Analysis of Factors Affecting the Efficiency of Department of Science and Technology (DOST) Grants-in-Aid (GIA) Program, 2019[1].

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ABSTRACT

The Department of Science and Technology (DOST) believes that enhanced research and development (R&D) is a prime mover to achieve innovation-driven economic growth and national development. Through the DOST Grants-in-Aid (GIA) Program, the DOST provides support on countless R&D undertakings and mobilization in the country. However, issues surrounding inefficient practices affect project implementation.

The study intends to prove if the factors identified (i.e. budget release for year 1, number of days delayed, delayed budget release, procurement process, extensive signing agreement, hiring of staff/personnel, and force majeure) have significantly affected the implementation of DOST-GIA Program. Data were extracted from the database of DOST Special Projects Division, in which 498 of 1,541 new R&D projects were randomly selected. The study employed a logistic regression model to explain the relationship between the dependent binary variable (if a specific project is affected or not) and the factors identified.

1. Introduction

In the language of the development economics, technology innovation and economic growth are interactive and mutually reinforcing (Pernia and Clarete, 2014). The growth of the economy can be effectively supported through investment in technology innovation capacity that developed new processes, products and markets, and innovation which are generated from the research and development. An assessment of economic growth also explains how well a country mobilizes its resources to improve productivity for an increase in production of goods and services (Cororaton, 2003).

Translating the technology innovation to economic growth means that a robust R&D in the country must be in place. Research and Development (R&D) is defined as a composition of creative works accepted on a systematic basis to increase the stock of human knowledge and to introduce new application (Organization Economic Cooperation and Development, 2015). Concurrently, it focuses to discover new findings, based on the original concepts intended in producing results that could be freely transferred. A country's innovation system is defined as, "the network of institutions in the public and private sector whose activities and interactions initiate, import, modify and diffuse new technologies" (OECD National Innovation System, 1997). Moreover, R&D spending covers three activities namely: (a) basic research, (b) applied research, and (c) experimental development. These activities must possess characteristics such as original, creative, uncertain, systematic, transferable, and reproducible.

a The study of Todaro and Smith (2003) highlighted the following interventions the government must initiate: (a) stable macro environment, (b) infrastructure, (c) public health, (d) education and training, (e) technology transfer, (f) sustainable development and ecological protection, and (g) export incentives. Moreover, the Frascati Manual (2015) stated that the government must be performers and funders of R&D activities in the domestic and international set-ups. To achieve efficient R&D, the pre-implementation activities (i.e. activities before experiments or researches) must also be efficient which directly translates to a nurturing environment for a strong and robust R&D.

To assess the innovation level of a country, various indicators have been employed determining the current ratings. Two metrics have been observed, particularly the World Intellectual Property Organization – Global Innovation Index (GII) and the World Economic Forum – Global Competitiveness Index (GCI). These metrics captured the multi-disciplinary evidence on a country's innovation performance. The GII is defined as the multi-dimensional facts of innovation which provide tools that can assist in formulating policies to promote long-term output growth, improved productivity, and job development. While, the GCI evaluates factors and institutions identified by empirical and theoretical research as determining improvements in productivity as a variable for long-term growth, economic growth, and prosperity. In 2018[1], the Philippines ranked 56th and 73rd for GII and GCI, respectively.

In the Philippines, the Department of Science and Technology (DOST), the country's leading agency for science, technology, and innovation, undertakes the mandates of providing central direction, leadership, and coordination for all scientific and technological activities in support for maximum economic and social benefits for the Filipino people. To align with the world's standards, DOST has vigorously increased its R&D investment to attain the UNESCO standard of "at least 1 percent of Gross Domestic Expenditure on Research and Development". Continuously, DOST has spearheaded numerous initiatives to boost the stature of research and development. The current share of R&D expenditure in the national budget records only 0.17 percent or PhP 5.9 billion. From the PhP 5.9 billion, the share of budget for DOST-GIA Program amounts to PhP 2.67 billion wherein the remaining budget is allocated to sectoral councils' Grants-In-Aid Program[2]. Table 1 shows the allocation for DOST-GIA Budget from the year 2000-2018.

The DOST Grants-in-Aid program (DOST-GIA) is a funding mechanism designed to amplify the research innovation activities in the country (Administrative Order No. 009, 2017). Through the initiatives of the Office of the Undersecretary for R&D and Special Projects Division, the program seeks to strengthen the participation of various STI sectors particularly in research and development, promotion, technology transfer and utilization, human resources development, information dissemination, advocacy, and linkages both domestically and internationally. The DOST-GIA program has allotted grants to the following thrusts such as (a) R&D, (b) R&D Results Utilization – Diffusion of Knowledge and Technologies, (c) Development of Human Resources and R&D Institutions for the S&T Sector, and (d) Provision of Quality S&T Services. Recipients of DOST-GIA program grants are allocated to the main shareholders of R&D namely, the Higher Education Institutes, Research and Development Institutions (RDIs) of DOST, Regional Offices of DOST, other government and non-government organizations, and private industries. Through collaborations with these institutions, DOST has produced relevant S&T projects that assist many Filipinos (See Appendix for the list of some R&D projects funded by DOST and its partnered institutions).

