Development Of High Level Model Of A Framework For Automation Of National Grant Management System

Kalu Constance

Department Of Electrical/Electronic And Computer Engineering, University of Uyo, Akwa Ibom State Nigeria

Ntuen, Bassey Cletus

Department Of Electrical/Electronic And Computer Engineering, University of Uyo, Akwa Ibom State Nigeria

Philip M. Asuquo

Department Of Electrical/Electronic And Computer Engineering, University of Uyo, Akwa Ibom State Nigeria

Abstract— In this paper, development of high level model of a framework for automation of National Grant Management System (NGMS) is presented. The National Grant Management System (NGMS) is based on a hierarchical organizational structure that has the beneficiaries at the lowest level and the National Grant Management System Organization (NGMO) at the top. In the hierarchical structure, the NGMO is a body that coordinates the disbursement of grants by Non-governmental Organizations (NGO) across the nation. The NGOs establish cluster of beneficiaries where each cluster has a cluster head (or cluster coordinator) along with a set of directors and beneficiaries. The key functional components of the NGMS are presented along with the high level design of each of the functional units. The disbursement of the grant is centrally coordinated and funds are transferred from disbursement account of the NGMO directly to the various accounts of the registered and verified beneficiaries and directors at the cluster level. Also, funds are transferred from disbursement account of the NGMO directly to the various project accounts of registered clusters, NGOs and also to the project account and other service account of the NGMO. In all, the framework presented a feasible organizational structure and account management procedure that can be employed in the development of web-based application for automated management of grant disbursement across the nation.

Keywords— National Grant Management Organization, High Level Model, Grant Disbursement, Non-Governmental Organizations, Pay Schedule National Grant Management System

1. Introduction

Over the years, grant has been a major means of providing aids to the poor and also to fund certain projects that will enhance the standard of living in various nations across the globe [1,2,3,4,5]. The donor agencies for grants in most cases require transparent disbursement procedure and possible feedback on how the funds are disbursed to the target beneficiaries or projects [6,7,8,9,10,11]. In this wise, automation through the use of globally accessible software platform is required. This will enable the grant donors to access and monitor the grant disbursement process in real-time.

Generally, in Nigeria, most grants are disbursed by Non-Governmental Organizations (NGOs) who organize the beneficiaries in groups called clusters [12,13,14,15]. The NGOs are usually set up to address different social challenges and some of them have websites for communicating to the various stakeholders [16,17,18,19,20,21,22,23,24,25,26,27,28,29,30]. Also, the NGOs use the websites and other means to reach out and solicit for grants to fund their projects. However, the need to account for these grants has necessitated the involvement of various regulatory agencies in the disbursement process. The lack of known procedure at the national level has caused undue delays in the grant disbursement process [31,32,33,34,35]. As such, in this paper, the authors seek to proffer solution by developing a high level model of a framework for automation of National Grant Management System (NGMS). The details of the framework is presented in such a way that web-based software solution that is accessible to key stakeholders across the globe can be developed. The framework captured the concerns in the grant disbursement management at the national level.

2. Development of the Model

2.1 The organogram of the National Grant Management System (NGMS)

The National Grant Management System (NGMS) is based on a hierarchical organizational structure. In the hierarchical structure, there is a National Grant Management System Organization (NGMO) which is a body that coordinates the disbursement of grants by Non-governmental Organizations (NGO) across the nation. The NGOs establish cluster of beneficiaries where each cluster has a cluster head (or cluster coordinator) along with a set of directors and beneficiaries.

The organogram of the National Grant Management System (NGMS) based on the grant distribution from the NGMO perspective is presented in Figure 1. At the top of the National Grant Management System (NGMS) organogram is the NGMO which has money voted for its NGMO projects. Apart from the NGMO project, money is voted for other NGMO activities and oversight functions. Also, the NGMO has all the NGOs under its control.

Down the line of the organizational structure for grant disbursement management (Figure 1), each NGO has

money voted for the NGO project. In addition, each NGO has a group of clusters under its control. As such, money is voted to each NGO for the coordination role it plays over the clusters.

Similarly, each cluster has money voted for the cluster project which is different from the money voted for each

cluster director and each beneficiary in a cluster. At the same time, each cluster has money voted for the coordination role it plays over the cluster directors and beneficiaries.
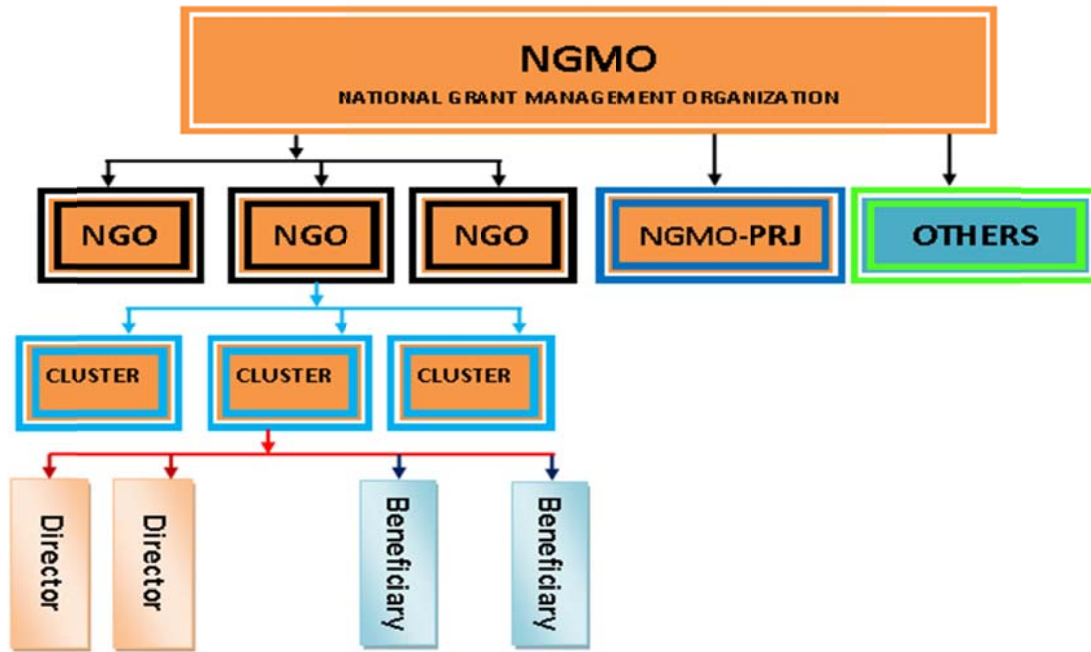

