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SMART INNOVATION AND SUSTAINABLE TRANSPORTATION TECHNOLOGY TRANSFER FRAMEWORK FOR INTERCONNECTIVITY IN DEVELOPING COUNTRIES

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ABSTRACT

Funding for research dissemination is increasingly uncertain which calls for trans-disciplinary and trans-sector research dissemination through collaboration in order to ensure that fundamental advances are made in the areas of focus for capacity building and sustainability of road infrastructure in Africa. Through dissemination of research, studies, publications on various disciplines, authoritative and non-partisan policy advice is being provided to decision makers in government, academia, and the private sector. Although, dissemination of research in road transportation is integral to our societies, there are persistent challenges to its sustainability. This paper proposes strategies for cooperation among academia, industry, and transport sector through transport research dissemination by establishment of transportation professional networking group to provide a platform for sharing of experiences and exchange of ideas amongst transport professionals and researchers. This group has organised four international conferences on transportation in Africa which required the dissemination of innovative researches and approaches that brought about safe and sustainable solutions. With proper coordination, transport experts are poised to help solve problems at this level of complexity and importance. The paper concludes by highlighting the availability of potentials and critical mass in academia, government and the private sector to attain global stature and tackle capacity building challenges in road transport sector which depends on how the research dissemination and publication ecosystem is nurtured.

Keywords: Sustainable development, road infrastructure dissemination, capacity building

1. INTRODUCTION

Globalization and rapidly evolving technologies are driving profound changes in the role of transportation in our society. Through research studies, publications on various disciplines, transport professionals continue to provide capacity building strategies, authoritative and non- partisan policy advice to decision makers in government, academia, and the private sector. This cooperation will enhance coordination of research within the transport sector in Africa, dissemination of research findings and innovations to transport professionals, promote uptake of research contributions amongst transport professionals, and provide a platform for sharing of experiences and exchange of ideas amongst transport professionals and researchers. Although research in transportation is integral to our societies, there are persistent challenges to the vitality of this sector. Funding for scientific research is increasingly uncertain which calls for trans-disciplinary and trans-sector research collaboration in order to ensure that fundamental advances are made in the areas of focus for capacity building and sustainability of road infrastructure in Africa.

Despite the challenges facing the transport sector, there are many promising avenues to strengthen this sector. New models of cooperation among academia, industry and government can better enable transport experts to meet the formidable challenge of dissemination of transport research. The world is increasingly faced with complex problems that require the adoption of innovative researches and approaches that will bring about lasting and sustainable solutions. For instance, the challenges facing communities from climate change, to providing adequate transport for the world's growing population are immense, urgent, and intimately connected. With proper coordination, transport experts are poised to help solve problems at this level of complexity and importance. Redesigning dated organizational structures and cultural attitudes within and across the sectors could dramatically accelerate the development of new approaches. I believe we now have the critical mass in academia, government, and the private sector to achieve this. To attain global stature and tackle critical societal challenges in transport sector will depend on how we nurture the research and publication ecosystem.

The objective of this paper is to develop capacity building strategies for sustainable development of cooperation among academia, industry and government through transport research dissemination by establishment of transportation professional networking group to provide a platform for sharing of experiences and exchange of ideas amongst transport professionals and researchers. This group has organised four international conferences on transportation in Africa which required the dissemination of innovative researches and approaches that brought about lasting and sustainable solutions. For instance, the challenges facing communities from climate change, to providing adequate transport for the world's growing population are immense, urgent, and intimately connected to the recent past theme. With proper coordination, transport experts are poised to help solve problems at this level of complexity and importance. The paper concluded by highlighting the availability of potentials and critical mass in academia, government and the transport sector to attain global stature and tackle capacity building challenges facing road infrastructure development which depends on how the research dissemination and publication ecosystem is nurtured.

2. LITERATURE REVIEW

In the field of Transport research, the academia, industry, and government are buffeted by common transport related problems and challenges. International Cooperation in Transport research is becoming an increasing priority aiming, primarily, at creating "critical mass" in moving collaboratively to solve critical 21st century transportation challenges (EUTRAIN, 2016). Developing countries have relied on researches carried out in the developed countries (Workman, 2013) which was strongly argued by O'Neil's and Greening (2010) that the capacity to develop innovative technology is an important part of the development process and a measure of a nation's ability to progress economically and identify solutions to local problems. TRB (2005) emphatically highlighted the benefits of research cooperation in accelerating growth of highway transportation if research studies and dissemination are best studied by highway departments in cooperation with their state universities and others through a coordinated program of cooperative research. This culminates into the establishment of African transportation professional networking group (AFTraP) to better enable transport experts to meet the formidable challenges by organising annual international conference on transportation in Africa. The main idea and objective were to establish through international cooperation in transport research dissemination; the free circulation of specialized knowledge, experience and know how in facing transport challenges. This has created through collaboration the conditions for more "breakthrough" research and achievements that would otherwise require more time and resources if faced individually and separately. The African transportation professional networking group (AFTraP) puts forward a framework for such international cooperation in Transport