In the first quarter of 2019, the DOST Office of the Undersecretary for R&D has initiated efforts to improve the processing and assessment of the Grants-in-Aid Programs of DOST. In partnership with DOST Central Office, DOST Sectoral Councils, and Shareholders, the DOST Monitoring and Evaluation (M&E) Protocol was formulated to enhance the process performance and achieve targeted results of R&D (DOST Administrative Order No. 014, 2019). This protocol

[1] Rankings of Philippines were acquired from the Global Innovation Index (GII) Report of 2018 and Global Competitiveness Index (GCI) Report of 2018 from World Economic Forum

[2] In 2008, the budget for R&D in DOST were divided among DOST-Central Office and DOST Sectoral Councils such as PCAARRD, PCHRD, PCIEERD, and NRCP

seeks to improve the current and future management of inputs, outcomes, and impacts of DOST R&D undertakings. With this protocol, DOST aims to re-integrate its processes in its different R&D projects, wherein, some of its components are inclined to strategic preparation on funding allocation and efficient project implementations.

Table 1. DOST-Grants-in-Aid for Research and Development Budget, 2000-2018[a]

Time (Year)	Budget (₱ billion)	Percent change (%)
2000	0.109	0
2001	0.135	19
2002	0.202	33
2003	0.214	6
2004	0.242	12
2005	0.249	3
2006	0.438	43
2007	0.704	38
2008	1.333	47
2009	1.541	13
2010	1.476	-4
2011	3.151	-53
2012	1.183	-166
2013	1.678	29
2014	1.984	15
2015	1.753	-13
2016	2.202	20
2017	2.596	15
2018	2.687	3

[a] Extracted and summarize from the DOST-SPD database.

2. Statement of the Problem

We have arrived at the era of drastic change where the process of research and development has varied considerably, and where economic and social status quo, as well as industrial structures, are rapidly changing. Thus, it is expected that the labor required for STI initiatives will exponentially increase. Immediately, the demand for the organization is to cope up with the challenges ahead, where efficient processes must be applied to mitigate the impact of inefficiencies on processes.

The study of Cororaton (2003) captured the gaps in the Philippine research and development which averts the economy from operating in its full potential. Referred in the study are the following gaps responsible for underutilized economic activities: (a) low R&D investments; (b) inadequate R&D personnel; (c) institutional weaknesses as a result of poor system, management and leadership; and (d) policy lapses and failures. These gaps have a monumental effect on the overall R&D performance in the Philippines. Furthermore, the study focuses on the institutional weaknesses as a result of poor system, management, and leadership, wherein, recognizing the source of these weaknesses marginally address the problems and/or issues on efficiency.

Relative to these institutional weaknesses are issues on the actual utilization rate of DOST-GIA program, in which, it is directly related to the efficiency of the R&D sector in the country. This indicates that if the actual utilization rate is lower than the target utilization rate, then it reflects an inefficient program. The utilization rate, according to the Department of Budget and

Management (DBM), is defined as the actual obligations incurred over the available allotment in a year. Observable on Figure 1 is the variation between the budget allocated over the expenditure incurred for DOST-GIA program, in which, it reveals an inefficient process by the funding agency. Figure 1 presents the utilization rate of DOST-GIA Program from the year 2000-2018.

Past studies have been undertaken also concerning innovation performance in the Philippines. In an assessment on the Philippine innovation ecosystem conducted by USAID-STRIDE, significant challenges have been identified which disrupt a research enabling environment in the Philippines. Coincidentally, the challenges were manifested also on the implementation of DOST-GIA projects. The significant challenges listed by USAID-STRIDE affecting the Philippine Innovation Ecosystem are listed as follows:

1. Inflexible purchasing and procurement laws which hamper the researches;
2. Unavailable competitive bidding and procurement processes for S&T equipment and consumables result in delays;
3. Problems on allowable costs and overhead which undercut institutional commitment on R&D;
4. Unproductive competition among government agencies, private sector, and HEI; and
5. Misaligned incentives and promotions for faculty members that promote R&D