Figure 1 The organogram of the National Grant Management System (NGMS) based on the grant distribution from the NGMO perspective

2.2 The organizational structure for the bank accounts required for the National Grant Management System (NGMS)

The organizational structure for the bank accounts required for the National Grant Management System (NGMS) is presented in Figure 2. In order to receive the money, the NGMO, the NGO, the clusters and their directors and beneficiaries must provide functional bank accounts which are validated before the disbursement takes place. Specifically, the NGMO will receive the entire grant using its NGMO disbursement account (NGMO-DACC). Next, the NGMO must provide two other accounts, one is the NGMO projects account, denoted as NGMO-PBACC and the second is the NGMO other services account, denoted as NGMO-OSACC, as shown in Figure 2. The

disbursement is done by the NGMO from its disbursement account NGMO-DACC) to all the other accounts, namely, the NGMO project account, the NGMO other services account, the NGOs project account, the cluster project account, the cluster director's account and the cluster beneficiary's account.

Accordingly, each of the NGOs must provide one account for the NGO projects account, denoted as NGO-PBACC, as shown in Figure 2. Furthermore, each of the cluster under the various NGOs must provide one account for the cluster projects account, denoted as NGOCL-PBACC, as shown in Figure 2. Each director in a cluster must provide a bank account, denoted as Director-ACC and beneficiary in a cluster must provide a bank account, denoted as Beneficiary-ACC.
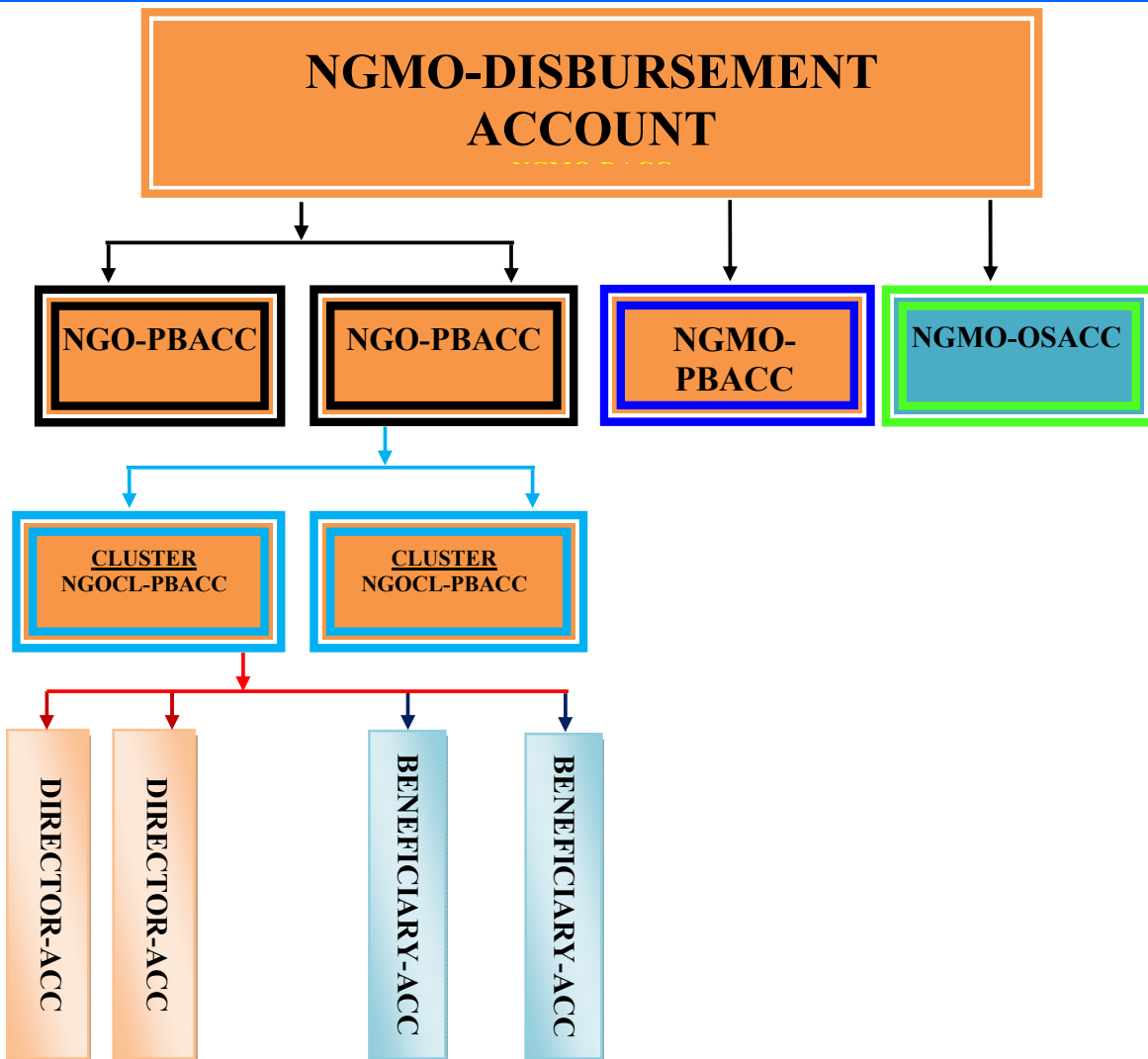
Figure 2 The organogram of the required bank accounts for the National Grant Management System (NGMS) based on the grant distribution from the NGMO perspective

