The sole author designed, conceptualized, interpreted and prepared the manuscript.

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ABSTRACT

Aim/Purpose: This article- a perspective, is an attempt to critically review the African scenario with respect to doctoral supervision for Basic Medical Sciences and proffer potential solutions in the form of a supervisory model.

Background: There is a need to develop supervisory models for emerging PhDs in Basic Medical Sciences [BMS] in Africa. There has been continuous evolutions and rapid advancements as further compounded by continuous sophistication in research tools, methods, and technologies. These have resulted in newer fields emerging from the traditional fields. A major fallout of this is a shortage or rather unavailability of supervisors to train younger scientists in these new fields. The available supervisors were mostly trained in a more traditional fields or in the context of the relatively traditional paradigm of scholarship. Thus, Africa currently, suffers from a lack of supervisory capacity to train younger scientists in the emerging fields of Basic Medical Sciences.

Methodology: This article is a perspective that included a narrative review of literature, critical appraisal of the current prevalent scenario, and proposition of a supervisory model. Relevant literature sources were considered. Effort was made to provide a practical supervisory model that

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might guide African doctoral schools to train doctoral candidates in emerging fields, leveraging on available resources while making strategic adaptations. It is important to note that this should be done in an evidence-based manner, hence standard practices were reviewed and considered.

Contribution: There is currently a paucity of data and information on doctoral scholarship and supervision in Africa. There is a need to conduct research on relevant subjects to provide further insight into the prevalent scenarios, the root cause of the problems and postulate potential solutions to the problems. This article presents a model that might employ effective, innovative, and practical approaches to address the current situation. Otherwise, lack of adequate supervisory capacity could contribute perpetually to impeding adequate advancements in BMS in Africa, through scholarship, particularly in line with global trends and current realities. The article proposes a collaborative model for supervising emerging and novel PhDs.

Keywords: Doctorate; scholarship; higher education; basic medical sciences; supervision.

1. BACKGROUND

Emerging Basic Medical Science [BMS] doctorates in the context of this discourse as well as the African context include doctoral programs in BMS that are relatively new and contemporary. They address specific disciplines that also engage specific modern and contemporary cutting-edge research tools. This is in contrast to the traditional doctorates in BMS which were built around long-established fields of knowledge. It is interesting to note that these recently developed and relatively newer fields of BMS cut across a number of the old and traditional disciplines. The contemporary approach places significant emphasis on cutting-edge approaches to addressing specific biological phenomena, aberrations in association with such phenomena as well as interventions to such aberrations. To illustrate this scenario more clearly, the traditional fields of the basic medical sciences include Anatomy, Physiology, Biochemistry, Human biology, Embryology, Histology and Pathology to mention a few. On the other hand, the newer contemporary and cross-cutting fields in BMS include neuroscience- and its numerous sub-fields, cardiovascular sciences, exercise sciences, infectious disease sciences, immunology and a number of the fields that belong to the OMICS category. The OMICS category of basic medical sciences includes genomics, metabolomics, proteomics and the likes.

It is important to note that up until this moment, most doctorates that were trained in the African context were trained based on the traditional fields of BMS. The problem with this reality however is that younger prospective doctoral students are in need of supervisors for the newer contemporary fields of basic medical sciences. Another complication that has resulted from this

is the observable disconnect between doctorate scholarship and training in BMS in Africa and the rest of the developed world. One of the problems arising from such complications is that many African doctorates find it challenging to secure suitable postdoctoral positions outside the African continent. This is because such positions are often based on the new and contemporary fields of the developed world systems. Furthermore, the newer contemporary fields in basic medical sciences are developed to address the modern realities and problems that medical sciences have to address. These were products of philosophical changes in education- from seeking further knowledge and understanding to developing better solutions, primarily. Africa's inability to train doctorate students in these fields constitutes a major barrier to the advancement of knowledge, development and potential contribution of basic medical sciences to the knowledge economy in Africa.