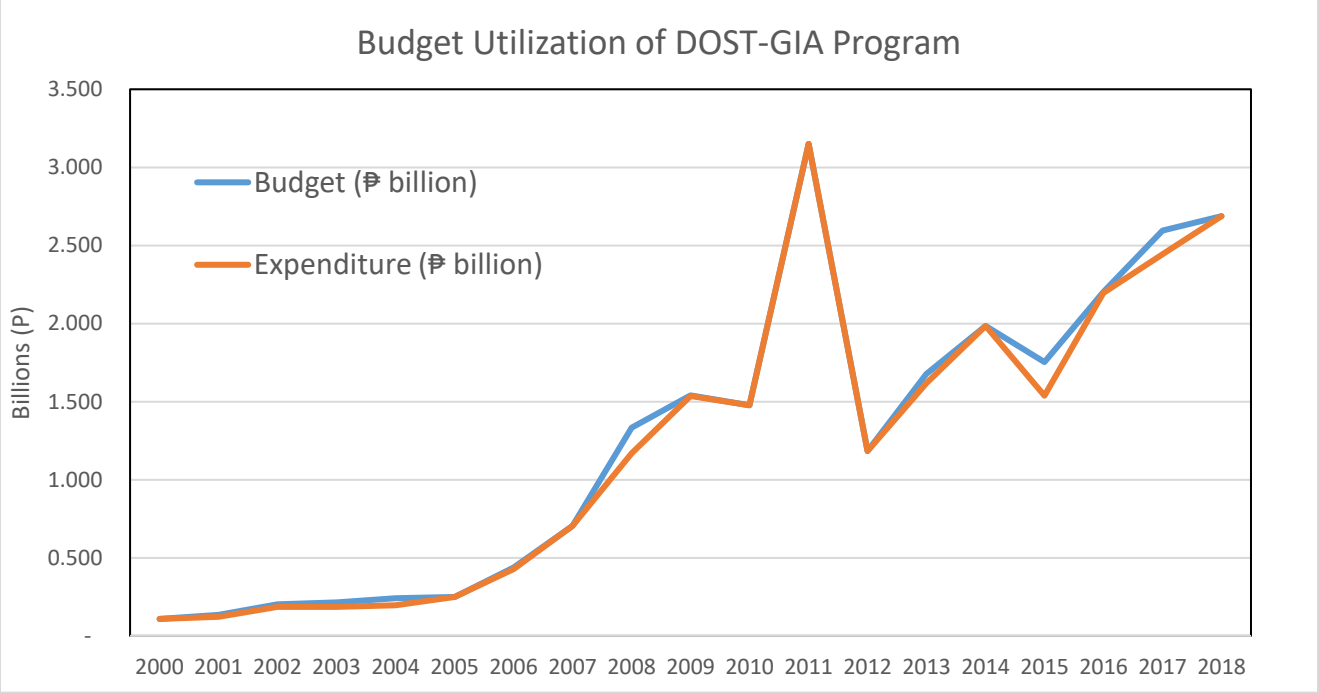

Figure 1. The Budget Utilization of DOST-GIA Program from 2000-2018

3. Significance of the Study

The study captures the possible indicators which affect the efficiency in the funding mechanism of DOST-GIA program. Through identification of the possible sources of problems, we can come up with the possible in-depth and case-in-point recommendations to further avert problems on efficiency. Furthermore, an efficient funding mechanism for DOST-GIA program is crucial as it directly subscribes to the enhancement of the performance of research and development in the country.

4. Objectives of the Study

The main objective of the study is to prove if the factors identified affect the implementation of DOST-GIA program. Specifically, the study aims:

1. To determine the factors affecting the implementation of DOST-GIA Program.
2. To assess if the factors identified are statistically significant on the implementation of DOST-GIA program;
3. To examine the impact of factors identified on the implementation of DOST-GIA Program; and
4. To provide policy recommendations on the continual improvement of the funding mechanism of DOST-GIA program

5. Hypotheses of the Study

The study was anchored to the following hypotheses:

1. The delayed budget release, procurement process, extensive signing agreement, hiring of personnel/staff, and force majeure have significantly affected the implementation;
2. There is a significant basis that increasing the amount of budget allocated per project will likely affect the project implementation; and
3. The number of days delayed is directly related to inefficiency of the project implementation

6. Scope and Limitation of the Study

The distribution of the project was grouped according to the five (5) sectors of HNRDA namely: (a) National Integrated Basic Research Agenda, (b) Health, (c) Agriculture, Aquatic and Natural Resources, (d) Industry, Energy, and Emerging Technology, and (e) Disaster Risk Reduction and Climate Change Adaptation. This was adopted instead of grouping the projects based on its regional distribution as it fully represents the priority agendas of DOST. Moreover, the listing of DOST-GIA Program was distributed according to the sectoral councils of DOST or the monitoring agency which provides technical assistance and coordination among implementing agencies.

The study captures only the approved projects under the funding of DOST-GIA program. Whereas, other R&D projects funded by the sectoral councils through its own respective GIA program were not included.

7. Framework

Presented is the flow of the funding mechanism of DOST-GIA program to its stakeholders (Figure 2). As the country's leading agency on the development of science and technology, DOST is mandated to capacitate majority of country's R&D undertakings. The management of DOST-GIA program is administered by the Office of the Undersecretary for R&D and Special Projects Division. It undertook contract researchers to form a collaboration among institutes, private sector, and academe. Furthermore, the agency has initiated funding assistance to technology developers and acceptors through tie-ups with financing institutions (Cororaton, 2003).

The DOST calls for research undertakings concerning the development of S&T sector in the country. Proponents are encouraged to submit S&T-related proposal to the Office of the Undersecretary for R&D, which endorses the proposal to the Special Projects Division. The Special Projects Division facilitates the consolidation of all necessary requirements (i.e. full-blown or capsule proposal, budgetary requirements, work plan of the project, and endorsement of the head of the agency). Moreover, the division refers the proposal to the evaluating/monitoring agency for technical review. In this process, the role of the evaluating agency is to review the proposal and provide technical assistance to the implementing agency. The evaluating agency also assess the feasibility of the proposal and later ensures the implementation upon the recommendation of the Governing Council. The proposal is then endorsed for approval of the DOST-GIA Executive Committee, the highest policy and approving body in DOST who, has the authority to decide on the implementation of DOST-GIA-funded project. If the program/project is approved, the Special Projects Division will process the completion of the necessary documents for fund assistance; But if disapproved, said division prepares disapproval letter sent to inform the proponent of the disapproval.

