



1st AISPI International Biennial Conference on Science, Technology and Innovation for
Sustainable Development, 2019

A Study of the Formulation and Feasibility of Implementation Strategies of the Nigerian Space Policy

I. A. Jesuleye^{1*}, T. O. Oyebisi² and F. A. Adesina³

¹Cooperative Information Network, National Space Research and Development Agency (NASRDA), Obafemi Awolowo
University, Ile-Ife, Nigeria

²African Institute for Space Policy and Innovation (AISPI), Obafemi Awolowo University, Ile-Ife, Nigeria

³Department of Geography, Obafemi Awolowo University, Ile-Ife, Nigeria

*Corresponding author's email: abisolajs@gmail.com

Abstract

This study examined the process of formulation of the Nigerian Space Policy (NSP) and the feasibility of the objectives and implementation strategies of the policy. These were with a view to enhancing socio-economic development in Nigeria through the effective development and application of Space Science and Technology. A set of questionnaires was used to collect data from selected individuals who participated in the formulation of NSP, the coordinating bodies, NASRDA centres and some other stakeholders. The study revealed that stakeholders were not adequately represented in the NSP formulation and the participants' contributions in the phases of the policy formulation were generally poor. The implementation strategies of the policy were considered to be highly specific and result-focused by the coordinating bodies and NASRDA centres, while the NASRDA centres and multifarious stakeholders found the strategies to be moderately measurable and achievable. The time-bound orientation of the implementation strategies was considered moderate across board. Low funding was reported on the policy implementation and leadership commitment was found to be moderate. Governmental stakeholders' involvement was found to be moderate by the coordinating bodies and NASRDA centres while multifarious stakeholders expressed limited involvement of various sectors of the government. Non-governmental organizations were found to have limited involvement in the policy implementation and a moderate level of interactions among the stakeholders on the policy implementation was revealed in the study.

Keywords: Policy, Space, Nigeria, implementation and NASRDA

INTRODUCTION

The dawn of space era in 1957 not only brought with it significant and progressive enhancement of human knowledge of the earth and outer space, it has also enabled the development of Space Science and Technology (SST) globally. SST has brought about remarkable socio-economic development in many parts of the World (International Space Exploration Coordination Group [ISECG], 2013). As an interdisciplinary subject, SST has promoted innovations by enhancing synergies of multiple areas of science and technology. It consistently aims at the “impossible” and the “incredible”, continuously moving forward the frontiers of knowledge (Abdulkalam, 2008). One of the remarkable features of SST is that in many cases what is perfected for use in space travel becomes a technology that improves the quality of human life on the earth. This has impacted on the microwave oven, infotainment, revolution in communication and an integrated picture of the earth and its resources. Innovative products such as the cardiac stent and heart pacemaker for healthcare are also spin-offs of SST.

The knowledge of SST received its major boost in Nigeria by the establishment of the National Space Research and Development Agency (NASRDA) under the Federal Ministry of Science and Technology in 1999 (Boroffice, 2008). In order to effectively operate the space agency of Nigeria, the Nigerian space policy was developed with the goal of making Nigeria attain indigenous competence in designing, developing and building appropriate hardware and software in space technology as an essential tool for its socio-economic development and enhancement of the quality of life of its people. The Nigerian space policy was approved by the Federal Government in 2001 (Boroffice, 2008). Some of the key ways by which the policy has been implemented are the establishment of seven major activity centres across the country, training of some Nigerian scientists and engineers who later participated in the building of two of the Nigerian satellites and the launching of five Nigerian satellites into the outer space. Two of the satellites operate with some others belonging to other countries (in a group) in a Disaster Management Constellation (DMC).

The implementation of the Nigerian Space Policy (NSP) began immediately after its approval in 2001 and it is still on-going presently. Over almost two decades of its implementation, there has been a dearth of information on review of the policy. This is at variance with what obtains in literature which stipulates that a public policy should be regularly evaluated and reviewed every five years (CONESTOGA, 2013 and International Organisation for Standardisation [ISO], 2017). Therefore, there exist no evaluations of the policy formulation process as well as the feasibility of the policy objectives and implementation strategies. This study examined the process of formulation of the Nigerian Space Policy (NSP) and the feasibility of the objectives and implementation strategies of the policy. These were with a view to proffering information which could be inputs for the thorough review of the Nigerian Space policy.