research dissemination between the academia, industry and government, in order to ease existing barriers and limiting factors for such collaboration vis-à-vis a number of "focused" international cooperation issues such as achieving "global" research infrastructures; information and data sharing issues, intellectual property regimes; pre-standardization issues and means of harmonizing approaches and practices; research training and human resource issues (mobility of researchers and global networking); establishment of open research cooperation programmes (e.g. notably joint programming); differences in institutional cultures and research governance regimes.

It becomes incumbent upon road engineers to gain from the technology transfer developments of colleagues rather than "re-inventing the wheel" or making the same mistakes that others have made. In other words, the extent and efficiency of a country's technology transfer system could reveal the extent of that country's development. There has been recognition that informal sharing of experiences may no longer be the best approach to improve road transportation as the travel demands of modern society have increased exponentially. Technology transfer in the transportation sector is aimed at using the benefits of someone else's successful research, development, or experience to benefit roads locally – often at a fraction of the original development cost (PIARC, 2000).

The primary objective is to systematically and actively facilitate acquisition and dissemination of technology, practice and policy knowledge and know-how that is relevant to a local operating transportation environment. Technology transfer was explained by PIARC (2000) as the process of openly gaining and freely sharing experiences, workable solutions, technologies, and innovations. It was also emphasized by Logie (2007) that technology transfer occurs in many ways and different forms. Technology transfer happens at its simplest form, when someone reads about a "new" technique in a report or a technical magazine from another place. Furthermore, technology transfer operations were described by Pinard (2007) as a process of developing appropriate technology transfer mechanisms and activities (newsletters and fact sheets; technical reports; news releases; journal and magazine articles; electronic bulletin boards); conveying well quantified success stories highlighting benefits over competing alternatives; carrying out well designed field tests, demonstration and pilot projects; producing well illustrated guidelines, reports and manuals in reader-friendly format; holding interactive conferences, workshops and seminars tailored to the differing requirements of segmented audiences at various stages of the technology transfer process.

3. RESEARCH METHODOLOGY

The African Transportation Professional Networking Group (AFTraP) is made up of transport professionals from the academic, business, and government sector with a commitment to proffer solutions to critical challenges facing transport in Africa. The goal of the group is to organise transportation professional conferences such as from country to country within Africa annually to provide a platform for experts and scholars to exchange ideas with each other, and also share the development and products in the field.

The goal of African Transportation Professional Networking Group (AFTraP) would be achieved in multiple steps and marked by three major deliverables

Deliverable 1 – Current challenges, practices, issues in international transport research cooperation

Deliverable 2 – Research areas, capabilities, and future priorities for international transport research cooperation

Deliverable 3 – Towards a framework and implementation for African international transport research dissemination.

The beneficiaries of the African Transportation Professional Networking Group (AFTraP) covered in a collective way all necessary aspects for the successful execution of an international cooperation in transport research project. As African Transportation Professional Networking Group (AFTraP) between the academia, government and the transport sector take shape and strength, international transport research collaboration can both help its further strengthening and internal cohesion as well as boost Africa's competitiveness in the global economy. However, enacting and fostering international research collaboration is faced with significant problems and difficulties today which should be researched, in order to provide the means of enacting solutions such as issues related to research infrastructures, intellectual property rights, and researchers' mobility.

The main objective was to produce a general framework related to international transport research cooperation, based on the reports of the three recent international conferences on transportation in Africa organised and the outcomes of related research topics presented. Other initiatives in the recent past as well as on the outcome of a thorough investigation of all different aspects of international cooperation such as current practices and more specifically gaps and barriers confronted in other international cooperation like European Transport Research Area International Cooperation activities (EUTRAIN) and Transportation Research Board of the National Academies (TRB) with the same field of interest, common characteristics, priorities and needs for international transport research and alternative models and tools for such research cooperation.

More specifically the AFTraP aimed:
(i) To contribute towards the establishment of a framework for international transport research cooperation and dissemination to be built upon the principles of knowledge sharing of transportation developments within African countries.
(ii) To investigate country research capabilities, future priorities, and potential for cooperation with the host countries in the prospect of mutual interest, in major regions of importance to AFTraP.
(iii) To consider and discuss current practices for research governance and management as well as barriers, gaps, and diversions for international transport research cooperation.
(iv) To assess the benefits or added value to AFTraP, as well as the prospective synergies from such closer international cooperation.
(v) To investigate alternative models and tools for carrying out such cooperation in the most effective and productive way and finally,
(vi) To disseminate, in the course of doing the above activities, African know how and practices in transport research.