The timeline of the process, from the submission of a proposal to the disbursement, will consume eighty-nine to one hundred days for a project to be implemented.

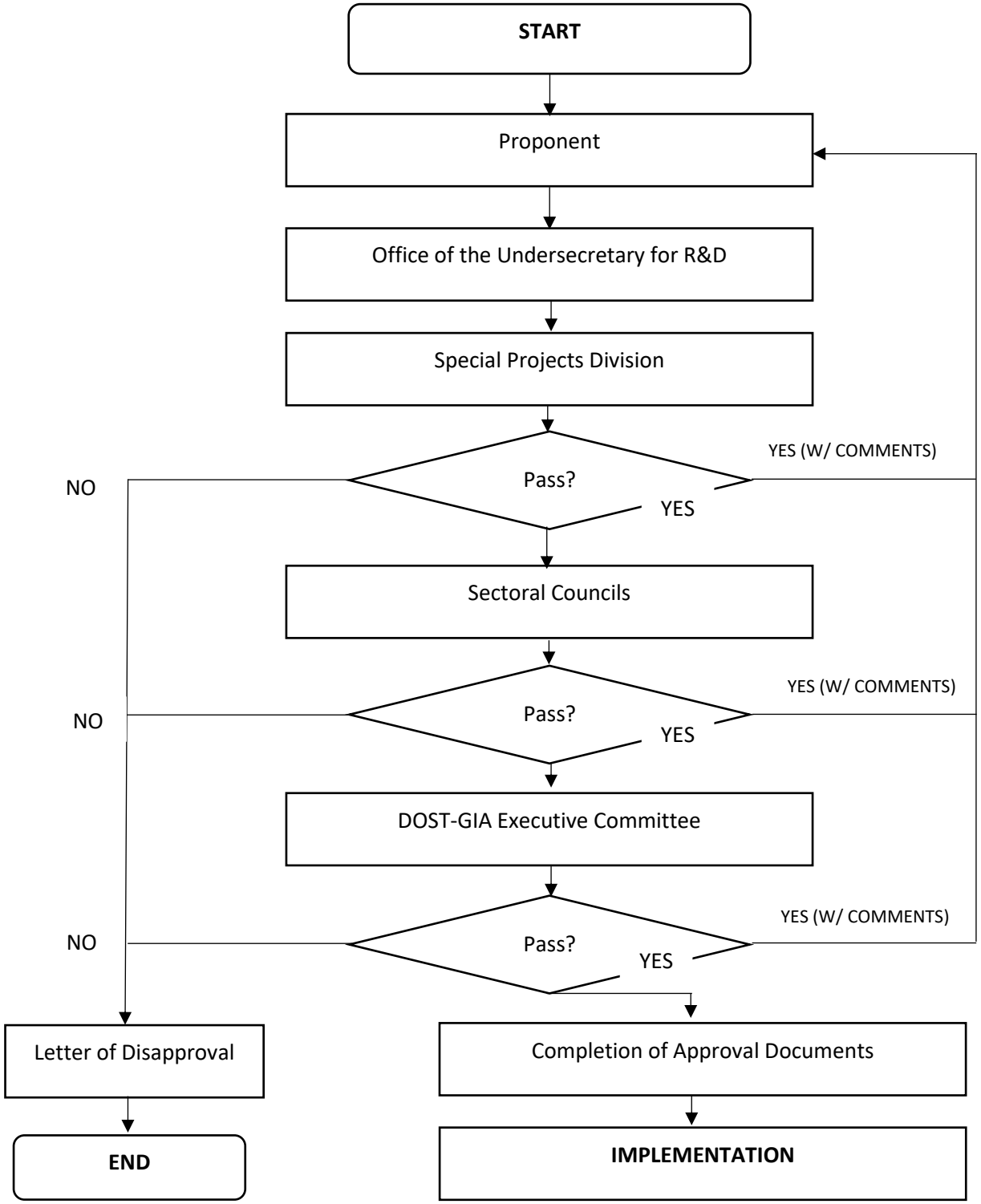

Figure 2. The Conceptual Framework of the System of Funding Mechanism of DOST-GIA Program obtained from the presentation of Undersecretary R.C.L. Guevara

8. Methodology

8.1. Types of Data and Methods of Data Collection

Secondary data were extracted from the DOST-SPD database, which captures the information from “list of proposals received” to “projects approved and monitored after completion”. Moreover, the study employed stratified random sampling to represent each sector perfectly. The DOST sectoral councils have identified five (5) factors which mostly affect the implementation of DOST-GIA projects. The factors identified are: delayed budget release; procurement process; extensive period in signing of agreement; hiring of project personnel/staff; and force majeure. These factors were labeled as affected or not affected to categorize the data. Additionally, budget allocated for year 1 implementations and number of days delayed were also considered as factors affecting the implementation of the DOST-GIA program.