RESEARCH METHODOLOGY

Primary data were used for the survey. A multistage sampling method was used to select the respondents for the survey. FMST (Federal Ministry of Science and Technology) and NASRDA were purposively selected being the active NSP implementation coordinating bodies. Three NASRDA Activity Centres (NACs) located in Abuja, Jos and Ile-Ife were selected; Five Federal Government Ministries and three Government Ministries each in Oyo, Ondo and Lagos States; Seven tertiary institutions (four from those enlisted for empowerment in the policy document) and seven private SST-oriented establishments were also selected for the survey. A total number of 214 respondents (top and middle level scientific personnel) were selected from the organizations. In addition, six strategic respondents that took part directly or as an observer in the NSP formulation were included in the sample. The sample size was altogether 220 respondents. Two sets of questionnaire were used to collect the data. The first set was used to collect data from the policy formulation participants and it elicited information on the composition of participants in the formulation of the Nigerian Space Policy and their level of involvement in the process. The second set was used for the coordinating bodies, NASRDA centres and the multifarious respondents (ministries, universities etc). It elicited information on the awareness of the policy in the organisations, perception of the policy objectives and implementation strategies, personnel capability, adequacy of funds and facilities. Out of the 220 copies of questionnaire administered, 171 were retrieved giving an overall retrieval rate of

77.7% for the survey (Table 2.1). Qualitative method and descriptive statistics were used to analyse the data. Qualitative method was used to analyse the data on policy formulation due to the small number (six) of the respondents. Descriptive (quantitative) statistics were used to analyse other data.

RESULTS AND DISCUSSION

Socio-demographic Characteristics of the Respondents

The summary of the background information about the respondents are given in Table 1. The respondents consisted of males (81.9%) and females (18.1%). Most of them (48.2%) were between 41-50 years of age, 29.5% were of 31-40 years of age, 12% were above age 50 and about 10% were 30 years and below. The respondents were of diverse educational qualifications, ranging from Higher National Diploma (HND) to Doctoral degrees. Masters holders form the dominant category (42%) while HND holders formed the smallest group (3.8%). More than a quarter (26%) of the respondents was Ph.D. holders while 28.7% held Bachelor's degrees. Almost half (45.6%) of the respondents had spent at least 10 years on their jobs while the rest had spent more than that.

Analysis of the Nigerian Space Policy Formulation Process

Information on the formulation process of Nigerian Space Policy was gathered from six purposively selected respondents who were involved in the policy formulation. The respondents included two retired Professors from Obafemi Awolowo University, a Director of one of the NASRDA centres, and three Directors at NASRDA, Abuja (two of them are also members of the Technical Advisory Committee on the Policy). Three of the respondents actually took part in the formulation process of the Space Policy while the others were close observers on the assignment.

The Composition of the NSP Formulation Team

Most of the participants were said to have Ph.D. and M.Sc. degrees. It was gathered that many sectors of the economy were formally invited for the policy formulation, however those that actually participated consistently in the assignment were from Environment, Security and Defence, Land and Housing, Science and Technology, ICT and Agriculture while participants from few other sectors partially turned up.

The institutional affiliations of the team included University, Government Ministry, Parastatals, Nigeria Academy of Science, Nigeria Academy of Engineering and the Private sector. Despite the fact that different sectors participated in the policy formulation, most of the respondents submitted that the composition of the NSP formulation team was somewhat weak in that the stakeholders were not adequately represented.

Trend of Activities in the Formulation Process

Policy formulation typically consists of four phases (problem identification, generation of ideas, analysis of the proposed ideas and policy adoption) which the NSP followed. Most of the respondents said that the participants' involvement or contributions in the phases of the policy formulation were generally poor.

As expected in any typical policy formulation process, some problems were identified during NSP formulation. Irregular attendance of the participants, managing the diverse opinions and inaccessibility to the necessary data/information were reported as some of the challenges that came up during the NSP formulation project. Of all the challenges, inconsistency of the participants and managing the diverse opinions were considered more significant.

Five of the six key informants indicated involvement in the implementation of the policy after its enactment. They were Directors of NASRDA activity centres, Directors in NASRDA, Abuja and members in the Technical Advisory Committee on the policy.

Table 1: Socio-demographic Characteristics of the Respondents

Parameters	Frequency	Percentage
Gender		
Male	140	81.9
Female	31	18.1
Age		
30 years and below	17	10.2
31-40	49	29.5
41-50	80	48.2
above 50 years	20	12.0
Highest Academic qualification		
Ph.D.	40	25.5
Masters	66	42.0
Bachelors	45	28.7
HND	6	3.8
Years spent at work		
Less than 10 years	81	54.4
10-19 years	51	34.2
20 years and above	17	11.4

Feasibility of the Policy Objectives

Invariably after the policy enactment, comes the dissemination of the policy to the relevant stakeholders for implementation. This section reports results about the level of NSP awareness by the respondents and their organizations. The results on the feasibility of the policy objectives are **also** discussed.

Awareness of the Nigerian Space Policy

At the organizational level, the NSP awareness in the NASRDA centres (NACs) was judged to be moderate (36.4%), very high (27.3%) and high (18.2%) respectively (Table 2). The prevailing positive responses about the NSP awareness in the NACs could be attributed to the fact that the centres were purposely established for research and development on SST.