It is clear from the above illustrations that a major reason why Africa might not be receptive to the contemporary fields of BMS is the inability to provide quality and experienced doctorate supervisors. There is, however, an urgent need to address this problem. A major potential way of addressing the current anomaly is to find a creative and pragmatic way provide doctorate supervision on the African continent that has several potential doctoral students who are interested in these contemporary fields of BMS. This work is an attempt to address this problem by proposing a model of providing quality doctorate supervision and scholarship to support students who are interested in undertaking such doctorate programs in the contemporary and newer fields of BMS. There should also be a way to create a supervisory model to support potential supervisors in these newer fields. It is therefore important to build this or any alternative

proposition on evidence-based practices that could be supported by genuine principles and quality presumptions.

2. DOCTORAL SUPERVISION IN AFRICA: CURRENT STATUS AND REALITIES FROM EXISTING LITERATURE

2.1 Quality of Supervision

Globally, there is an ongoing call for improved postgraduate or doctoral training with emphasis on supervision, and the challenge is probably turning into a global academic crisis [1]. One of the recent efforts to examine the challenges with PhD training in an East African country found out that a number of factors limited the quality of supervision that the students had. Ndayambaje [2] had done a qualitative study of two cohorts of PhD graduates and summarised his findings as follows: *(i) limited level of supervisor-supervisee interaction, (ii) inadequate technical guidance from supervisors and (iii) poor or delayed feedback from supervisors*. Though this study had certain limitations that included the population size, lack of quantitative measurement and methods as well as the limitation in terms of the fields; the findings would still provide insight into the prevalent scenario in the institution[s] that were studied, and by extension possibly, in other institutions in the region.

Two themes would stem out from the observations made by the author, which include: [1] supervisors lacked adequate technical skills to supervise students' projects effectively and/or satisfactorily. [2] supervisors lacked mentoring and project management skills to manage the research project and process as well as relationships while working with students. This again would support the current proposition of a supervisory model, in which technical skills are pooled from a group of supervisors. This will help the supervisee with clearly defined roles that are implemented following clearly laid down processes. Furthermore, having properly documented expectations and milestones that are premised on project management skills could help to change the current unpleasant and undesirable experiences whereby trainees express frequent frustrations with supervisory methods. The report of Manderson et al. [3], showed that the CARTA [a multi-institutional sub-Saharan Africa initiative] project/program attempted to address this by training supervisors of PhD programs and by structuring the

supervision process through the use of supervisor-candidate contract. The authors also advocated for a change in the current practices. What the work of Manderson et al. [3] further alluded to, is the fact that both technical and managerial competencies are critically required to improve the process, hence outcomes of doctorate programmes and supervision processes in Africa. This explains why the CREST (Centre for Research on Evaluation, Science and Technology) program of the Stellenbosch University, South Africa on training African doctoral supervisors is a laudable project.

Major markers of quality doctoral programs and supervisions might include the rates of completions versus attrition per cohort [4], reported quality of mentorship, support and supervision [5-6], quality of student-advisor relationship [7], duration of program completion, reported candidates/students satisfaction [8] quality of research output and publications [9], potential to contribute to the knowledge economy and overall measurable impact of doctoral education on the various walks of life as measurable in terms of innovations, solutions, quality of life and wellbeing. Unfortunately, most of these markers are generally rated between low and poor in many instances in Africa. More worrisome is the lack of adequate data in many places in the Continent.

2.2 BMS Fields and Expertise of Supervisors

It is currently challenging to find definitions that exhaustively explore basic medical sciences both in terms of content and context. This is however not a major problem as perspective appears to shape the definition, given its broad theme. Furthermore the fields that constitute BMS always have a contextual definition. It is also worth mentioning that it is not difficult to clearly describe what should constitute basic medical sciences. Therefore, one might consider basic medical sciences as a collection of fundamental and applied subjects that help to explore biological organisms, systems, milieu and phenomena as well as their interactions with the environments and the aberrations both in vivo or in their interactions with what constitute their environments. It is also important, therefore, to always have context in mind when an attempt is made to describe what is considered BMS. When basic medical sciences are considered within the context of medical education only, context might be limited to subjects such as

Anatomy Physiology and Biochemistry. Also included will be their offshoots and advanced forms such as Embryology, Histology, Histochemistry and Cytology, Molecular biology, Immunology and the various themes in the fields of Physiology. There is however a very elaborate collection of fields of subjects that could constitute BMS generally. While some of these may not have direct links to medicine or human health, such fields do have an array of applications to almost every walk of life. The term Biomedical Sciences is also often used to approximately represent the fields that belong to the basic medical sciences.