8.2. Logistic Regression: Logit Model

Logistic regression is a statistical method analyzing a dataset in which one or more independent variables are determining an outcome. This method predicts the probability of an outcome that can only have two values (i.e. a dichotomy). The prediction is also based on the use of one or several indicators that can be categorized whether numerical or categorical. Logistic regressions assume that a dependent variable is a stochastic event.

Logistic regression is a mechanism for estimating the probability present given the values of explanatory variables. It provides a better perspective for improved decision making, in this case, providing information whether the factors identified have influenced the implementation of DOST-GIA Program or not. The logistic regression is given by:

$$\pi_i = \mathrm{Prob}(\mathrm{Y_i} = 1|\mathrm{X_i} = \mathrm{x_i}) = \frac{\exp(\beta_0 + \beta_i \mathrm{x_i})}{1+\exp(\beta_0 + \beta_i \mathrm{x_i})} \qquad (1)$$

$$\mathrm{logit}\ (\pi_i) = \log\left(\frac{\pi_i}{1-\pi_i}\right) = \beta_0 + \beta_1 \mathrm{x_i} \qquad (2)$$

$$\mathrm{logit}\ (\pi_i) = \beta_0 + \beta_1 \mathrm{x_{i1}} + \cdots + \beta_k \mathrm{x_{ik}} \qquad (3)$$

Where:
π_i = Random component/Response variable
β = coefficient that impact the x
X_1 = Delays on budget release (1 = Affected; 0 = otherwise)
X_2 = Procurement process (1 = Affected; 0 = otherwise)
X_3 = Signing of agreement (1 = Affected; 0 = otherwise)
X_4 = Hiring of staff/personnel (1 = Affected; 0 = otherwise)
X_5 = Force majeure (1 = Affected; 0 = otherwise)
X_6 = Budget allocated per project (million pesos)
X_7 = Number of days delayed (days)

9. Results and Discussions

9.1. Selection of Sample Size

The study employed stratified random sampling method which involves a division of the population. From a total of 1,541 new DOST-GIA projects approved, 498 projects were randomly selected by the DOST sectoral councils to represent the whole population with a 95% confidence level and a 5% margin error. These projects were sub-divided into four (4) groups based on each monitoring agency. Funding of these projects was randomly allocated based on the proposals approved by the DOST Executive Committee. Table 2 shows the breakdown of DOST-GIA projects based on the designed sample size.

Table 2. Distribution of DOST-GIA projects per sectoral council based on the designed sample size

SECTORAL COUNCIL	NUMBER	PERCENTAGE (%)
NRCP	45	9.42
PCAARRD	149	29.86
PCHRD	51	10.02
PCIEERD	253	50.70
TOTAL	498	100

9.2. Interpretation of Variables

The variables were extracted based on the merit of its effect on each project. Overall, the study revealed that DOST-GIA-funded projects were exposed to different factors, such as delay in budget release, procurement activity, extensive period in signing agreement, hiring of personnel/staff, and force majeure, which results to inefficient processes. These indicators were classified whether it affected the project or not. The observation was done on 498 DOST-GIA-funded projects.

Observed in Table 3 is the summary of DOST-GIA-funded projects that are likely to be influenced by the factors identified (Table 3). Majority of the total observed projects were affected because of delay in budget release (69.68%) and procurement activity (69.88%). On the other hand, half of the observed projects were affected due to the extensive period in signing agreement (51.00%). For hiring of personnel/staff and force majeure, the extracted data indicated only 44.78% and 22.29%, respectively.

Table 3. Summary of factors affecting the implementation of DOST-GIA-funded projects

VARIABLE	AFFECTED	NOT AFFECTED
Delayed Budget Release	347 (69.68%)	151(30.32%)
Procurement Process	348 (69.88%)	150 (30.12%)
Extensive Time in Signing Agreement	254 (51.00%)	224 (49.00%)
Hiring of Staff/Personnel	223 (44.78%)	275 (55.22%)
Force Majeure	111 (22.29%)	387 (77.71%)

n = 498

On a per sectoral council approach, the data captured differs among sectoral councils. This can be associated with procedures implemented that is unique to each sectoral council. For NRCP (Table 4), the implementation of DOST-GIA-funded projects was affected mostly because

of delayed budget release and extensive time in signing agreement. In contrast, procurement process, hiring of staff and force majeure were least likely to affect the implementation monitored by NRCP. 1 (2%) of 45 NRCP-monitored projects have experienced delays in their implementation.

Table 4. Summary of factors affecting the implementation of DOST-GIA-funded projects monitored by NRCP

VARIABLE	AFFECTED	NOT AFFECTED
Delayed Budget Release	31 (68.89%)	14 (31.11%)
Procurement Process	15 (33.33%)	30 (66.67%)
Extensive Time in Signing Agreement	23 (51.11%)	22 (48.89%)
Hiring of Staff/Personnel	3 (6.67%)	42 (93.33%)
Force Majeure	2 (4.44%)	43 (95.56%)
n = 45		

For PCHRD (Table 5), the implementations of DOST-GIA-funded projects were undermined by the procurement process. This is evident as most of the projects monitored by PCHRD required infrastructure development and equipment outlay in their project implementations. In contrast, delayed budget release, extensive time in signing agreement, hiring of staff/personnel and force majeure less likely influenced the implementation of DOST-GIA-funded projects. 29 (56.86%) of 51 PCHRD-monitored projects have experienced delays in their implementations.