Among the multifarious stakeholders (MFS) 43.3% responded that the NSP awareness was moderate in their organization, 25.2% said it was low while 13.4% said it was very low. The NSP awareness could be said to be obviously low among the multifarious organizations and the trend could be attributed to the fact that many of the organizations in this were already in existence before the enactment of the policy. Therefore extra efforts could be needed to properly incorporate the policy and its programmes into the establishments’ operations.

Quality of the Policy Objectives

The concept of S.M.A.R.T. was applied to examine the quality of the objectives of the Nigerian Space Policy. The concept evaluates goals, objectives and the likes on the criteria of how **S**pecific (clear), **M**asurable, **A**chievable, **R**esult-focused (relevant) and **T**ime-bound they are (University of California, 2017). Each criterion was examined on a five-point Likert scale of Very low to Very high. The calculated means of the responses on quality of the policy objectives are presented in Table 3.

Table 2: NSP Awareness in the Respondents’ Organizations

Level of Awareness	NASRDA Activity Centres (NAC)	Multifarious stakeholders (Ministries, Universities, Private sector)
Very low	–	17 (13.4%)
Low	4 (18.2%)	32 (25.2%)
Moderate	8 (36.4%)	55 (43.3%)
High	4 (18.2%)	14 (11.0%)
Very high	6 (27.3%)	9 (7.1%)

Table 3: Calculated Means of the Quality of Policy Objectives

Quality Description of the Policy Objectives	Mean Rating		
	NSP Coordinating Bodies	NASRDA Centres	Multifarious stakeholders
Specificity	4.06	4.05	2.76
Measurability	3.25	3.68	2.75
Achievability	3.65	3.73	2.85
Result-focused capability	3.86	3.82	2.78
Time-bound orientation	2.56	3.41	2.62

Key: VL=Very Low (1); L= Low (2); M= Moderate (3); H= High (4); VH=Very High (5)

The results show that the policy coordinating bodies and NASRDA centres judged the policy objectives to be highly specific while multifarious stakeholders found the objectives to be moderately specific. A similar trend of results was also observed on the achievability and result-focused capability of the policy objectives. The measurability criterion of the policy objectives was judged moderate by the coordinating bodies and multifarious stakeholders while the NASRDA centres expressed the objectives to be highly measurable. The analysis results on the time-bound orientation of the policy objectives revealed that all the respondents found the objectives to be moderately time-bound.

Feasibility of the Implementation Strategies

The concept of S.M.A.R.T. was also applied here to examine the quality of the implementation strategies put up for the Nigerian Space Policy. Furthermore, the evaluation of results of certain aspects of the implementation strategies for NSP, such as funding, facility adequacy, personnel operational adequacy, training and retraining strategies, leadership and stakeholders’ involvement, stakeholder’s interaction, international collaborations and so on, are reported in the following sub-sections.

Quality of the Implementation Strategies

The calculated mean results on the quality of the implementation strategies are presented in Table 4. It could be deduced from the results that the coordinating bodies and NASRDA centres found the implementation strategies to be highly specific and result-focused while the multifarious stakeholders

Table 4: Calculated Means of the Quality of Implementation Strategies

Quality Description of the Implementation Strategies	Mean Rating		
	NSP Coordinating Bodies	NASRDA centres	Multifarious stakeholders
Specificity	3.56	3.50	2.63
Measurability	3.50	3.27	2.68
Achievability	3.88	3.41	2.70
Result-focused capability	3.75	3.55	2.77
Time-bound orientation	2.67	3.18	2.65

Key: VL=Very Low (1); L= Low (2); M= Moderate (3); H= High (4); VH=Very High (5)

expressed the strategies to be moderately specific and result-focused. On the measurability and achievability criteria of the implementation strategies, the coordinating bodies judged the two criteria to be high while NASRDA coordinating bodies and multifarious stakeholders opined that the criteria were moderate. The results further reveal that all the respondents found the implementation strategies of the Nigerian Space policy to be moderately time-bound.

Funding of the NSP Implementation

The primary source of funds on NSP implementation for the coordinating bodies and the NASRDA Activity Centres (NAC) was the government (94% and 100% respectively). Among the multifarious stakeholders, 57.5% of the respondents also indicated government as their primary source of funding on the policy. An additional 23% and 10% of multifarious stakeholders also indicated private sourcing and foreign donors respectively as the primary sources of funding for NSP implementation in their organizations (Table 5).

The results show that all the groups under study had other sources of funds for the policy implementation. Most respondents (about 37.5%) from the Coordinating Bodies (CB) indicated foreign donors. Private sourcing, foreign and local donors were indicated by the NAC and Multifarious Stakeholders (MFS) as other sources of fund for the policy implementation. However, a significant number of respondents indicated no other source of funds for the policy implementation while the Government was also mentioned by some as the additional source of funds for NSP implementation in their organizations.

Most of the CB respondents (62.5%) indicated that the funds available for them, on NSP implementation, were just about average while majority (40.9%) of NAC said it low. The prominent response (35.2%) for MFS was very low funding, though 32.4% and 31.5% also expressed low and moderate funding respectively (Table 6).

