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ACADEMIC MOBILITY FOR ENGINEERING AND TECHNOLOGY GRADUATES IN AFRICA: LESSONS AND EXPERIENCES FROM THE IMPLEMENTATION

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ABSTRACT

This paper was inspired by lessons and experiences arising from the implementation of an on-going academic mobility project supported by the Intra-ACP European Commission Program. Twelve universities (11 in Africa and the University of Gent in Belgium, Europe) in a consortium brokered by the Regional Universities Forum for Capacity Building in Africa (RUFORUM) conceived and successfully put a proposal in response to the 2013 Intra-ACP Academic Mobility Call. The project "Mobility for Engineering and Technology Graduates in Africa (METEGA)" is on-going and entails academic mobility of 72 beneficiaries (44 at Masters level, 20 at Doctoral level, and 8 at the staff and faculty level) in sixteen countries of the five sub-regions in Africa. Africa is lagging behind in terms of numbers of graduate students in engineering fields. The METEGA project is one of the 15 partnerships on academic mobility supported by the EU Intra-ACP Academic Mobility Scheme; and constitutes significant a contribution towards increasing the number of graduate students in Africa. The project has provided opportunity to leverage resources among participating universities. The participating universities offered three and nine quality Doctoral and Masters training programs. This project represents a significant effort towards internationalization of higher education in the sciences and has served as an opportunity for graduates and faculty to gain skills, relevant experience as well as learn from the implementation process. This paper presents lessons and experiences of the METEGA project, including institutional and operational issues that can be used to inform future academic mobility arrangements in Africa and elsewhere in the world.

Keywords: Higher education, Intra-ACP academic mobility, Innovation, Universities.

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This paper documents a successful case of academic mobility in Africa in higher education and research which is based on a collaborative engagement among universities. Higher Education Institutions can learn from this example and leverage resources for quality postgraduate training and research.

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1. INTRODUCTION

Key interrelated processes including internationalization, globalization, virtualization, and industrialization influence higher education today (Pavla *et al*., 2015). This means that there is an increased need for universities and other institutions of higher learning to share resources and cooperate in educational programs that meet the demands of various industrial sectors. Some educational programs are designed to address specific needs and are only implemented by specific universities. Academic mobility is vital for many graduates and professionals to benefit from such programs. Though, for a long time academic mobility was associated with civilization, it declined in the 1980s with increase in tuition fees. In the process, the science courses (particularly at postgraduate level) were more affected. This is largely because training and research for sciences such as Engineering and Technology are more expensive owing to laboratory and field experimentation. To promote the international movement of graduates, the commonwealth countries responded to the decline in academic mobility by creating the "commonwealth of learning". Today, universities are initiating projects to allow mobility of graduates into highly specialized programs across borders, and in many regions across the world. The movement of students, staff, and faculty is likely to remain a key activity in the education sector for the foreseeable future. Additionally, coupled with the economic principle of globalization, graduate education is gaining an essential place in international trade. Thus, education commercialization is a new trend that can now be observed in academic mobility in almost every country in the world.

At the international and national levels, academic mobility has been increasingly facilitated through flows in higher education which have evolved in different forms. The flows develop through key stages. At first, rapidly increasing demands for educational services exceed the capacity of domestic institutions forcing an increased number of students to seek education and training across borders or abroad. In the subsequent stage, domestic providers may choose to initiate educational options in partnership with reputable foreign institutions. The third stage entails the local market reaching maturity with a focus on local quality and capacity development. Finally, the institutions in developing countries begin to attract students from neighboring regions; education and research partnerships begin to be initiated. Thus, projects like the Mobility for Engineering and Technology Graduates in Africa (METEGA) take advantage of this opportunity to offer student, staff, and faculty mobility. Around the world, an increasing number of institutions are building partnerships with foreign universities, offering education online, and establishing campuses abroad; all of which are changing the trends in student and staff mobility. This is also coupled with the desire to promote mutual understanding among states and build a more educated workforce (Njuguna and Florence, 2013). Although, academic mobility has been experienced in many parts of the world (Todorescu *et al*., 2012; Bryła, 2015; Khoroshilova *et al*., 2015) focus has been minimal in Engineering and Technology programs especially in developing countries. For instance, advances in some engineering fields including nanotechnology and nuclear energy have no established institutions in Africa. Thus, Africa has to depend on the rest of the world for building in this new and emerging areas. Despite this challenge, there is effort to build capacity for training graduate engineers in Africa. Additionally, the trend for staff and faculty mobility which is experienced in developed countries (Storme *et al*., 2013) is gaining considerable recognition in developing countries through maiden projects like METEGA. Therefore, the aim of this paper is to give an account of the lessons learnt and experiences gained from the implementation of the METEGA project.

2. METHODOLOGY

This paper is based on a review of secondary literature and the authors' experience gained from the implementation of the METEGA project. The paper focuses on lessons and project implementation experiences. Different project reports and related literature were reviewed. Additional data was obtained through physical

interactions with the implementation team and beneficiaries of the project, and meetings with key project stakeholders.