Fig. 1 approximate illustration of BMS fields based on the generation and generational perspectives. The oldest generational perspectives consider the fundamentals in terms of functions, structural and molecular attributes or genetics of organisation etc., and the study of the whole organism, systems, milieus, behaviours and functional interactions almost exhaustively. This approach partitions the bodies of knowledge in 'stacks'.

The second generational perspective considers a complete structural and functional phenomenon across all fundamental fields and attempts to appreciate the phenomenon almost exhaustively. This approach uses cross-sectional/crosscutting perspectives; hence considering bodies of knowledge as 'comprehensive' cross-sections.

The third and emerging perspectives consider basic and applied phenomena, using cutting-edge methods and technologies.

Quote: "Not all things have dramatically changed as we perceive the changes; the changes that we observe remain a product of dynamic interplays between the actual changes, our changed and enhanced perspectives, and the tools that have continuously improved our insights".

The above illustration therefore underscores the fact that doctoral training in BMS will include a large number of fields that might include but not limited to the following:

Traditional BMS

Examples: Anatomy
Physiology
Biochemistry

Contemporary, Translational and Laboratory

Examples: Pathology
Pharmacology
Radiology
Microbiology

Modern, Translational and Applied

Examples: OMICS

Broad BMS Classifications

Examples: Medical Biochemistry
Anatomical Sciences
Medical Cell Biology
Human Physiology
Embryology
Immunology
Medical Genetics
Microbiology
Virology
Radiation Medicine
Pathology/ Pathological sciences
[Experimental Pathology,
Environmental Pathology, Molecular
Pathology, Pathobiology, Pathological
Anatomy, Pathophysiology, Systemic
Pathology]
Pharmacology/ Pharmacological
sciences [Biochemical Pharmacology;
Clinical Pharmacology; Immuno-
pharmacology; Molecular
Pharmacology]
Psychology
Medical Statistics/Biostatistics

2.3 Comparing Africa with the Rest of the World

Lee [10] made a case for the need to provide supervision for the modern doctorate. The description of a modern doctorate is presented as the doctorate training whose outcome satisfies needs within and beyond academia. It combines academic competence with competencies and qualities for translational/cutting edge research as well as the application of the knowledge and skills to the industries and other sectors [11-12]. One can safely say that most medical scientists that qualify to be doctoral supervisors in many African countries were trained based on the traditional views of BMS. On the contrary, institutions in certain parts of the world especially the developed world have come up with alternatives such as the more contemporary and modern fields of BMS

including the OMICS. African systems are therefore left with two choices as it is, currently.

The first choice is to always send a new generation of potential trainees to the developed world to study based on the relatively modern fields of basic medical sciences. The problem with this however is that upon return, these trainees however skillful and proficient, would likely find it difficult to fit in into the existing system. This is a system which is not only traditional but that is typically characterized by significant limitations in technology and advancement in methods. Poor structures, limitations in policies and their implementations, hence culture and practices are other factors that returning doctorates struggle with on the continent. In fact, they have been described as having ‘hard times upon returning home’ in certain instances [13].

The second choice would be to start a pragmatic process of training a new generation of basic medical scientists in the African context by

making use of the existing resources including supervisors. This will be supplemented with adequate adaptations that consider the current limitation and make up for them in the approaches to supervision. The advantage of this is that a new generation of trainees who are being trained within this system would have adequate understanding of the system within which they are trained as well as expectations after being trained. They would also be aware of the prevalent challenges and existing practices during such training. They would be suitable for the system as they will have an all- round perspective and quality understanding of the system. Fitting into the existing system will not likely be too difficult. Also, advocating and working for change will also be more feasible with this crop of researchers and scientists. This approach is therefore recommended as it offers an opportunity to provide a contextually appropriate way of addressing the current problem. Notwithstanding, in the context of a global world, the foreign trained scientists might always provide a steady pool of complementary resources and, international perspectives.