Table 5. Summary of factors affecting the implementation of DOST-GIA-funded projects monitored by PCHRD

VARIABLE	AFFECTED	NOT AFFECTED
Delayed Budget Release	15 (29.41%)	36 (70.59%)
Procurement Process	42 (82.35%)	9 (17.65%)
Extensive Time in Signing Agreement	11 (21.57%)	40 (78.43%)
Hiring of Staff/Personnel	4 (7.84%)	47 (92.16%)
Force Majeure	2 (3.92%)	49 (92.08%)
n = 51		

For projects monitored by PCIEERD (Table 6), delayed budget release, procurement process, and extensive time in signing agreement have undermined the project implementation. On staff/personnel and force majeure variables, the figures indicated that these variables do not necessarily affect the implementation of DOST-GIA program. According to PCIEERD, infrastructure development and equipment outlay are the root cause of deferred project implementations. 88 (34.78%) of 253 PCIEERD-monitored projects have experienced delays in their implementations.

Table 6. Summary of factors affecting the implementation of DOST-GIA-funded projects monitored by PCIEERD

VARIABLE	AFFECTED	NOT AFFECTED
Delayed Budget Release	142 (56.13%)	111 (43.87%)
Procurement Process	171 (67.59%)	82 (32.41%)
Extensive Time in Signing Agreement	137 (54.15%)	116 (46.85%)
Hiring of Staff/Personnel	121 (47.83%)	132 (52.17%)
Force Majeure	27 (10.67%)	226 (89.33%)
n = 253		

For projects monitored by PCAARRD (Table 7), the data indicated that the implementation of DOST-GIA-funded projects has been affected by all indicators observed. Thus, delay on the implementation of most PCAARRD-monitored projects were evident. 95 (63.76%) of 149 of its monitored projects have experienced delays in their implementations.

Table 7. Summary of factors affecting the implementation of DOST-GIA-funded projects monitored by PCAARRD

VARIABLE	AFFECTED	NOT AFFECTED
Delayed Budget Release	148 (99.33%)	1 (0.67%)
Procurement Process	143 (95.97%)	6 (4.03%)
Extensive Time in Signing Agreement	110 (73.83%)	39 (26.17%)
Hiring of Staff/Personnel	98 (65.77%)	51 (34.23%)
Force Majeure	80 (53.69%)	69 (46.31%)
n = 149		

The study has extracted the average number of days the project was delayed. Table 8 provided the information on the distribution of DOST-GIA-funded projects according to the number of days delayed. Contrary to initial understanding, most of the projects observed (53.23%) did not defer its implementation date. On the other hand, 212 (42.58%) of 498 projects were delayed from 1-360 days. Only one project had deferred its implementation for more than a year.

Table 8. Distribution of DOST-GIA-funded projects according to the number of days delayed

Number of Days Delayed	FREQUENCY	PERCENTAGE (%)
0 days	285	57.23
1-30 days	33	6.63
31-75 days	71	14.26
76-150 days	82	16.47
151-360 days	26	5.22
>361 days	1	0.20
TOTAL	498	100

The study has presented also the distribution of DOST-GIA-funded projects according to its budget allocation (Table 9). In an average, 228 (45.78%) of 498 projects funded by DOST have an average allocation ranging to ₱1,000,001 - ₱5,000,000. On the other hand, 92 (18.47%) and 91 (18.27%) of 498 projects funded by DOST have average allocation ranging to ₱5,000,001 - ₱10,000,000 and ₱10,000,001 - ₱25,000,000, respectively. 33 projects (6.63%) have an allocation ranging to ₱500,001 - ₱1,000,000. 22 (4.42%) and 20 (4.02%) of 498 projects have

average allocation of ₱25,000,001 - ₱50,000,000 and ₱0- ₱500,000, respectively. Furthermore, the 12 projects (2.41%) have an allocation of more than ₱50,000,001 for its financial grant.

Table 9. Distribution of DOST-GIA-funded projects according on budget allocated

Budget Allocated (₱)	FREQUENCY	PERCENTAGE (%)
0 – 500,000	20	4.02
500,001 – 1,000,000	33	6.63
1,000,001 – 5,000,000	228	45.78
5,000,001 – 10,000,000	92	18.47
10,000,001 – 25,000,000	91	18.27
25,000,001 – 50,000,000	22	4.42
>50,000,001	12	2.41
TOTAL	498	100

The logistic model is statistically significant at 0.05 as the p-value is less than 0.00 (Table 10). This denotes that the likelihood ratio chi-square of 281.59 with a p-value of 0.00 explains the whole model is significantly fit. On the other hand, the individual indicators were also tested. The delayed budget release ($p = 0.00$), procurement process ($p = 0.00$), extensive period of signing agreement ($p = 0.001$), and hiring of personnel ($p = 0.019$) were all statistically significant to the implementation of DOST-GIA Program at 0.05. However, allocated budget for first year ($p = 0.549$) number of days delayed ($p = 0.558$), and force majeure ($p = 0.584$) were not statistically significant at 0.05.