3. The mechanism for management of the bank accounts and database login account for the National Grant Management System (NGMS)

In order to manage the bank account and give account of the transactions on the bank account, the NGMO, NGO and cluster must appoint an account management officer. For the NGMO, the account management officer is denoted as NGMO-AMO. For the NGO the, account management officer is denoted as NGO-AMO. For the cluster, the account management officer is denoted as NGOCL-AMO.

On the other hand, the software platform that is used to manage the grant disbursement requires login account setup for the listed account officers. In this work, the NGMO is expected to appoint an Admin officer for the back end of the web-based software for NGMS. Let the admin be denoted as NGMS_WebMaster. Accordingly, the NGMS_WebMaster will collect and validate personal profile and biometric data from the various listed account officers and create a login account with certain privileges to access the web application and manage the bank account transactions they are appointed to manage. The flow diagram for setting up the system login account for the NGMO-AMO and the loading and validation of the two NGMO accounts (NGMO-PBACC and NGMO-OSACC) details on the NGMS web application database is shown Figure 3. In the flow diagram of Figure 3, it is assumed that the NGMO-DACC, NGMO-PBACC and NGMO-OSACC are already in existence at the bank. What is done in Figure 3 is to provide the details of each of those three accounts to the NGMS_WebMaster who keys the details into the NGMS web application. The NGMS web application has mechanism to validate the account details from the bank Mobil application of through some third party applications. Also, the NGMO-AMO personal and biometric details are captured and some key data items like BVN number, phone number and email number are verified using some third party applications.
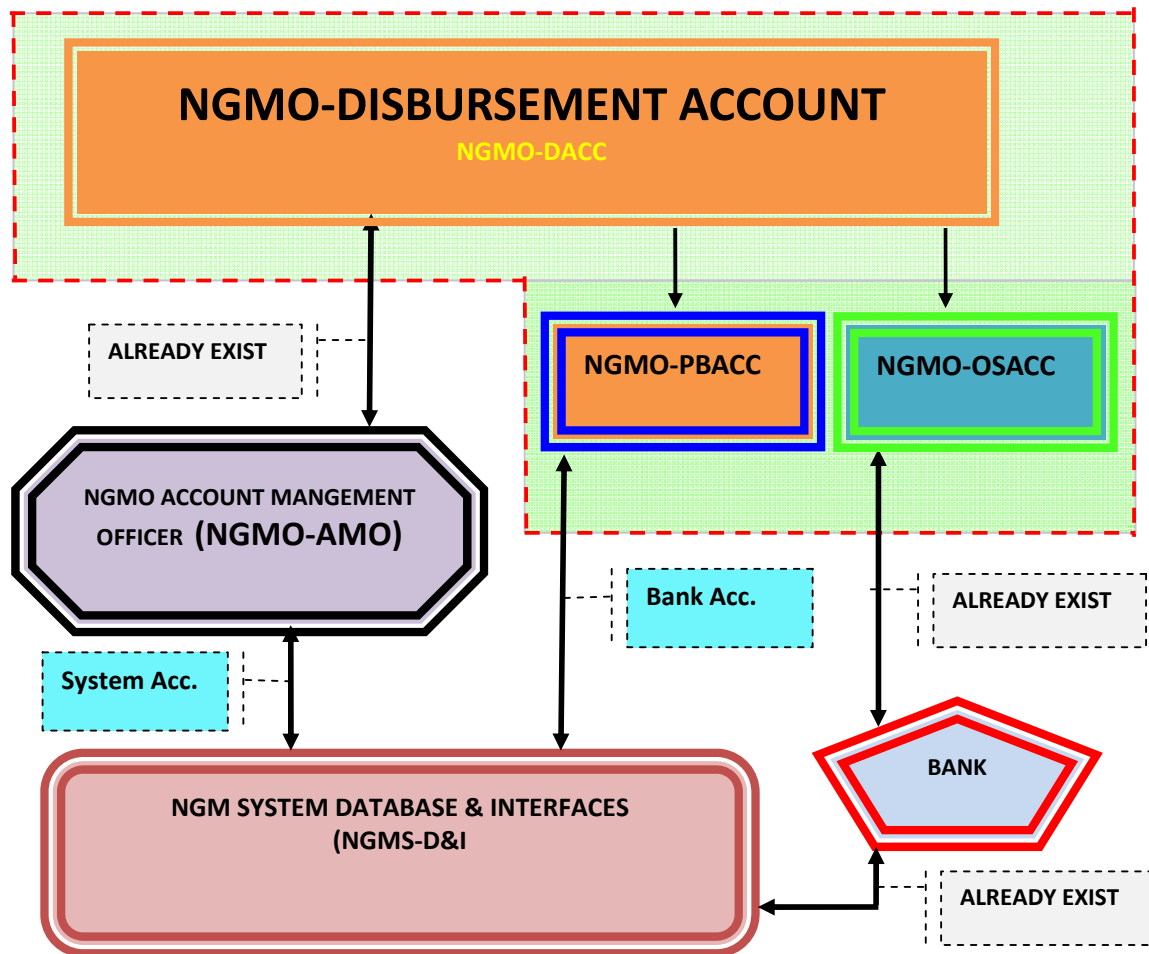
Figure 3 The flow diagram for setting up the system login account for the NGMO-AMO and the loading and validation of the two NGMO accounts (NGMO-PBACC and NGMO-OSACC) details on the NGMS web application database