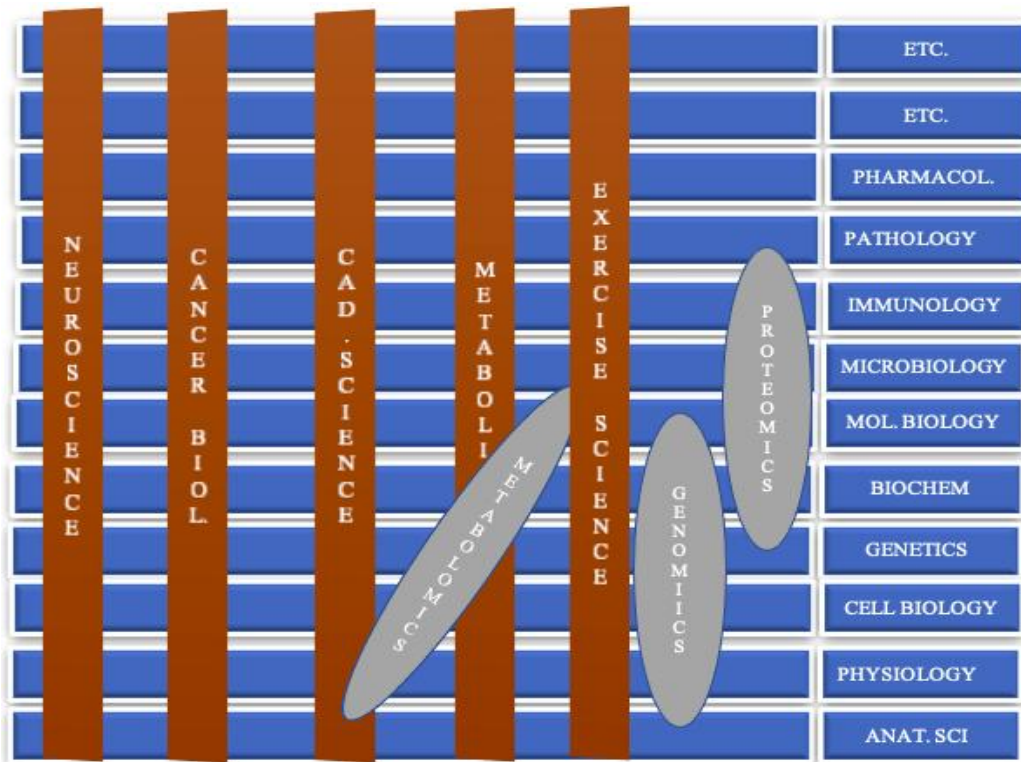


Fig. 1. Is an attempt to illustrate how perspective shapes the definitions of the various fields of BMS

The presentation of Mouton and Frick [14] shows that it is currently not an uncommon practice for supervisors to supervise candidates whose work lies outside the supervisor's primary fields of expertise and/or interest. In fact, the percentages of those who agreed/strongly agreed ranged from 28% [Health Sciences] to 55% [Social Science Humanities and Arts]. This is another pointer to the fact that a more robust collaborative and system-based approach to supervising would address such an anomaly as observed in the current situation. Furthermore, this showed that Africa is currently in dire need of doctorate degree holders because of their potential contributions and positive impacts on development and contributions to the knowledge economy [14].

2.4 Evaluation of Critical Needs

A number of empirical reports and scholarly works have identified the multiple challenges that confront the training of world-class biomedical scientists on the African continent. The work of Botha et al. [15] captured a major and overarching need as 'standard setting'. There are key problems that have to be addressed. Identified needs in many instances might include:

1. Competent and effective supervisors
2. Dynamic systems that support adaptations
3. A change in perspectives, methods and procedures
4. Basic resources and technology for cutting edge research
5. A cultural shift and positive change

2.5 Variants of Doctorates in BMS and the African Scenarios

The shortage of physician scientists and the potential consequences were highlighted by the commentary of Adefuye, Adeola and Bezuidenhout [16]. One thing that should be added to this is the need to provide quality supervision in all relevant fields. Biomedical science combines the field of biology and medicine in order to advance the health of both humans and animals [17]. This illustration is both simple and profound. It could further be elaborated as an attempt to study biological systems, milieu and phenomena because of wellness or health and diseases, including their complications and implications from various biological perspectives. It might be important to state that all human solutions to health are grounded in quality understanding and

applications of clearly defined principles of biological milieu and phenomena. Advancements in medicines and all other aspects of wellness will therefore be built, continually, on the advancement of biomedical or basic medical sciences. An attempt is made in the following sections to consider the variants of BMS; the key subjects are used for the purpose of representation and as examples.