The coefficient signs of the indicators were also observed. This is done to determine the effect of the independent variables on the dependent variable. The logistic regression model shows that delayed budget release, procurement process, extensive period of signing agreement, and hiring of staff have a positive sign. This implies that these indicators are more likely to affect the implementation of DOST-GIA projects, which can result in inefficient processes. Moreover, the coefficient for the variable delayed budget release is 1.295. This means that a one-unit change in a delayed budget release, a 1.295 chance is expected to affect the implementation of DOST-GIA program. The interpretation is the same as other indicators with a positive coefficient sign.

The odds-ratio effects interpretation is a viable option for the binary and multinomial fixed-effects logistic regression. Wherein, the odd ratio is used to understand the effect of treatment on outcomes. For delayed budget release, the odd ratio measured is 3.651809. This means that the implementation of DOST-GIA-funded project is 3.651809 times more likely to be affected by the delayed budget release. For procurement process, the odd ratio measured is 13.577. This means that implementation of DOST-GIA-funded projects is 13.577 times more likely to be affected by the procurement process. The same case for both extensive period of signing agreement and hiring of staff/personnel.

Table 10. Logistic Regression Analysis of DOST-GIA-funded projects (Coefficient)

VARIABLE	COEFFICIENT	95% CONFIDENCE LIMIT		P-VALUE
		LOWER	UPPER	
Constant	-1.610039	-2.157951	-1.062126	0.000
Budget allocated for Year 1 [ns]	$6.55x10^9$	$-1.49x10^8$	$-2.80x10^8$	0.549
Number of days delayed [ns]	0.0018154	-.0042602	.0078909	0.558
Delayed budget release*	1.295223	0.625475	1.96497	0.000
Procurement process*	2.608377	1.883153	3.333601	0.000
Extensive period of signing agreement*	1.72619	0.6875016	2.764878	0.001
Hiring of staff/personnel*	1.438452	0.2351202	2.641784	0.019
Force majeure [ns]	0.3600634	0.983363	1.648463	0.584

n = 498
χ^2 = 281.59
df = 7
P > χ^2 = 0.00

*= significant at 5%
[ns]= not significant at 5% level of probability

VARIABLE	ODDS RATIO	95% CONFIDENCE LIMIT		P-VALUE
		LOWER	UPPER	
Constant	0.1998799	0.1155617	0.3457199	0.000
Budget allocated for Year 1[ns]	1	1	1	0.549
Number of days delayed[ns]	1.001817	.9957489	1.007922	0.558
Delayed budget release*	3.651809	1.869134	7.1347	0.000
Procurement process*	13.577	6.574203	28.03913	0.000
Extensive period of signing agreement*	5.619203	1.988741	15.87711	0.001
Hiring of staff/personnel*	4.214168	1.265061	14.03823	0.019
Force majeure [ns]	1.43342	0.3952107	5.198984	0.584

n = 498
χ^2 = 281.59
df = 7
P > χ^2 = 0.00

*= significant at 5%
[ns]= not significant at 5% level of probability

10. Conclusions and Recommendations

Generally, delays are inevitable in project implementation and this is evident especially on government-funded programs and projects. Likewise, the implementation of DOST-GIA program has been aggravated by different factors causing delays which resulted in inefficient processes. This study was able to establish a significant relation between the implementation of DOST-GIA-funded projects and the factors identified. The study proved that delayed budget release, procurement process, extensive period of signing agreement, and hiring of personnel/staff affects the implementation of DOST-GIA-funded projects. Results also revealed that these indicators have negatively affected the whole DOST-GIA program. In view of these conclusions and other findings, the following are recommended to further improve the performance of DOST-GIA program:

Improve the procurement process especially on science, technology, and innovation-related programs and projects to enhance the innovation ecosystem in the country - Propose the amendment of "Government Procurement Reform Act" and strengthen the authority of Government Procurement Policy Board (GPPB) to resolve issues on the inefficient procurement process in the Philippines. The study has established evidence that procurement process negatively affects the implementation of DOST-GIA program. The restrictive regulations in procuring of equipment and consumables for researches have lessened research productivity and innovation condition in the country. A transparent mechanism should be established to accelerate purchasing research equipment and consumables that will be more conducive for our research ecosystem while maintaining transparency and accountability. This would achieve speed, efficiency, and relevance to the country's research activities.

Implement the DOST monitoring and evaluation protocol - The implementation of new monitoring and evaluation protocol crafted by the Office of the Undersecretary for R&D and DOST sectoral councils will further improve the implementation of DOST-GIA program. The essence of the new protocol is to meet the requirement of Republic Act No. 11032 known as the "Ease of Doing Business and Efficient Government Service Delivery Act of 2018". This protocol would also delimit the period time in the processing of needed requirements for DOST-GIA-funded projects. Moreover, the DOST monitoring and evaluation protocol will improve the process of selecting relevant S&T programs and projects.

Improving the competencies of STI support personnel - This is one of the immediate solutions to address the gap in the implementation of DOST-GIA program. Enhancement of STI support personnel working on research projects must be intensified. The role of STI support personnel is crucial as it assists the S&T experts in dealing with administrative and non-technical matters. One of the problems encountered by DOST-GIA program is the lack of competent personnel handling of administrative and non-technical matters for the implementing agency. However, this issue has been overlooked since the focus of implementing agencies is mainly on research and development and not on administrative and non-technical matters.