The flow diagram for setting up the system login account for the NGO-AMO and the loading and validation of the two NGO project account (NGO-PBACC) details on the NGMS web application database is shown in Figure 4. In the flow diagram of Figure 4, it is assumed that the NGO-PBACC and NGMO-DACC are already in existence at the bank. What is done in Figure 4 is to provide the details the NGO-PBACC accounts to the NGMS_WebMaster who keys the details into the NGMS web application. The NGMS web application has mechanism to validate the account details through some third party applications. Also, the NGO-AMO personal and biometric details are captured and some key data items like the Bank Verification Number (BVN, phone number and email number are verified using some third party applications. Similar approaches in Figure 3 and Figure 4 are used to setup the system login account for the NGO cluster account management office (NGOCL-AMO) as well as upload and validate the account details for the NGO cluster project account (NGOCL-PBACC) details.
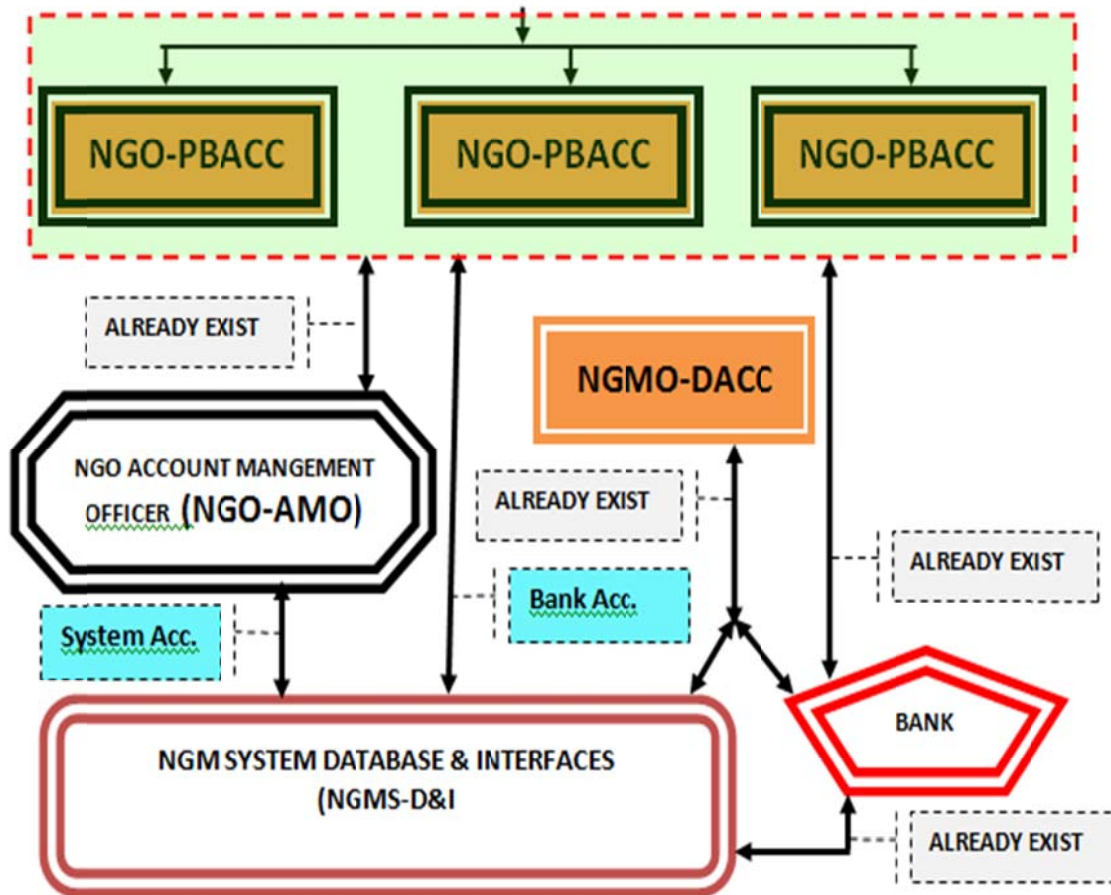
Figure 4.The flow diagram for setting up the system login account for the NGO-AMO and the loading and validation of the two NGO project account (NGO-PBACC) details on the NGMS web application database