Involvement of the NSP leaders

The active leadership for the NSP is provided by NASRDA and FMST. The National Space Council (NSC) to be chaired by the Nigerian President was listed in the policy document to be the apex body for NSP matters. Though inaugurated in 2013 by the President (Jonathan, 2013), NSC was yet to launched out into full operation at the time the survey for this study was conducted.

The results presented in Table 8 show that in each category of stakeholders, most of the responses indicated moderate performance of the leadership on NSP. This was expressed by 46.8% of the multifarious stakeholders, 40.9% of NAC respondents and 50% from the coordinating bodies. The cooperation among the coordinating bodies and the organizational leadership of other stakeholders was also examined. The results revealed that most of the respondents from the three categories observed moderate cooperation

Table 5: Sources of Fund for NSP Implementation in the Organizations

Sources of Fund for NSP implementation		NSP Coordinating Bodies N=16	NASRDA Centres N=22	Multifarious stakeholders N=87
Primary source	Government	15 (93.8%)	22 (100%)	50 (57.5%)
	Local donor(s)	1 (6.2%)	–	6 (6.9%)
	Foreign donor(s)	-	–	9 (10.3%)
	Private sourcing	-	–	20 (23.0%)
	None	-	–	2 (2.3%)
Other Sources*	Government	5 (31.2%)	9 (40.9%)	28 (32.2%)
	Local donor(s)	–	1 (4.5%)	12 (13.8%)
	Foreign donor(s)	6 (37.5)	2 (9.1%)	21 (24.1%)
	Private sourcing (consultancy etc)	–	3 (13.6%)	30 (34.5%)
	None	4 (25%)	7 (31.8%)	30 (34.5%)

*Multiple responses applied

Table 6: Adequacy of the funds for NSP implementation

Sufficiency of the obtainable funds	NSP Coordinating Bodies (CB)	NASRDA Centres (NAC)	Multifarious Stakeholders (MFS)
Very Low	1 (6.2%)	6 (27.3%)	38 (35.2%)
Low	3 (18.8%)	9 (40.9%)	35 (32.4%)
Moderate	10 (62.5%)	5 (22.7%)	34 (31.5%)
High	2 (6.2%)	2 (9.1%)	1(0.9%)
Very High	–	–	–
Mean rating	2.07	2.14	1.98

Key: Very Low =1; Low=2; Moderate= 3; High=4; Very High=5

among the NSP implementation leadership and leaders of other stakeholders (Table 7). The percentages were 62.5% from CB, 50% from NAC and 41.9% from MFS.

Involvement of the Stakeholders

Most of the respondents from the coordinating bodies (46.7%) and NASRDA centres (68.2%) indicated that the government stakeholders across various sectors were moderately involved in NSP implementation. Most of the respondents from the multifarious stakeholders (52.4%) indicated limited involvement of the government organisations (Table 8). It could also be deduced from the table that the non-governmental stakeholders had limited involvement in the NSP implementation as most of the responses across the three respondent categories indicated this. The multifarious stakeholders gave 50% response; NASRDA centres gave 59.1% response while the coordinating bodies gave 60% response.

Table 7: Leadership Involvement in the Implementation

Issues on Leadership Involvement in NSP Implementation		NSP Coordinating Bodies	NASRDA Centres	Multifarious stakeholders
Commitment of the Coordinating/bodies (FMST and NASRDA)	Very Low	1 (6.2%)	1 (4.5%)	8 (6.3%)
	Low	1 (6.2%)	5 (22.7%)	32 (25.4%)
	Moderate	8 (50%)	9 (40.9%)	59 (46.8%)
	High	5 (31.2%)	5 (22.7%)	24 (19.1%)
	Very High	1 (6.2%)	2 (9.1%)	3 (2.4%)
	Mean rating	2.94	2.77	2.58
Cooperation among the organizational leaders and Coordinating/Monitoring bodies	Very Low	1 (6.2%)	2 (9.1%)	18 (14.5%)
	Low	3 (18.8%)	6 (27.3%)	41 (33.1%)
	Moderate	10 (62.5%)	11 (50%)	52 (41.9%)
	High	2 (6.2%)	3 (13.6%)	11 (8.9%)
	Very High	–	–	2 (1.6%)
	Mean rating	2.81	2.68	2.50

Key: Very Low =1; Low=2; Moderate= 3; High=4; Very High=5

Oyebisi et al. (2018) submitted that interactions/collaborations among stakeholders would facilitate SST development and applications in the country. Practically the output of one stakeholder could be the input of another (Altman and Petkus, 1994). The study examined the state of interactions/collaborations among the NSP stakeholders. The results presented in Table 9 reveal moderate state of collaborations/interactions (46.2%), followed by low state of collaborations (36.7%) among the stakeholders. Some of the collaborations among the organizations mentioned by respondents include:

- i. Project design and execution (e.g. there is collaboration between Centre for Space Transport and Propulsion (CSTP), Epe and Centre for Space Technology Development (CSTD), Abuja for cube satellite development and launching collaborations among relevant centres on geodesy and geodynamics in terms of earth movement).
- ii. Human Resources Development (Center for Space Science and Technology Education (CSSTE) Ife collaborated with African Regional Institute for Geospatial information Science and Technology (AFRIGIST), Ife and Federal University of Technology, Akure (FUTA) for postgraduate programmes).
- iii. Use of resource persons from other centres/organizations (e.g. for the post graduate programmes in CSSTE, Ife).
- iv. Provision of Nigeria Sat-1 and 2 imageries by CSTD, Abuja for other organizations in need of them.
- v. Collaboration of some NASRDA centres on research and development with some universities (e.g. CSTP, Abuja and Federal University of Technology, Akure).

Table 8: Stakeholders Involvement in NSP Implementation

Issues on Stakeholders' Involvement in NSP Implementation		NSP Coordinating Bodies	NASRDA Centres	Multifarious stakeholders
Involvement of Governmental stakeholders/ organizations	None – only the FMST & NASRDA (1)	–	1(4.5%)	12(9.7%)
	Limited involvement of various sectors (2)	5(33.3%)	4(18.2%)	65(52.4%)
	Moderate involvement of various sectors (3)	7(46.7%)	15(68.2%)	40(32.3%)
	Wide multisectoral involvement (4)	3(20%)	2(9.1%)	5 (4%)
	Very wide multisectoral involvement (5)	–	–	2(1.6%)
	Mean rating	2.87	2.82	2.35
Involvement of non-governmental stakeholders.	None – only the Governmental (1)	2(13.3%)	–	17(13.7%)
	Limited involvement (2)	9(60%)	13(59.1%)	62(50%)
	Moderate involvement (3)	3(20%)	7(31.8%)	38(30.6%)
	Wide involvement (4)	1(6.7%)	2(9.1%)	6(4.8%)
	Very wide involvement (5)	–	–	1(0.8%)
	Mean rating	2.20	2.50	2.29

Table 9: Level of Interactions/collaborations among the NSP Stakeholders

	Response	Percentage
Very Low	15	9.50%
Low	58	36.70%
Moderate	73	46.20%
High	12	7.60%
Very High	-	-
Total	158	100

Application of SST in the Organizations

The policy emphasized the need for the application of the SST in many sectors of the economy including natural resources management and food security, disaster warning and mitigation, and defence and security etc. The study examined various forms of SST and the extent of their applications in the different organizations. The SST forms examined were Global Positioning System (GPS), Remote Sensing and Geographic Information System (GIS) and Script writing.

The results of the analysis of the responses on SST applications are provided in Table 10. The widest application was for GPS (74.8%). This was followed by Remote Sensing and GIS (72.4%) and Satellite Meteorology (30.7%); script writing to enhance the open-source SST software had the least (26.8%) application among the stakeholders. Some of the reported specific ways of applying SST in the organizations were: Monitoring of programmes, projects and policies of the federal government and capital expenditures from the National planning and budget; soil survey and mapping; production of suitability and fertility maps; land use and land cover evaluation; establishment of control points and to carry out perimeter survey of land; environmental hazard vulnerability mapping etc.

Adequacy of the Personnel

The capability of the members of staff directly involved in policy implementation is an important factor for the success of policy execution (Altman and Petkus, 1994). The results presented in Table 11 shows that from the end of NASRDA Activity Centres (NAC) more than two-fifths (42.9%) indicated that the state of SST knowledge and skill capability of the scientific officers in fulfilling the mandate of their various centres was ‘fairly adequate’.

Less than a third (28.6%) said it was ‘adequate’. On the contrary, the multifarious stakeholders generally expressed low adequacy on SST knowledge and skills of their concerned personnel. About a third (31.6%) indicated inadequate; an additional 28.9% and 28.1% of these stakeholders indicated ‘very inadequate’ and ‘fairly adequate’ respectively on the issue.

In terms of quantity, about a third (33.3%) of the NAC respondents said that the number of their scientific staff was ‘adequate’, an additional same proportion expressed ‘fairly adequate’ while about a quarter (19%) indicated highly adequate. Most of the multifarious stakeholders’ responses (35.1%) indicated that the number of the scientific personnel in their organization was fairly adequate, 29.8% indicated “inadequate” and another 18.4% indicated “very inadequate”.