3. MOBILITY FOR ENGINEERING AND TECHNOLOGY GRADUATES IN AFRICA PROJECT

The mobility for engineering and technology graduates in Africa (METEGA) project is a student, staff, and faculty mobility programmme. The project offers a total academic mobility of 72 representing 61.1%, 27.8%, and 11.1% Masters, Doctoral, and staff/faculty, respectively. The project aims to increase the number of postgraduates in selected fields, reduce brain drain, and create mechanisms for circulating experts on the African continent. Mobility of researchers and administrative staff is intended to broaden the professional and research network, and create a sustainable framework of relationships which can continue to support future academic endeavors. The project is also intended to develop a mutual understanding of credit recognition and work towards a single credit system, and developing joint, dual, or/and sandwich postgraduate programs. Key outcomes of the project include closer cooperation between the members in the consortium in various fields, and providing training opportunities to the consortium members through conferences and meetings; this adds to increasing the level of expertise in the internationalization and globalization of higher education in Africa. These project activities have a multiplier effect and are envisaged to strategically position participating universities to engage in future programmes on academic mobility.

The participating universities, selected academic programs, and associated mobility flows are as indicated in Table 1. Table 2 presents the target countries from where the graduates participating in the programme are drawn. The project supports highly specialized programs in the thematic areas of engineering and technology as indicated in Table 1. The key themes are in mechanical engineering, data communications, irrigation and hydraulics, software engineering, agricultural engineering, textile and industrial engineering, and post-harvest technology. From Table 1, agricultural engineering (at 18.75%) takes the largest percentage of graduates. This is closely followed by data communications and software engineering (at 18.75%); these are subsets of information and communication technology (ICT) programs. This is largely because previous academic mobility endeavors have focused less on ICT related programs. The mechanical engineering graduates in the project stand at 14.0625%, while those in textile and industrial engineering stand at 9.475%. The graduates in post-harvest technology, and irrigation and hydraulic engineering stand at 7.8125% and 3.125% respectively. Generally, the programs related to agriculture and its mechanization have the highest number of graduate trainees. This can be attributed to the fact that Africa largely depends on agriculture for its growth and economic development (Amjath-Babu *et al.*, 2016). It is interesting to note that ICT is now spreading to all industrial fields; and maybe as the African continent is geared towards industrial revolution, more academic mobility programs will include more cross-cutting ICT related disciplines. Also, in comparison, doctoral programs account for 31.25% of the graduates. Some Masters level programs produce highly specialized graduates who are readily absorbed into the industry. For instance, textile and industrial engineering, and irrigation and hydraulic engineering graduates, mostly serve government (public) institutions which focus less on research activities. This explains the large percentage (68.75%) of graduate trainees in the project at Masters level.

There are two target groups for students; masters and doctoral level students. To be eligible, the students must be nationals and resident in any of the eligible countries, be registered/admitted at one of the higher education institutions (HEIs) within the partnership at the time of the application for studentship or be registered/admitted in an HEI (not included in the partnership) of a country in the target lot; additionally, the candidate may have

obtained a degree (or equivalent) from an institution of a country concerned by the lot; and have sufficient knowledge of the language of instruction for the courses in the host countries.

Since not all partner countries permit joint degrees, the project offers full support to students under the mobility. However, in cases where joint degrees are permitted, the partnership members can co-design the curriculum to produce coherent and desired learning outcomes for joint degree qualifications at the masters level. Additionally, candidates previously enrolled for doctoral degrees at home universities can enroll for sandwich programs. This requires the potential candidates to undertake an eleven month period of supervised research at the host university.

Table-1. Partner Universities and thematic areas for METEGA

#	Partner Institution	Country	Program	Masters	PhD	Total
1	Makerere University	Uganda	Software Engineering	-	12.5%	12.5%
			Agricultural Engineering	9.375%	-	9.375%
			Data Communication and Software Engineering	6.25%	-	6.25%
2	Jomo Kenyatta University of Agriculture and Technology	Kenya	Mechanical Engineering	7.8125%	-	7.8125%
3	Gulu University	Uganda	-	-	-	-
4	Moi University	Kenya	Textile and Industrial Engineering	9.375%	-	9.375%
5	University of Botswana	Botswana	Engineering	-	6.25%	6.25%
			Mechanical Engineering	6.25%	-	6.25%
			Agricultural Engineering	6.25%	-	6.25%
6	University of Zambia	Zambia	Agricultural Engineering	9.375%	-	9.375%
7	University of the Cape Coast	Ghana	Post-Harvest Technology	7.8125%	-	7.8125%
8	Eduardo Mondlane University	Mozambique	-	-	-	-
9	Ains Shams University	Egypt	Environmental Engineering	3.125%	12.5%	15.625%
			Irrigation and Hydraulic Engineering	3.125%	-	3.125%
10	University of Mali and Polytechnique	Mali	-	-	-	-
11	RUFORUM Uganda (Associated partner)	Uganda	-	-	-	-
12	Ghent University (Technical partner)	Belgium	-	-	-	-