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12. Appendix

Table 12. Big-Ticket Projects funded under the DOST-GIA Program for AANR Sector

IMPLEMENTING AGENCY	PROGRAM/PROJECT NAME
University of the Philippines	Smarter Approaches to Reinvigorate Agriculture as an Industry in the Philippines (SARAI) Program
University of the Philippines	Optimization of the Production and Use of FertiGroe Nitrogen (N), Phosphorous (P) and Potassium (K) Nanofertilizers in Selected Agricultural Crops
Central Luzon State University	Industry-Focused Technologies, Innovations and Knowledge for Livelihood, Income, and Food Supply Enhancement (ITIK FOR LIFE) Program for Sustainability of the Philippine Duck Industry
University of the Philippines	Monitoring and Detection of Ecosystems Changes for Enhancing Resilience and Adaptation in the Philippines (MODECERA)

Table 7. Big-Ticket Projects funded under the DOST-GIA Program for NIBRA Sector

IMPLEMENTING AGENCY	PROGRAM/PROJECT NAME
DOST Regional Offices	Community Empowerment for S&T (CEST)
DOST Regional Offices	Implementation of the Small and Medium Enterprises Technology Upgrading Program (SET-UP)
Various Agencies	Sustainable Communities (SAKLAW or Saklolo sa Lawa Program) Taxonomy of Flora and Fauna in the Philippines

Table 13. Big-Ticket Projects funded under the DOST-GIA Program for DRR-CCA Sector

IMPLEMENTING AGENCY	PROGRAM/PROJECT NAME
University of the Philippines and State Universities and Colleges (SUCs)	PHIL-LIDAR 1. Hazard Mapping of the Philippines using LIDAR
University of the Philippines and State Universities and Colleges (SUCs)	PHIL-LIDAR 2. Nationwide Detailed Resources Assessment Using LIDAR
University of the Philippines	Nationwide Disaster Risk Exposure, Assessment and Mitigation (DREAM) Program
Industrial Technology Development Institute (ITDI)	Shelf Stable Ready-to-Eat (RTE) Disaster/Relief Foods
Advanced Science Technology Institute (ASTI), Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA), DOST-Regional Office	Nationwide Operational Assessment of Hazards (NOAH) for Climate Change Adaptation and Mitigation and Disaster Risk Reduction (CCAM-DRR) Deployment of Early Warning Systems
Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA)	Optimization of the Operation Capabilities of Hydromet Sensor in Line with International Standards (WMO Standards) for Effective, Weather, Flood Warning (CBFFEWS) and Application to Research

Table 14. Big-Ticket Projects funded under the DOST-GIA Program for NUHRA Sector

IMPLEMENTING AGENCY	PROGRAM/PROJECT NAME
University of the Philippines, University of Santo Tomas, Philippine Genome Center (PGC)	Philippine Biorepository Network Program
University of the Philippines, National Kidney and Transplant Institute (NKTI), Lung Center of the Philippines (LCP), Philippine Genome Center (PGC)	Clinical Proteomics for Cancer Initiative
State Universities and Colleges (SUCs)	Tuklas Lunas Program: The Philippine Drug Discovery and Development Program
University of the Philippines and Philippine Genome Center (PGC)	Biotek M Dengue Aqua Kit: Dengue Detection Kit
University of the Philippines, University of San Agustin, and Pharmalytics Corporation	Bridging Efficacy and Safety: Ind-Enabling Suite of ADME-TOX Assays
Ateneo de Manila University (ADMU), De La Salle University (DLSU), Industrial Technology Development Institute (ITDI), Pascual Laboratories Inc. (PLI), University of the Philippines, University of Santo Tomas (UST)	Discovery and Development of Health Products (DDHP)
University of the Philippines	BIOTEK-M Dengue Aqua Kit
Philippine Nuclear Research Institute (PNRI)	Development of an Animal Model for Use in Radiation Research and Establishment of the Radiation Biology Research Center

Table 15. Big-Ticket Projects funded under the DOST-GIA Program for Industry, Energy and Emerging Technology Sector

IMPLEMENTING AGENCY	PROGRAM/PROJECT NAME
Advanced Science and Technology Institute (ASTI)	Electronics Product Development Center (EPDC)
Industrial Technology Development Institute (ITDI)	Advanced Device and Materials Testing Laboratory (ADMATEL)
Metals Industry Research and Development Center (MIRDC)	Die and Mold Solution Center (DMSC)
University of the Philippines	Development of Philippine Scientific Earth Observation Microsatellite (PHL-MICROSAT)
Metals Industry Research and Development Center (MIRDC)	Development of a Prototype Automated Guide-way Transit (AGT) System
University of the Philippines	Sustained Support for Local Space Technology and Applications Mastery, Innovation and Advancement (STAMINA4SPACE)
Metals Industry Research and Development Center (MIRDC) and Industrial Technology Development Institute (ITDI)	Advanced Additive Manufacturing R&D Program
DOST Regional Offices	One Expert
DOST Regional Offices and DOST R&D Institutes	Science, Technology and Innovations for Productivity and Competitiveness Program: One Lab