4. The mechanism for disbursement of fund to the various project accounts

The NGMO-AMO will obtain the payment details from the NGMO management team and then transfers the specified amount to the respective accounts. The fund transfer will require submission of the payment schedule to the bank and final authorisation given to the bank to credit the specified amount of money to the listed accounts on the pay schedule. The flow diagram in Figure 5 shows the flow of activities for the disbursement of fund to the NGO project account (NGO-PBACC). The flow diagram in Figure 5 shows that the NGMO-AMO uploads the NGO project account pay schedule to the NGMS database which is also forwarded to the bank. The NGO project pay schedule is a table containing the list of the NGOs, their respective project account details and the amount to be credited to the respective accounts. The banks waits for a final authorisation to pay before they can credit the respective accounts on the pay schedule. Once, the authorisation is given and the accounts are credited, the transaction details are forwarded by the bank for each of the bank accounts on the pay schedule to the NGMS database. The NGMS database in turn forward the payment transaction details of each account to the respective NGO account management officer (NGO-AMO). Any issue emanating from the payment is resolved at this point.
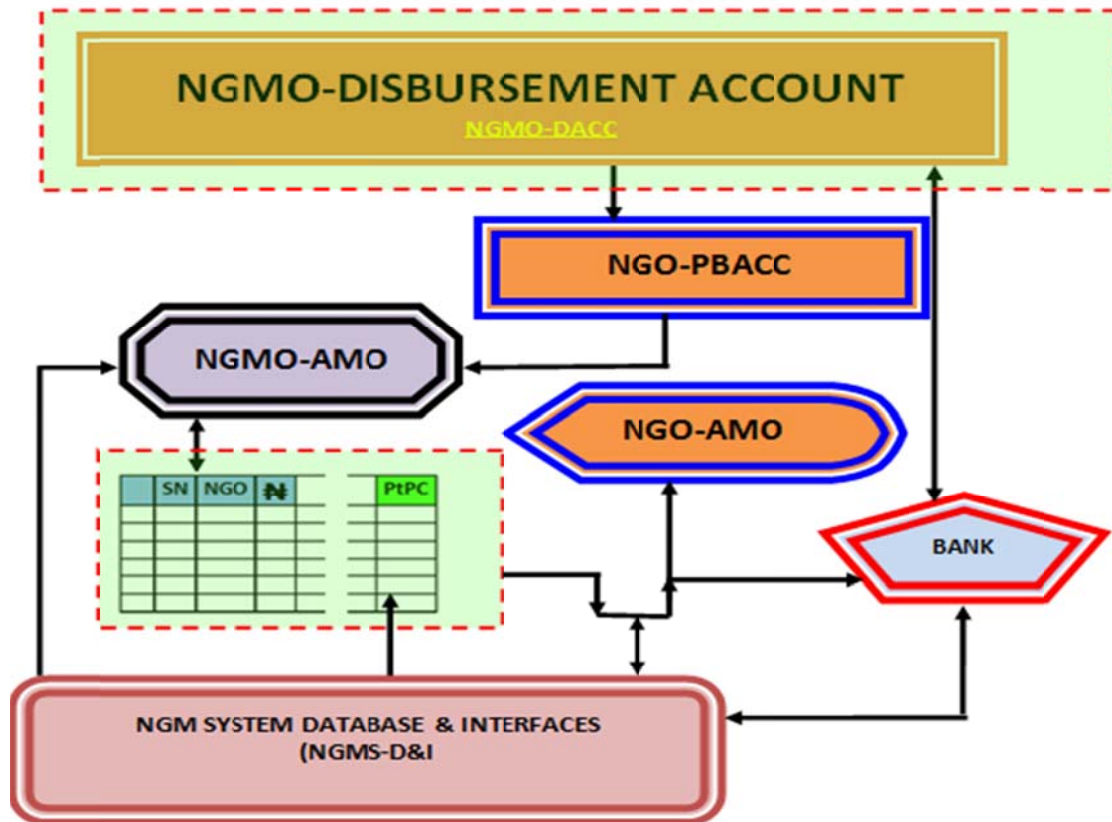
Figure 5 The flow diagram for the disbursement of fund to the NGO-PBACC.

Similarly, the flow diagram in Figure 6 shows the flow of activities for the disbursement of fund to the cluster project account (NGOCL-PBACC). The flow diagram in Figure 6 shows that the NGMO-AMO uploads the cluster project account (NGOCL-PBACC) pay schedule to the NGMS database which is also forwarded to the bank. The cluster project pay schedule is a table containing the list of the clusters in the various NGOs, the cluster respective project account details and the amount to be credited to the respective accounts. The banks waits for a final authorisation to pay before they can credit the respective accounts on the pay schedule. Once, the authorisation is given and the accounts are credited, the transaction details

are forwarded by the bank for each of the bank accounts on the pay schedule to the NGMS database. The NGMS database in turn forward the payment transaction details of each account to the respective cluster account management officer (NGOCL-AMO). Any issue emanating from the payment is resolved at this point.

The payment to the NGMO-PBACC and NGMO-OSACC is in the same way as the NGO-PBACC and the NGOCL-PBACC. In this case, the pay schedule uploaded include the NGMO-PBACC and NGMO-OSACC accounts and the payment transaction details are mail available to the NGMO-AMO.
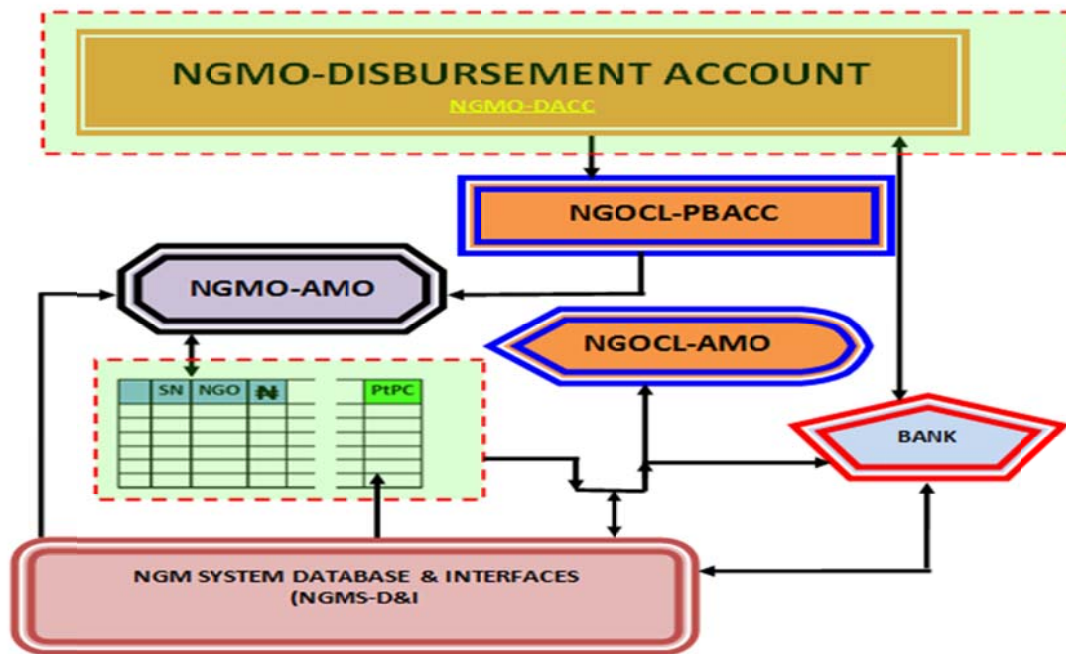
Figure 6 The flow diagram for the disbursement of fund to the cluster project account (NGOCL-PBACC)