Table 10: Forms of SST Incorporated into the Multifarious Organizations’ Operations

Forms of SST	Organizational Incorporation N=127)	%*
a. Global Positioning System (GPS)	95	74.8
b. Satellite Meteorology (Satellite-based atmospheric data collection etc.)	39	30.7
c. Remote sensing and Geographic Information System (GIS)	92	72.4
d. Script writing to enhance the open-source SST software	34	26.8

**Multiple Responses Applied*

Table 11: Adequacy of Personnel on SST

Adequacy of the Scientific Personnel		NASRDA Centres	Multifarious stakeholders
a) SST knowledge & skills for the fulfillment of organizational mandate.	Very Inadequate	1 (4.8%)	33 (28.9%)
	Inadequate	2 (9.5%)	36 (31.6%)
	Fairly Adequate	9 (42.9%)	32 (28.1%)
	Adequate	6 (28.6%)	8 (7.0%)
	Highly Adequate	3 (14.3%)	5 (4.4%)
b) No. of scientific staff (lectures, technologist etc)	Very Inadequate	–	21 (18.4%)
	Inadequate	3 (14.3%)	34 (29.8%)
	Fairly Adequate	7 (33.3%)	40 (35.1%)
	Adequate	7 (33.3%)	14 (12.3%)
	Highly Adequate	4 (19.0%)	5 (4.4%)

Personnel Capacity Building on SST

The study gathered that a good number of the respondents approached on the survey were actually making conscious effort for capacity development on SST in order to be relevant in their respective organizations. In line with knowledge acquisition, it was also expressed that some organizations gave assistance, in some ways, to their members of staff.

(a) Channels of Knowledge Acquisition

It was revealed in Table 12 that among the NAC respondents, 90.9% of the respondents indicated that Training (academics, workshop etc) within Nigerian borders and on-job interactions were the prevalent channels of the knowledge acquisition. Training off-shore and the use of internet and library had also been significantly explored. On the part of the multifarious stakeholders, a pattern of response somehow similar to that of NAC was gathered. Training within Nigeria was the prevalent means of capacity building on SST for the personnel, having about 60% response while On-job interactions and material sourcing were very close alternatives as indicated by 59.1% and 57.5% of the respondents respectively.

(b) Organizational Assistance on SST Knowledge Acquisition

Swarajyalakshmi (2005) submitted that human resources possess infinite potential capabilities which make them distinct from other resources. Therefore, personnel capacity building is of great necessity for such organizations that value growth and vibrant performance. Sponsorship for training within and outside the country, enrichment of library, and provision of internet facilities were expressed by the respondents as the ways by which many of the organizations assist their personnel for capacity development on SST (Table 12).

Table 12: Channels and Organizational Aids for Personnel Knowledge Acquisition on SST

Channels of SST Knowledge acquisition*	NASRDA Centres (N=22)	Multifarious stakeholders (N=127)
a) Training or Re-training (academics, workshop, etc.) within the country	20 (90.9%)	76 (59.8%)
b) Training or Re-training outside the country	18 (81.8%)	29 (22.8%)
c) On-Job training and Interactions	20 (90.9%)	75 (59.1%)
d) Material sourcing (library, internet etc)	17 (77.3%)	73 (57.5%)
Organizational Assistance on SST Knowledge acquisition*		
a. Sponsorship (Partial or full) for training or programmes within the country	16 (72.7%)	50 (39.4%)
b. Sponsorship (Partial or full) for training or programmes outside the country	15 (68.2%)	25 (19.7%)
c. Enrichment of Library	9 (40.9%)	38 (29.9%)
d. Provision of internet facilities	10 (45.5%)	80 (63.0%)
e. None	1 (4.5%)	17 (13.4%)

* *Multiple responses Applied*

More than 70% of the NAC respondents indicated that personnel in their centres do enjoy sponsorship for training within the country by their organizations and about 70% gave positive response for personnel training abroad being sponsored by their centres. Enrichment of library and provision of internet facilities was indicated by 50% of the respondents at NASRDA centres as ways which their personnel are supported for capacity development. In addition, the respondents expressed that in most cases where a centre might not be able to sponsor the personnel, study leave with full salary payment would be granted.

It was revealed that provision of internet facilities was the most prominent way of assistance by the multifarious organizations for personnel capacity development on SST, as more than 60% responses emerged. Sponsorship for training within the country, and library enrichment were also prominent options as about 40% and 30% responses were respectively gathered on them. However 13% responded that no assistance has come forth so far from their organizations to support the personnel for capacity development on SST.

Adequacy of the Facilities

Availability of appropriate and functional facilities is important for the proper implementation of a policy. Facilities for SST operations usually include computers and their peripherals, SST-based software and hardware, Global Positioning System receiver, Data (satellite imagery, atmospheric indices readings etc.), laboratory and so on. Most of the facilities examined in the survey were said to be available with fair (average) adequacy (Table 13). This applied to Data e.g. satellite imagery (34.4%), computer system (45.6%), specialized software (37.4%), GPS receiver (39.3%) and specialized equipment (28.4%). However laboratory (with its equipment) and field trip vehicle were mostly opined of to be of low adequacy.