3. TRADITIONAL / FUNDAMENTAL BMS: ANATOMY, PHYSIOLOGY, BIO-CHEMISTRY, ETC.

The traditional fields of basic medical sciences address specific themes about life forms in terms of structures, functions, sub-systems and interaction with the external milieu among other perspectives. Many of these fields attempt to study normal life forms and functions with applied insights into anomalies. Others focus more on the application of fundamental knowledge and aberrations that are associated with the normal forms and functions of life. The most popular of such fields, arguably, include Anatomy, Physiology, Biochemistry, Pathology, Cytology, Immunology, Microbiology and Molecular Biology among others.

4. THE OMICS

The OMICS belong to the modern, translational, applied and relatively contemporary approaches to biomedical or basic medical sciences. The term *omics* is collectively used for certain fields of study in biological sciences that ends with -*omics*, and these include genomics, transcriptomics, proteomics, or metabolomics [18]. Other omics fields include lipidomics, glycomics, foodomics, transcriptomics and multiomics. Omics, derived from the *-ome* with the Greek origin implying *stem* is contemporarily used to indicate collective and holistic exploration of all principles and body of knowledge around the stem. For example, proteomics will be concerned with a holistic and large-scale study of proteins with emphasis on their structures, expressions in milieus as well as functions and associated diseases or conditions. This explains why the mass spectrometry techniques are generally employed in this field. The term proteome stands for a whole complement of proteins, including its basic structures, forms and functions and modifications of such proteins within a system or a whole organism.

Using the concept of proteomics to explain the guiding principles of the OMICS fields, it would

be important to note that an OMICS field will consider the central concept in a holistic manner irrespective of systems, organisms, species, milieu, and conditions among other factors. It is therefore appropriate to say that such a field is longitudinal, applied and cross-cutting in terms of systems, species and context/scope and dimensions in terms of the fundamental field study that it cuts across.

5. LONGITUDINAL BMS: NEUROSCIENCES, CANCER BIOLOGY, ETC.

Based on this perspective and approach to biomedical and BMS, a number of doctoral programs are structured in a longitudinal way that enable them to address a holistic cross-sectional field of a biomedical system or whole organism. These could be termed the longitudinal basic medical sciences. Examples of such approach include Neuroscience and Neurobiology, whereby all basic and certain advanced aspects of the concerned theme and/or system are considered in a somewhat longitudinally integrated manner. Neuroscience or Neurobiology doctorate program can consider all or selected and integrated aspects that include the appropriate aspects and proportions of anatomy, physiology, histology and histochemistry, molecular biology, neurochemistry / biochemistry, pathology, neurology, cognitive neuroscience, microscopy and optogenetics among others. The same principles are applicable to similar longitudinal approaches to BMS including cancer biology.

6. APPLIED BMS: EXERCISE PHYSIOLOGY, NUTRITION BIOCHEMISTRY, METABOLISM SCIENCE, COGNITIVE NEUROSCIENCE, ETC.

A number of basic medical sciences can be considered as applied based on the fact that they are concerned with specific phenomena in association with life and life functions in biological milieu. This, by extension the application of fundamental knowledge and research findings to solving relevant problems especially those that are associated with health and wellness. Examples of these include Exercise Physiology/Sciences which is concerned with research about optimization of body functions for exercise and sporting activities. Another field is nutrition biochemistry which is concerned with the application of biochemistry principles to nutrition. Cognitive

Neuroscience on the other hand is concerned with the application of fundamental principles of neural structural organisations and functions to optimising learning and human behavior. In general, these approaches to doctorate training and research would typically apply relevant fundamental principles and body of knowledge towards addressing specific problems or optimising relevant life functions or processes.

7. CLINICALLY ORIENTED BMS: PATHOLOGY, ONCOLOGY, PHARMACOLOGY, MOLECULAR MEDICINE

A number of BMS consider the fundamental understanding of life organization, functions and phenomena and apply them towards understanding and advancing the cause of clinical sciences or health. Some of such perspectives to biomedical sciences have been classified as laboratory medicine in the context of practice. However, doctorate training approaches as well as research emphasis are basically centered on the use of cutting-edge research approach towards understanding functions and phenomena of life including the interaction of the same with an environmental factors and other associated milieu. Findings, including new solutions, are applied to address aberration in life functions and states, and consequently to improve the quality of life and living.