5. The mechanism for disbursement of fund to cluster directors and beneficiaries

After the disbursement of funds to the NGMO-PBACC, NGMO-OSACC, NGO-PBACC and NGOCL-PBACC accounts, the disbursement of funds to the individual beneficiaries is performed based on the flow diagram presented in Figure 7.

First, the cluster head, through the NGOCL-AMO uploads the registration details of the directors and beneficiaries in the cluster to the NGMS database. Then, the NGMO-AMO configures the NGMS database to prepare the pay schedule for the cluster directors and the pay schedule for the rest of the beneficiaries. The two pay schedules are actually merged into one pay schedule per cluster. The pay schedule for all the clusters are then forwarded to the banks by the NGMO-AMO, as shown in Figure 7. The NGMO-AMO issues the final authorisation to pay to the bank. At this point the accounts are credited, the transaction details are forwarded by the bank for each of the bank accounts on the pay schedule to the NGMS database. The NGMS database in turn forward the payment transaction details of each account to the respective account owner's phone number, as provided in the payment schedule. Any issue emanating from the payment is resolved at this point.
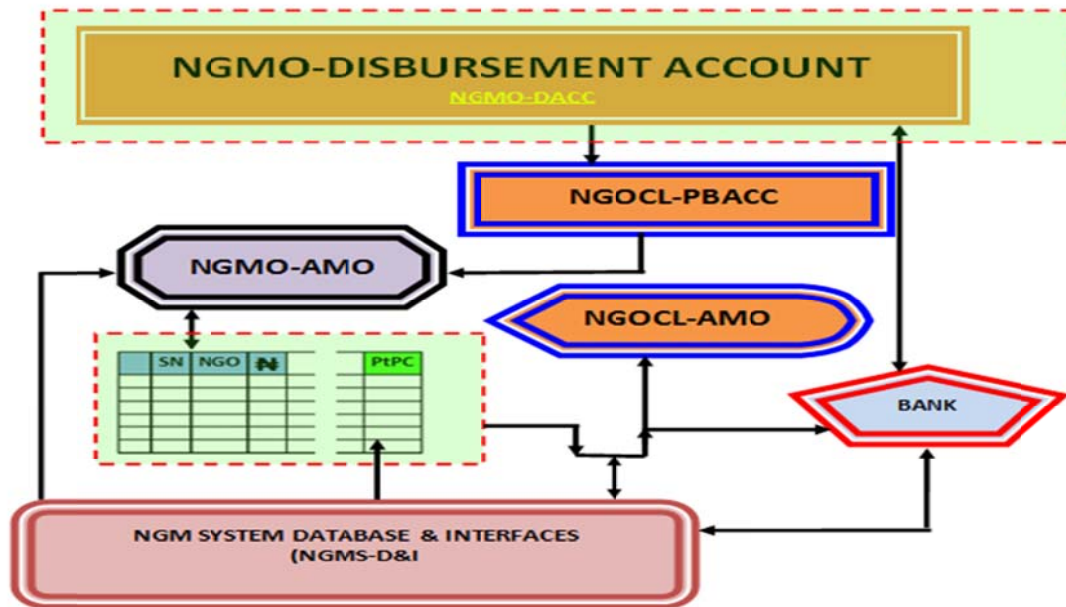
Figure 7 The flow diagram for the disbursement of fund to the cluster directors accounts and cluster beneficiaries accounts

6. Some Notable Issues with The Disbursement Framework and The Solutions

Some of the issues that were observed in the end-user evaluation of the framework are presented here along with the solution options.

6.1 Inactive Bank Account Details

Problem:

Some beneficiaries may have inactive or incorrect account details. As such, at disbursement point, the bank will not be able to credit such account.

Solution:

The solution to such issue is as follows:

At the point of registration, the account details are validated using a third party API which checks the account number to ensure it exists and it matches with the account name. If there is any discrepancy, such person will not be registered for the grant. Also, when the pay schedule is submitted to the banks, a cross validation of the accounts is also performed and those accounts that are not capable of being credited are noted and the persons are informed through the phone numbers they provided with their account details. Those people that respond and their accounts defects are corrected are included in the final pay schedule. However, those that their account defects are not resolved before the specified deadly are dropped from the pay schedule.

6.2 Multiple Registration of Directors and Beneficiaries

Problem:

Some directors and beneficiaries may have multiple registration with the same account or different account details.