Table 13: Adequacy of Facilities

	Very Inadequate	Inadequate	Fairly Adequate	Adequate	Highly Adequate
a. Data (e.g. imagery, atmospheric, etc.)	34 (22.1%)	28 (18.2%)	53 (34.4%)	28 (18.2%)	11 (7.1%)
b. Computer System and accompanying facilities (e.g. printers)	15 (9.5%)	28 (17.7%)	72 (45.6%)	28 (17.7%)	15 (9.5%)
c. Specialized software (to meet the organization’s peculiar needs)	30 (19.4%)	32 (20.6%)	58 (37.4%)	26 (16.8%)	9 (5.8%)
d. GPS receiver	25 (16.7%)	25 (16.7%)	59 (39.3%)	33 (22.0%)	8 (5.3%)
e. Specialised equipment (e.g. A0 plotter, A0 scanner, etc)	37 (25.0%)	31 (20.9%)	42 (28.4%)	28 (18.9%)	10 (6.8%)
f. Internet facilities	28 (18.4%)	33 (21.7%)	48 (31.6%)	28 (18.4%)	15 (9.9%)
g. Laboratory and its equipment	39 (25.5%)	44 (28.8%)	37 (24.2%)	27 (17.6%)	6 (3.9%)
h. Library facilities	32 (21.3%)	46 (30.7%)	49 (32.7%)	20 (13.3%)	3 (2.0%)
i. Others: Field work Vehicle	5 (16.7%)	25 (83.3%)	–	–	–

Government Assistance for the Private Sector on SST

Encouraging the private sector, by the government, to participate in the development and application of SST is part of the implementation strategies outlined in the NSP (NASRDA, 2001). The policy coordinating bodies and the multifarious stakeholders were asked to mention ways by which the government had assisted the private sectors on SST. No form of government assistance for the private sector on SST could be gathered from this survey. This revealed that such assistance was scarcely in the circulation. The private sector therefore stands the chance of impaired participation in SST ventures because the technology could be capital intensive and this on the long run would have an adverse effect on the development of indigenous capacity in SST.

Oyebisi (2018) submitted that as a result of low technological capacity in Nigeria, the home-grown firms have turned to foreign sources for technology acquisitions and even with minimal or no modification. Invariably, this has brought about acute underutilization of indigenous resources including both environment and human resources. In extension, collaboration among various economic sectors is continually hindered. Hitt et al. (2000) also explained that foreign technologies are actually conceived and constructed for foreign economies. Therefore, firms (or country) that combines imported technology with

intra-firm technology transfer and indigenous development are more likely to achieve technological paradigm shifts and would boost their competitiveness.

The growth and development of Surrey Satellite Technology limited (SSTL), in the United Kingdom is an apt lesson that Nigeria could learn from. Abiodun (2017) narrated that a research and development project in 1985 conceived and brought forth SSTL. The then small initiative/venture was subsequently fostered by staff, radio amateurs and students of the University of Surrey to become the present day, internationally-recognized private organization in the area of space science and technology. The Nigeria government consulted SSTL for the development and launching of the Nigeria's three Earth observation satellites: NigeriaSat-1, NigeriaSat-2 and NigeriaSat-X. The company also offered Know-How-Technology-Trainings (KHTT) for some Nigerian engineers and scientists who resulted in the NigeriaSat-X being built by Nigerians in the SSTL laboratory (Boroffice, 2008 and Isoun, 2013). Invariably, Nigeria's success assurance on SST could be stepped-up if concrete guidelines and programmes are put in place to motivate its private sector.

Feedback Reporting on NSP Implementation

The NASRDA centres and the multifarious stakeholders were expected to give feedback on the NSP implementation activities and programmes. The implementation leading agency, NASRDA, was identified by the stakeholders as the primary body that collates and manages the feedback information. Regular meetings, periodic report and dedicated conferences or exhibitions were the media of feedback delivery explored in this study.

As shown in Table 14, periodic report was the most widely used (81.8%), followed by regular meetings (63.6%) in the NASRDA activity centres (NAC). Among the multifarious stakeholders, periodic reporting and dedicated Conferences were the most frequently mentioned. More than 50% of NAC respondents attested that their centres had access to some other organizations' operational information. On the other hand many of the multifarious organizations were not so informed about the performance of many other organizations on SST. This was evident as 67% of the responses expressed lack of access to other stakeholders' reports. Lack of access to other stakeholders' information on the policy information might, on the long run, impair the overall implementation process. USAID (2001) and Kellogg (2004) submitted that having adequate access to other stakeholders' feedback would enable implementers to assess the provisional or present achievements, make necessary course corrections and view themselves as part of the larger effort. Most of the responses from the coordinating bodies and multifarious stakeholders judged the effect of giving and receiving feedback on NSP implementation to be "averagely helpful", while the prominent responses (46.2%) from the NASRDA centres indicated "mostly helpful" (Table 15).