Source: Compiled by authors based on METEGA Academic Mobility

Table-2. Target African countries

Target group 1	Botswana, Kenya, Uganda, Egypt, Zambia, Mozambique, Ghana, Mali, Benin
Target group 2	Democratic Republic of Congo, Malawi, Burundi, Rwanda, South Sudan, Zimbabwe

Source: Compiled by authors based on METEGA Academic Mobility

The staff and faculty mobility is offered for the professional development of university communities. The opportunities are limited to staff and faculty engaged at the project partner universities. Thus, a multiplier effect of this mobility can enhance mutual institutional knowledge which can easily lead to the development of cooperative projects. This mobility also includes benchmarking exercises and sabbatical research periods, guest lecturing, curriculum development, knowledge sharing, and academic resources such as libraries and infrastructure. Individual projects need a strong support of the home institutions and a matching host mentor/academic colleague to support all staff and faculty during their mobility period. For eligibility, academic and administrative staff must be nationals

and resident in any of the eligible countries and covered by the relevant lot, work in or be associated with an HEI within the partnership. The mobility assignments are based on agreements between the members in the partnership; home and host institutions must agree on the program and research activities, and type of training.

4. LESSONS AND OPPORTUNITIES PRESENTED BY THE PROJECT

A number of lessons can be drawn from the implementation of the project that can inform future related programmes. Key among the lessons learnt include the critical role collaboration plays in education and research in terms of student, staff, and faculty exchanges. Collaboration brings together institutions and individual with similar thinking towards a given issue.

They form the basis for initiating focused research that can help in addressing problems that cut across nations in Africa. The African continent is endowed with cultural diversity; understanding and appreciating such diversity provides a noble opportunity for graduates from universities in Africa to participate and contribute in linking societies. The mobility within the METEGA project permits students, staff, and faculty to learn and appreciate different cultures. Thus, more specialized engineering and technology programs should be incorporated and the project allowed to extend and run for a longer period; similar projects can also be initiated to add to the effort the project is making towards making Africa self-sustainable.

Universities in Africa always seek to partner with universities outside the continent. Interestingly, this can be reversed and have these universities partnering and collaborating in training and research activities. To foster such partnerships, regional networks are necessary.

The METEGA programme already has a consortium of universities drawn from different parts of the continent. These networks can tap into the African talent and help the continent attain the required threshold of engineering professionals for growth and development. In essence, the project provides an ideal opportunity to tap and retain the African talents. The project also demonstrates that Africa can sustain its engineering and technology needs through cross border mobility in education and research.

Compared to HEI in Africa, universities from the developed world have a rich experience in managing mobility programmes. This is vital, especially for universities in developing countries. Equally, the project provides an opportune moment for African countries to merge curriculum and program requirements. For instance, some countries in Africa offer five-year engineering programs while others offer four-year engineering programs. The curriculum for engineering worldwide is almost uniform with some variations in the manner in which the programs are executed. The courses that were fronted for the programme were based on comparative advantage of the hosting institutions. For instance, the course on data communications is offered in Makerere University in the whole of Africa. Also, all the courses provided under the project cannot be offered by one university, largely because of infrastructural and field experimentation needs which are expensive. Therefore, for students to benefit, the mobility provided by METEGA presents a great opportunity for students to move to the hosting institution.

Countries in Africa face almost the same engineering and technology challenges. To solve these challenges and produce sound optimal engineering solutions requires a contextualized and a deeper understanding of these challenges. The emphasis for METEGA to have graduates trained outside their home country and institutions provides such an opportunity.

Sentiments from some key stakeholders seem to be in tandem with the fact that the project has provided an opportunity of its own kind that has seen some member university units receive foreign students and have their own graduates trained outside their universities. Also, the project demonstrates the critical role academics, research, and training play in integrating Africa. As a requirement, a candidate participating in the project is expected to study from a different country. This increases the level of political ties and strengthens regional cooperation

towards achieving common goals. Thematic cross-border education enables regional gains in networking and clustering of technical human resources. This improves reputation and forms a good selling point for a region.

5. PERCEIVED IMPACTS OF THE PROJECT

The impacts of the project are varied including short-term, medium-term and long-term impacts. The immediate short-term impacts include student, staff, and faculty mobility, increasing the number of highly specialized engineering and technology graduates in Africa, cultural exchanges based on regional diversity, wider experiences on the part of students, staff, and faculty moving into host countries and institutions, and regional research networks among scholars spread across the continent.

Also, as part of the short-term impacts is increased experiences in managing study schedules for students to complete on time. The mid-term impacts for the project include Africanizing the curriculum, producing home (regional) grown engineers who understand the African continent in context, contributing to the research agenda for the continent, and providing training to members of the consortium through conferences and workshops. The long-term impacts of the project include providing an avenue for creating lasting regional education and research networks, more collaboration between universities in Africa as a result of the regional networks, and replication of the project to continue producing more specialized engineering graduates in Africa.

6. CONCLUSION

Although graduate level training plays an important role in many nations, few countries have made commitments regarding it. The global demand for graduate education, training, and research propels mobility of people for study and research among other reasons. METEGA project presents a maiden program within the African continent that provides opportunities for such. The lessons and experiences gained it its implementation are vital to universities and research networks in Africa.

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