Solution:

The solution to such issue is as follows:

Bank accounts are tied to BVN and even name of accounts and date of births are all tied to the accounts belonging to the same person. As such, at the point of registration, BVN validation of account using BVN API will be conducted and any person with account with the same BVN will not be allowed to register for the grant a second or multiple times.

Also, the account number and account name verification API will be used to ensure that no one uses another person's account to register on the platform. Today, phone numbers verification API can also be used to ensure that the beneficiary is using his/her personal number. As such, multiple phone number belonging to one person may not be allowed to be used on the grant registration platform.

6.3 Directors and Beneficiaries without account numbers

Problem:

Some directors and beneficiaries may not have account number to register for the grant.

Solution:

The solution to such issue is as follows:

Each director or beneficiary must have a phone number to register for the grant. As regards account number, the system liaises with the bank to use their special account opening framework to open a special account using the phone number. This happens when the pay schedule is submitted to the banks and they are authorized to create special account with phone numbers for those without account numbers. At this point, the bank will send special code to the phone number via SMS messaging system. Each of those directors or beneficiaries that receive such code are advised to go to the nearest branch of the bank to open an account for the grant. The cost of the basic account opening is built into the grant and will be deducted from source when the account is being credited with the grant money. If the director or beneficiary responds and creates the account, the BVN and other account verification are performed to avoid multiple registration. Once he account is cleared of multiple registration, the account can be credited at the instance of the NGMO-AMO.

6.4 Omitted Accounts and Names and payment discrepancies

Problem:

Some directors and beneficiaries may complain that they are omitted in the payment process. That means, their account was not credited or the amount credited to them does not tally with what other received.

Solution:

The solution to such issue is as follows:

The payment schedule will specify what amount each person in a given cluster is to receive. After the disbursement, the bank transaction details are forwarded to the NGMS web application database where the application use the disbursed amount and the pay schedule amount to identify any discrepancies. Such discrepancies are noted and the banks are notified to effect the requisite corrections. Also, the affected beneficiaries are notified of the discrepancies and the solution options being applied.

Also, an SMS code API is can be provided for individuals to verify what amount they are supposed to get and what amount they were actually paid. Also, the NGMO should reserve some amount, say about 20% of the total some to handle shortfall payments which the banks cannot handle from their end.

Furthermore, there should be arrangement for supplementary payments, to accommodate those that were registered but not paid in the first batch of payments. At this point, new registration is not permitted, but rather registered but omitted persons are considered in the supplementary disbursement.

7 Conclusion

The design of a framework for national grant management is presented. Also, key functional components of the National Grant Management System (NGMS) are presented along with the high level design of each of the functional unit. Basically, the NGMS is based on the organizational structure whereby the benefices are organized into clusters. The clusters are organized by non-government organization (NGO) which reports to the National Grant Management System Organization (NGMO). The NGMO is the apex body at the national level that coordinates the activities of the NGOs and the NGO clusters. The grant is disbursed directly from the disbursement accounts that belongs to the NGMO. Finally, the framework made provision for handling post disbursement issues.

References

1. Bräutigam, D. (2011). Aid 'with Chinese characteristics': Chinese foreign aid and development finance meet the OECD-DAC aid regime. *Journal of international development*, *23*(5), 752-764.

2. Schalet, A. T., Santelli, J. S., Russell, S. T., Halpern, C. T., Miller, S. A., Pickering, S. S., ... & Hoenig, J. M. (2014). Invited commentary: Broadening the evidence for adolescent sexual and reproductive health and education in the United States. *Journal of youth and adolescence*, *43*(10), 1595-1610.

3. Leal Filho, W., Brandli, L. L., Lange Salvia, A., Rayman-Bacchus, L., & Platje, J. (2020). COVID-19 and the UN sustainable development goals: threat to solidarity or an opportunity?. *Sustainability*, *12*(13), 5343.

4. Arrossi, S., Bombarolo, F., Hardoy, J. E., Mitlin, D., Coscio, L. P., & Satterthwaite, D. (2014). *Funding community initiatives*. Routledge.

5. Starr, M. K., & Van Wassenhove, L. N. (2014). Introduction to the special issue on humanitarian operations and crisis management. *Production and Operations Management*, *23*(6), 925-937.

6. Correa, J., van der Hoff, R., & Rajão, R. (2019). Amazon Fund 10 years later: lessons from the world's largest REDD+ program. *Forests*, *10*(3), 272.

7. Perakis, R., & Savedoff, W. (2015). Does results-based aid change anything? Pecuniary interests, attention, accountability and discretion in four case studies. *CGD policy paper*, *52*.

8. Too, D. (2015). *Influence of donor funds disbursement procedures on project implementation in Kenya: the case of NGOs in Nairobi county* (Doctoral dissertation, University of Nairobi).

9. Keng'ara, R. (2014). Effect of funds disbursement procedures on implementation of donor projects in Homabay County, Kenya. *Universal Journal of Accounting and Finance*, *2*(1), 9-23.

10. Lam, P. T., & Law, A. O. (2016). Crowdfunding for renewable and sustainable energy projects: An exploratory case study approach. *Renewable and sustainable energy reviews*, *60*, 11-20.

11. Dieleman, J. L., Graves, C. M., Templin, T., Johnson, E., Baral, R., Leach-Kemon, K., ... & Murray, C. J. (2014). Global health development assistance remained steady in 2013 but did not align with recipients' disease burden. *Health Affairs*, *33*(5), 878-886.

12. Levie, F., Burke, C. M., & Lannon, J. (2017). Filling the gaps: an investigation of project governance in a non-governmental organisation's response to the Haiti earthquake disaster. *International Journal of Project Management*, *35*(5), 875-888.