8. OTHERS: ENDOCRINOLOGY [SYSTEM-BASED] AND METABOLISM [PHENOMENON-BASED], ETC.

There are also other variants of approaches to BMS training and research that might not exactly fall into the above categories. This also alludes to the fact that doctorate programs cultures and philosophies including their variants vary from place to place. Hence, certain programs are basically designed based on specific needs and designs as adjudged by the concerned stakeholders. This approach to doctorate training and research could vary greatly with almost an inexhaustible list of possible variants or examples. In certain instances, there might be an umbrella degree title such as PhD in Medical Sciences, but with a wide range of options of specialisation. For example, training in Endocrinology [System-Based] might consider several fields and themes, and the dimension might largely depend on the program philosophy and the identified needs and prospects. A

doctoral program in metabolism [Phenomenon-based], in a similar fashion can also consider in terms of scope several fields and scope as determined by the program philosophy and context or training scope. The degree title might read a more generic title such as PhD in Biomedical Science, for instance.

9. SUPERVISING EMERGING AND UNCONVENTIONAL DOCTORAL PROGRAMS: CRITICAL CONSIDERATIONS

9.1 The Model: Collaborative Doctoral Supervision

The current work proposes the Collaborative Doctoral Supervision model [Fig. 2] when supervising emerging and unconventional doctoral programs in Africa. The proposed model, will have the following basic features:

- I. Resources are provided as a pool and, shared: Based on a presumption that resources are limited on the continent, sharing resources and conservation would be a good and helpful practice. For a cohort as supervisees, resources are pooled and shared.
- II. Support services are provided as a pool and, shared: Qualified and high-quality support staff are recruited to provide services, and thereby are also given quality support including remuneration. The collation and concentration of resources on highly qualified human resources [as compared to the spread of such resources in support of quantity- i.e multiple human resources with poor skills and values for impact] will help to provide the needed support.
- III. Cohort and supervisory team: Depending on the size, a department, college or school could constitute a supervisory team or form clusters of supervisory teams.
- IV. Other considerations: External support might be used, including local and international mentorship, laboratory rotations etc. Creative and innovative practices such as peer mentoring and coaching [19] might also be considered.

9.2 Methods: Cohort, Collaborative and Cooperative [3C]

In this particular approach to doctoral supervision, the supervisory team including the

supervisee and the support system[s] consider themselves as belonging to a cohort at a particular point in time. Furthermore, the implication of this is that supervision and the processes involved in the training remains collaborative and cooperative. Specific methods may vary on the basis of the concerned fields and certain preferences, size of institution, school or department, number of students versus supervisors and the setting among other factors. These attributes, however, would underscore the actions, practices and processes that the programs might involve.

9.3 Primary Supervisor: Roles and Responsibilities

The primary supervisor is assigned on the basis of technical competence and primary field of expertise as well as demonstrated interest as much as possible. The primary supervisor oversees the technical aspect of the research project and the process. This supervisor would also determine when help or support is required from the supervisory team or from external sources/advisors in a collaborative way. It would therefore be important to define clearly the role of this person in the memorandum of understanding and every policy document that is relevant to the doctorate program [Fig. 3].

9.4 Supervisory Team: Structure, Roles and Responsibilities

The supervisory team is saddled with a collective responsibility of helping students in a cohort. A culture of collaboration has to be established such that members of a supervisory team share a collective responsibility of supporting all the trainees in the cohort. A primary supervisor is a member of this supervisory team and while s/he remains the primary guide and contact person for the supervisee. Opportunities provided for support then might range from technical, writing, sourcing for resources, pastoral, and mentoring among others. These are to be provided in a collaborative manner especially when a need is identified for such by the supervisory team, and without undue relationship *frictions* [Fig. 3].