CONCLUSIONS

This research aimed at enhancing the formulation and implementation of the Nigerian Space Policy. The necessary stakeholders not being well-represented at the policy formulation, the policy awareness not wide enough, diverse stakeholders' commitment not exceeding average, low funding and private sector not having well-structured assistance from the government are undoubtedly part of the cause for the crawling pattern of NSP implementation and productivity. The study concluded that the Nigerian Space Policy could enhance the socio-economic development of the country if all relevant stakeholders are involved in its timely review and implementation.

The following policy actions are recommended:

- (i) User needs analysis should be well-considered in compiling the implementation strategies.
- (ii) The Policy when being reviewed should be tuned with the global focus of Space research in the present. However the nation's basic need should be considered.
- (iii) Proactive Human Resources Development on SST should be taken into consideration by the government and all stakeholders in order to speedily achieve the indigenous critical mass of manpower for SST development.
- (iv) Strategies should be made specific and proactive on how to encourage and assist the private sector on SST development and enterprises.

Table 14: Feedback Presentations on NSP Implementation

	NASRDA Centres	Multifarious Stakeholders
Mediums of Feedback*	(N=22)	(N=127)
Regular meetings of the stakeholders	14 (63.6%)	24 (18.9%)
Periodic report submission	18 (81.8%)	28 (22%)
Dedicated Conferences, Exhibitions, etc.	13 (59.1%)	28 (22%)
Access to other stakeholders' report	(N=16)	(N=97)
Yes	9 (56.2%)	32 (33%)
No	7 (43.8%)	65 (67%)

**Multiple Responses Applicable*

Table 15: How Helpful the Feedback Presentations were on NSP Implementation

	NSP Coordinating Bodies	NASRDA Centres	Multifarious stakeholders
Not helpful	1 (9.1%)	1 (7.7%)	6 (9.23%)
Somehow helpful	3 (27.3%)	1 (7.7%)	21 (32.31%)
Averagely helpful	4 (36.4%)	4 (30.8%)	21 (32.31%)
Mostly helpful	3 (27.3%)	6 (46.2%)	10 (15.38%)
Totally Helpful	–	1 (7.7%)	7 (10.77%)
Mean rating	2.82	3.38	2.86

REFERENCES

- Abdulkalam, A. (2008). The future of space exploration and human development. *The PARDEE papers, No 1*. Boston University, USA: Fredrick S. Pardee Centre for the Study of the longer-Range Future.
- Abiodun, A. A. (2017). *Nigeria's space journey: Understanding its past, reshaping its future*. San Bernardino, CA: African Space Foundation.
- Altman, J. and Petkus, E. (1994). Toward a stakeholder-based policy process: An application of the social marketing perspective to environmental policy development. *Political Sciences*, 27, 37–51.
- Boroffice, R. (2008). The Nigerian space programme: An update. *African Skies*, No. 8. Retrieved June 10, 2012, from www.saa.ac.za/~wgssa/archive/as12/boroffice.pdf
- CONESTOGA. (2013). *Review of policies and procedures policy*. Retrieved January 5, 2019, from <https://cms.conestogac.on.ca/sites/corporate-websites/policies/PDFDocuments/Academic/Review%20of%20Policies%20and%20Procedures%20Policy.pdf>
- Hitt, M., Ireland, R., Camp, S. and Sexton, D. (2001). Strategic entrepreneurship: Strategies for wealth creation. *Strategic Management Journal*, 22 (3-4), 479-491.
- International Organization for Standardization (ISO). (2017). *Guidance on the systematic review process in ISO*. Retrieved January 5, 2019 https://www.iso.org/files/live/sites/isoorg/files/store/en/Guidance_systematic_review.pdf.
- International Space Exploration Coordination Group (ISECG). (2013). *Benefits stemming from space exploration*. U.S.: Author.
- Isoun, T. (2013). *Why run before learning to walk: Reflections on high technology as a strategic tool for development in Nigeria*. Ibadan: Book Builders Edition Africa.
- Jonathan, G. (2013). President Jonathan inaugurates National Space Council. Retrieved September 14, 2014, from <http://fmi.gov.ng/speeches/19042>.
- Kellogg Foundation. (2004). *Evaluation Handbook*. Battle Creek, MI: Author Retrieved on January 28, 2015, from <http://www.wkkf.org/~media>
- Oyebisi, T. O. (2018). Nexus between technology management and rejuvenation of the Nigerian economy. *Inaugural Lecture, Series 321*. Ile-Ife: Obafemi Awolowo University press.
- Swarajyalakshmi, C. (2005). *Human resource development in public enterprises*. New Delhi: Discovery Publishing House.
- University of California. (2017). SMART goals: A how to guide. Retrieved February 20, 2016, from https://www.ucop.edu/local-human-resources/_files/performance-appraisal/How%20to%20write%20SMART%20Goals%20v2.pdf.
- USAID. (2001). *Policy implementation: What USAID has learned*. Washington, DC: Centre for Democracy and Governance.