4. KEY FINDINGS AND CONTRIBUTIONS

The first International Conference on Transportation in Africa was organised by the African Transportation Professional Group in collaboration with Ministry of Transport and Communications (Transport Hub, Botswana) themed "Improving Transport Systems and Sectors through Innovative Approaches", on December 15, 2014, at Gaborone Sun International Hotel, Botswana. During the opening ceremony, the Minister of Transport and Communications opined that to develop a safe, reliable, and sustainable transportation system for socio-economic development in Africa, the government needs to consider innovative approaches. Furthermore, the Minister emphasised that safe and reliable transport systems cannot be achieved without improved transport systems, adding that improved transport systems should form part of every government's top agenda. "In dealing with the broad set of issues facing transport sector particularly in Africa the conference should also tackle issues of safety, accessibility, and improved infrastructure, taking in consideration the environmental issues. It is also worth mentioning that in so doing, all

modes of transportation should be considered." The Minister stated that despite the considerable investments put in the road transport sector, problems of unmanageable and rough or periodically impassable roads are still quite common. "Government allocated funding for the provision of paved roads while maintenance lags behind, an improved balance between initial road investment and realistic assessment of maintenance capacity should lead to a better deployment of available resources."

Moreover, the minister said that transport might be considered as a vital missing link in the efforts to achieving the United Nations (UN) Millennium Development Goals (MDG) because without access to adequate transport infrastructure and services, the MDG's would not be effectively met and achievements made would be difficult to sustain. The Minister also added that research and publication will in turn help governments to come up with informed policies and appropriate interventions as urbanization increases, most cities and towns in Africa are faced with the problem of traffic congestion." This rapid increasingly congestion calls for definition and deployment of coherent and effective urban mobility plans and public transport policies. Africa needs to modernize its public transport systems. The minister assured the participants that the recommendations from the conference will be of immediate application to the transport sector and the whole of Africa as the representatives of governments and other stakeholders were urged to take the lessons from the conference seriously in formulating new strategies to take the transport sector forward.

Figures 1: Group picture of the Minister of Transport, Botswana with the 1st International Conference on Transportation in Africa participants (ICTA2014)

The 2nd International Conference on Transportation in Africa (ICTA2015) was successfully held on 25th - 27th November, 2015 at Majestic Five Hotel, Palapye, Botswana which indeed was a resounding Success. The conference was organised by the African Transportation Professional Networking Group and co-hosted by Botswana International University of Science and Technology, BIUST in collaboration with Transport Stakeholders, Private/Public sectors, Universities & Transport Professionals in Africa. The conference focused on how to optimally engage speakers and all stakeholders involved in the transport sector from African Countries, Australia, America, Europe to provide "safe and sustainable transport infrastructure in developing countries". The attendees gave the conference content an excellent satisfaction rating. It was an opportunity for Botswana International University of Science and Technology to be part of this outstanding program with International delegates from United Kingdom, Czech Republic, Ethiopia, Namibia, Zimbabwe, South Africa, Kenya, Tanzania, and Botswana as the host-country.

Figure 2: Group photo of 2nd International Conference on Transportation in Africa (ICTA2015)

The "African Transportation Professional Networking Group" is actually made up of transport professionals from the academic, business, and government sector that has a commitment to proffer solutions to critical challenges facing the transport sector by organizing transportation professional conferences, from country to country within Africa annually, to provide a platform for experts and scholars to exchange ideas and publish recent developments in the field of transportation. African Transportation Professional Networking Group in collaboration with Botswana International University of Science & Technology and the Ministry of Transport & Communications brought together practitioners and researchers from around the world to foster partnerships and collaboration. Technology transfer centres are now tasked with exploring ways in which research institutions, academia, industry and government will collaborate to bring about the effective dissemination and implementation of transportation research to the benefit of the public, locally, regionally and globally "to attain global stature and tackle critical societal challenges in the transport sector, which will depend on how the research and publication ecosystem is being nurtured.

4.1 Mitigating Current Challenges Facing Transportation in Africa

The 3rd International Conference on Transportation in Africa (ICTA2016) was successfully held on 26th - 28th October, 2016 at Ramada Resort, Accra, Ghana which indeed was a resounding success. The conference was organised by the African Transportation Professional Networking Group and co-hosted by Kwame Nkrumah University of Science & Technology, Kumasi, Ghana in collaboration with Ministry of Transport, Stakeholders, Private/Public sectors, Universities & Transport Professionals in Africa. The conference focused on how to optimally engage speakers and all stakeholders involved in the transport sector from African Countries, Australia, America, Europe to provide "mitigating measure towards the challenge of climate change facing transportation in Africa".