9.5 Supervisory Process and Methods: Time, Resources, Research Methods, Supervisory Methods

A general guide template is developed, based on the agreement and shared interests of the supervisee and the supervisor. This is to ensure

that all parties share a common understanding and consolidated philosophy about the supervisory processes among other factors. The primary supervisor would be required to work with a supervisee to develop a timeline that considers time, resources, and milestones in the course of the training. This has to be approved by the primary supervisor and the supervisee when the document is completed. The Supervisory document is shared with the supervisory team for the purpose of records, and this could provide guidance during the program Fig. 3.

9.6 Adoption and Adaptation: Fundamental Considerations, Project Management Principles

This model will require that supervisors will share a number of things in common, that might include how best to use the available program resources, technical skills and resourcefulness. A number of

other considerations will have to be put in place, and these include project management guidelines following the right principles and best practices. It would be expedient for the supervisor and supervisee to sign a memorandum of understanding which must also be presented to the supervisory team. This might also be made available in electronic format and might remain trackable. It is therefore important that the supervisory team share specific values and to have basic training in project management principles and best practices. The need for project management skills and general managerial competences, which had been highlighted in certain key publications including that of Vilkinas [20] and the presentation by Boughey and McKenna [21] should be emphasised and given adequate consideration. The adoption and effective applications of project management principles will constitute a major consideration as proposed by this model [19] [22,15].

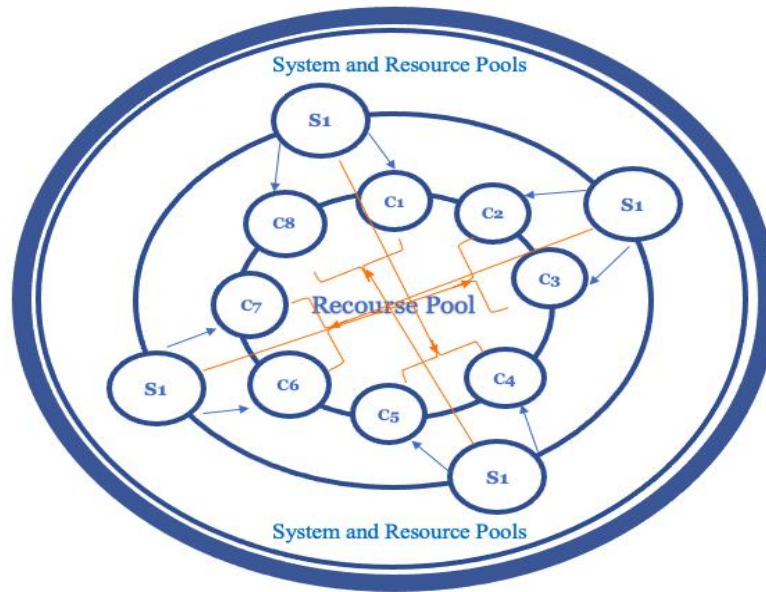


Fig. 2. A Model for supervising emerging and novel PhDs in the developing world. This is a system that holds a pool of human resources including supervisors and technical and support staff as well as materials and resources for research and other aspects of doctoral education. Resources are made available as a pool. Supervisors are assigned as primary and secondary. First, all supervisors serve as a pool of human resources for the candidates in a cohort [a cohort can be a department, school, or faculty, depending on size and organisation]; the primary supervisor is determined based on skills, competences, experience, and interests as the most suitable and appropriate for the candidate. The secondary supervisors provide complementary support and the entire pool of supervisors are available and others that are neither the primary nor secondary can provide tertiary support. A committee of supervisors is thereby made available to the candidates.; yet with clearly defined roles, supported by policy documents and supervision MoUs

[Key: S1-S4 are supervisors; C1-C8 are candidates]

	Early Year [s]	Advanced Year[s]	Latter/Final Year[s]
← System Support →			
Primary Supervisor	Academic/Advisory/Community of Learning & Practice/Support	Project Supervision	Dissertation Writing, Presentations, Publications and Defense/Graduation Requirements
Secondary Supervisor	Support: Advisory/academic	Support: technical	Support: Writing/proofreading
← Supervisory Team →			
Vital generic skills	Reading & Writing Introduction to Communities of Learning and Practice	Scientific communication & Becoming members Communities of Learning and Practice	Formal scientific writing skills including research article and dissertation writing/publishing

Fig. 3. An illustration of the basic and suggested roles of the primary supervisor, the secondary supervisor, supervisory team and the support system, including a number of vital generic skills that should accompany the doctoral training.