13. Saxena, R., Singh, R., & Raman, M. S. Non-governmental organizations in transforming the agri-business scenario. *Indian Farming*, *71*(9).

14. Aall, P., & Helsing, J. W. (2021). Non-Governmental Organizations. In *Responding to Violent Conflicts and Humanitarian Crises* (pp. 53-87). Palgrave Macmillan, Cham.

15. Gautam, D., & Cortés, G. (2021). Reconstruction assistance in rural Nepal after the 2015 Gorkha Nepal earthquake through Aarma Parmah approach- A case study in Bijulikot, Ramechhap District. *Progress in Disaster Science*, *10*, 100148.

16. **Ozuomba, Simeon. (2013).** Triple-win user innovation network and facilitated all-inclusive collective enterprise (TWUINFAICE): A postdoctoral research agenda for turning the youth bulge in Africa into blessing. *Science Innovation 1*(3), 18-33.

17. Ezenkwu C. P , **Ozuomba Simeon,** Kalu C. (2013) Community informatics social network for

facilitated community policing: A case study of Nigeria . *Software Engineering* 2013; Vol.1(No.3): PP 22-30 . Published online November 20, 2013

18. Bendell, J. (2017). *Terms for endearment: Business, NGOs and sustainable development*. Routledge.

19. **Ozuomba Simeon,** Chukwedebe G. A. , Opara F. K., Ndinechi M. **(2013)** Preliminary Context Analysis Of Community Informatics Social Network Web Application. *Nigerian Journal of Technology (NIJOTECH)* Vol. 32. No. 2. July 2013, pp. 266-272

20. Gordon, O., **Ozuomba, Simeon**. & Ogbajie, I. **(2015).** Development of educate: a social network web application for e-learning in the tertiary institution. *European Journal of Basic and Applied Sciences, 2 (4)*, 33-54.

21. Mathew-Emmanuel, Eze Chinenye, **Simeon Ozuomba**, and Constance Kalu. **(2017)** "Preliminary Context Analysis of Social Network Web Application for Combating HIV/AIDS Stigmatization." *Mathematical and Software Engineering* 3.1 (2017): 99-107.

22. **Simeon Ozuomba , Gloria A. Chukwudebe , Felix K. Opara and Michael Ndinechi** (2014)Chapter 8: Social Networking Technology: A Frontier Of Communication For Development In The Developing Countries Of Africa . *In Green Technology Applications for Enterprise and Academic Innovation (Chapter 8).* **IGI Global, Hershey, PA 17033-1240, USA**

23. Franceschini, I. (2014). Labour NGOs in China: A real force for political change?. *The China Quarterly*, *218*, 474-492.

24. Franceschini, I. (2014). Labour NGOs in China: A real force for political change?. *The China Quarterly*, *218*, 474-492.

25. **Ozuomba S., Chukwedebe G. A., Opara F. K., Ndinechi M.(2013)** Social Networking Technology: A Frontier Of Communication For Community Development Presented at International Conference on Corporate Social Responsibility, Governance and Sustainable Development (ICCSR-GSD) 2013 , UNILAG Lagos, Nigeria on April, 8 – 10, 2013

26. **Ezenkwu**, Chinedu Pascal, **Simeon Ozuomba**, and Constance **Kalu. (2013).** "Strategies for improving community policing in Nigeria through Community Informatics Social Network." *2013 IEEE International Conference on Emerging & Sustainable Technologies for Power & ICT in a Developing Society (NIGERCON)*. IEEE, 2013.

27. Nicholas Aigbobhiose Esene, Simeon Ozuomba, C. Kalu (2013) Community Informatics Social E-Learning Network: A Case Study of Nigeria. *Software Engineering , Volume 1, Issue 3, November 2013, Pages: 13-21*

28. Gordon, O., **Ozuomba, Simeon**. & Ogbajie, I. **(2015).** Development of educate: a social network web application for e-learning in the tertiary institution. *European Journal of Basic and Applied Sciences, 2 (4)*, 33-54.

29. Ibanga, Jude, and **Ozuomba Simeon**, Obot, Akaniyene. B. **(2020)** "Development of Web-Based Learning Object Management System." Development 7, no. 3 (2020).

30. *Journal of Multidisciplinary Engineering Science and Technology (JMEST) Vol. 7 Issue 3, March – 2020*

31. Gallien, J., Rashkova, I., Atun, R., & Yadav, P. (2017). National drug stockout risks and the global fund disbursement process for procurement. *Production and Operations Management*, *26*(6), 997-1014.

32. Sikia, M. (2015). *Assessing the utilization of capitation grants in public primary schools: a case study of Iringa district in Tanzania* (Doctoral dissertation, The University of Dodoma).

33. Choudhry, A. J., Haddad, N. N., Rivera, M., Morris, D. S., Zietlow, S. P., Schiller, H. J., ... & Zielinski, M. D. (2016). Medical malpractice in the management of small bowel obstruction: a 33-year review of case law. *Surgery*, *160*(4), 1017-1027.

34. Le Gargasson, J. B., Mibulumukini, B., Gessner, B. D., & Colombini, A. (2014). Budget process bottlenecks for immunization financing in the Democratic Republic of the Congo (DRC). *Vaccine*, *32*(9), 1036-1042.

35. Gallien, J., Rashkova, I., Atun, R. A., & Yadav, P. (2014). National Drug Stockout Risks in Africa: Analysis of the Global Fund Disbursement Process for Procurement from 2002 to 2013. *Ross School of Business Paper*, (1241).