Figure 3: ICTA2016 Conference participants group photo with Transport Professionals

The 4th International Conference on Transportation in Africa (ICTA2017) was successfully held on 11th - 13th October 2017 at Sheraton Hotel, Abuja, Nigeria which indeed was a great success. The conference was organised by the African Transportation Professional Networking Group and co-hosted by The Nigerian Institution of Highway and Transportation Engineers, Abuja, Nigeria in collaboration with Ministry of Transport, Stakeholders, Private/Public sectors, Universities & Transport Professionals in Africa. The conference focused on how to optimally engage speakers and all stakeholders involved in maintenance from African Countries, Australia, America, Europe to provide "effective maintenance, safety and funding for sustainable transportation in developing countries".

Figure 4: ICTA2017 Conference participants group photo with Transport Professionals

The 5th International Conference on Transportation in Africa (ICTA2019) was successfully held on October 29th – 31st, 2019 at Morgan State University, Baltimore,

Maryland, USA which indeed was a great success. The conference was organized by the African - American Transportation Professional Networking Group and co-hosted by Morgan State University, Department of Civil Engineering in collaboration with Institute of Urban Research, Transportation Stakeholders, Private/Public sectors, Universities & Transport Professionals in America, and Africa. The conference focused on how to optimally engage speakers and all stakeholders involved in transportation from America and Africa to provide "sustainable transportation infrastructure and smart innovations".

Figure 5: ICTA2019 International Conference participants at Morgan State University, USA

5. CONCLUSION

Collaborative research dissemination and activities between the "advanced" - in terms of funding - countries or regions such as ASANRA, AFCAP, TRB, ARRB are now on the rise as the benefits from pulling of resources and commonly addressing the major issues and challenges in the transport field, seem to outweigh the traditional "competitive" positions taken by such countries and push towards more cooperation. This trend should be strengthened in the future by pursuing, at first, more easily achievable tasks such as multi-year technical personnel exchanges, agreements to further the exchanges of critical transport data, and so on. In the case of African countries, it is important to try and incentivize the private sector to contribute to international cooperative programmes and projects and compensate for existing funding restrictions and legislation for as long as these exist. Successes in collaboration should lead to larger projects and more extensive collaborative frameworks. These "advanced" research supporting countries should also explore in a more medium to long term horizon, more advanced models of international cooperation such as joint programming and funding of research, as well as use of more state-of-the-art technologies for new publications and dissemination that would highlight some existing best practices and success stories.

In the countries with "lesser research capabilities", for example African countries, there are considerable divergences of attitudes found towards international cooperation policies. Firstly, the factors hindering such cooperation are lack of timely information, lack of networking capabilities, as well as the substantial level of bureaucratic and cumbersome procedures and paperwork that is associated with establishing international cooperative proposals. Secondly, the attitudes were generally in favour of increasing the "reciprocity" in any future collaborative research programme, and a joint outreach to significant funding

sources and foundations to support sustainable (i.e. long term) ways of funding international collaborative transport research. Thirdly, there are a number of "critical" hindering factors which restrict researchers and research organisations in "lesser developed" countries to mobilise and benefit from international cooperative research programmes. These are due to the following observations: Lack of open, timely and reliable information about the various calls and networking with professionals from other countries; too cumbersome and complex administrative procedures; high co-funding percentages; lengthy turnaround times (proposals – evaluation – contract signature); need for capacity development for appropriate research personnel.

Recommendations for sustaining research dissemination and cooperation are:

(i) Observe "equal" standing as regards the focus and work programmes of international cooperation programmes and projects. In other words, the content of the call for paper as well as the criteria for selection and evaluation must not be simply aiming to promote the technologies, standards, and even commercial products of the "funding donor" countries.

(ii) Establishing effective and multi-channel communication processes has been stated as the key factor that will measurably enhance collaboration between developed and lesser developed countries internationally.

(iii) Foster international cooperation actions and human capacity building focusing on major global transport related problems and issues.

(iv) Relevance of research to the country's problems and policies. It is felt that some of the joint research programmes offered for international transport research cooperation are not of equal interest and importance to both sides and that they simply express the interests of the "funding donor" countries.

(v) Promote joint programming as a source of international Cooperation programme funding i.e. join forces between major research funder countries in order to provide greater funding opportunities for transport research dissemination in Africa.

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