9.7 Policies and Sustainability: Policy Documents, Driving Change, MoU/Supervisory Contract

A number of policies will have to be developed in addition to conventional or any other existing policies that guide doctorate programs. In this particular instance, policies on the supervisory models and the role of the primary supervisors and the supervisory team will be required. A memorandum of understanding or supervisory contract policy would also have to be developed. This will have to be shared with the supervisee who will have to sign in agreement as a formal way of indicating commitment.

9.8 Making a Case for the Proposed Model

Cross, M., Backhouse [23] had made a strong case for change to the current traditional approaches to supervising doctoral candidates on the African continent, describing it as not sustainable. Lee [24] advocated for certain qualities of supervision highlighting the facts that supervisors' diversities in knowledge and skills can be of advantage. The proposed model would also provide complementary supervisory styles while the policies and structures would make supervision more effective [25]. The proposed model combines the benefits of co-supervision and cohort supervision as previously studied and reported. This model further offers the needed and desired qualities in doctoral supervision

which include creating and sustaining a sense of belonging within the academic community, balance in power dynamics with beneficial democratic processes, diversity and helpful dynamics; effective collaborations and cooperation [26-31]. Interestingly, the suspected disadvantages such as increased cost and less control will be normalised through the system and sharing approach to the management of resources.

The importance and usefulness of such an approach has been highlighted as it encourages a system-thinking and work model by enabling resources and resourcefulness to be pooled, shared and optimised in the process of supervision. It allows the supervisors to complement one another in terms of their expertise and interests. It also saves cost for the systems as resources are shared and optimised, hence, wastages are reduced. The affective benefit of this is that it would enshrine a culture of a collaborative approach to work, encouraging system-thinking, with a potential to constitute an effective community of learning and practice. This approach might also help to break down disciplinary barriers, thereby, facilitating interdisciplinary relationships. Products of such a system would therefore have strong and positive affective attributes which might serve as soft skills that would also help them to excel in their chosen endeavours. This proposition is in alignment with a number of previous efforts and suggestions on the need and means of improving doctoral educating [32-36].

9.9 Final Remarks

The following remarks highlight how African institutions can effect positive changes to ensure proper supervision of doctoral students in the emerging BMS fields:

1. Work towards building a dynamic, versatile, multidimensional knowledge economy.
2. Define the programs purpose, and in alignment with relevant local, national and international agendas.
3. Clearly define the composition, roles and responsibilities of the supervisory team.
4. Ensure accountability of the team, primary supervisor and supervisory teams, especially through documentation.
5. Develop and implement relevant policies.
6. Cultivate a sustainable culture.
7. Adopt this model which allows the institutional system to develop a strong team spirit, collaborative culture and a local community of learning which can contribute to the effective aspect of students learning.

10. CONCLUSION AND RECOMMENDATIONS

This section summarizes the paper, presents challenges, suggests future study, and so on to create a lasting impression of the paper.

10.1 Conclusion

It is important to summarise the essence of this work and the proposition being made about the need to use a new model of supervision towards addressing the need to train modern basic medical scientists in the various aspects of the BMS in Africa. Those identified include the need to train basic medical scientists in the newer and modern fields of BMS and to equip them with the capacity to conduct cutting-edge research in the relevant fields. Since there are not enough qualified potential supervisors in all the fields that have been identified, it is hereby proposed that a collaborative system-based supervision model as proposed in this work is adopted. It is therefore logical to conclude that this collaborative, complementary and system-based supervisory model remains a viable option in Africa's attempt to use in-house developed solutions to address the current shortages in the training of experts in the field of basic medical sciences.

10.2 Recommendations

The following recommendations will help African institutions to effect the required changes to enable proper supervision of doctoral students in the emerging BMS fields:

1. Task stakeholders to develop various models that can address the identified shortages in expertise in the fields of BMS.
2. Invest in the field of doctoral studies towards obtaining practical and empirical information on evidence-based practices and the most effective solutions to the identified challenges.
3. Conduct further studies to test the current model and any other one towards identifying the most effective models and making changes to optimize any adopted model.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

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COMPETING INTERESTS

Author has declared that no competing interests exist.

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