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# Risk Allocation Model for Public-Private Partnership in Radiodiagnostic Facilities in Nigeria

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## ABSTRACT

**Background:** Developing a mechanism for risk sharing in public-private partnerships (PPP) is crucial to success of the project as well as improving returns to the government and the private investor. It has become needful to develop a project-specific model for radio-diagnostic facilities.

**Objective:** To develop a model of risk allocation for PPP in radio-diagnostic facilities in Nigeria.

**Methodology:** The survey was undertaken from January 2017 to December 2017. A total of 122 questionnaires aimed at allocating different risk factors to either the public or private sector were sent out with 82 (67.21%) returned for data analysis. The target respondents were radiographers and radiologists in PPP and academics who had gained in-depth knowledge of the PPP model through research. Data collected were presented in tables and the preferred risks allocation expressed in percentage.

**Results:** Out of thirty-three key risks in this study, eighteen (55%) were preferably shared between the public and private sectors. This cut across all the risks groups (political, economic, legal, natural and operational). There is no risk that is solely retained by the public sector (government) with percentage scores above 50%.

**Conclusion:** The risk allocation model for PPP in Radio-diagnostic facilities suggests that all the risk groups should be shared between the public and private sectors. This study will serve as a risk mitigation tool for the government agencies and prospective investors in this area.

**Keywords:** Public-private partnerships (PPP), Radio-diagnosis, Risk allocation, Nigeria

## Introduction

The recent economic meltdown has increased the mismatch between government funding and demand for improved infrastructure in the health care system [1]. A Public-Private Partnership (PPP) is a project that is funded and operated through a partnership of government and private sector. Nigerian government in recent years has received, and widely adopted PPP [2]. Public-private partnership in the health sector in particular helps in the provision of better service,

reduction in management costs, innovations, investments in infrastructure, new medical equipment, and the potential to attract and retain better performing staff and efficient risk allocation among parties [3].

Public-private partnerships (PPP) in radio-diagnosis is concerned with a long-term contractual agreement between a public hospital management and a private sector concern,

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in which resources and risks are shared for the purpose of developing radiological services in a public facility. The defeat of PPP does not begin with failure of the projects but the attitude towards the risk management.

Risk allocation is a crucial issue in risk management. Risk allocation involves systematic consideration of possible outcomes and procedures to accept, avoid, or minimize the impact of project risks [4]. The ability of the partners to handle the risks is the beginning of risk allocation [5]. Risks should be allocated to the party that best handles it. Failure to identify, assesses, and manages the risks associated with PPP projects comes with consequences which may include poor schedule performance, conflicts, and even business failures [6].

Objective assessments that rely on historical information and experiences of professionals and researchers have been used to allocate risks in PPP projects [6, 7]. From reviewed literature, twenty-four risk factors for PPP in general, were identified in addition to eleven project-specific risk factors linked to radio-diagnostic services. The thirty-five risk factors were summarized in five categories thus: political, economic, legal, natural and radiation/operation risk group [3, 6].

### **Political risk group**

This includes incessant changes in relevant political office holders and the chief executives of regulatory agencies, government corruption, government intervention, nationalization/expropriation, public credit, poor public decision-making process and political/public opposition, summarized as political interference [6].

### **Economic risk group**

This includes interest rate fluctuation, foreign exchange fluctuation, inflation, financing risk and debt servicing risk. Given the large capital expenditure involved in radiology [9, 10].

### **Legal risk group**

Legal risk refers to risk arising from the legal and regulatory systems surrounding PPPs. This includes legislative changes, imperfect law, poor supervision system and change in tax regulation [6].

### **Natural risk group**

Force majeure, unforeseen weather/geotechnical conditions, environmental risk specific project risk are in this category. In the context of this study, they include events beyond the control of the authority (public sector) and the operator (private sector), which prevents a party from complying with any of its obligations [4].

### **Operation risk group**

Operation risk factors include; poor knowledge of radiation protection, lack of periodic quality assurance checks on the x-ray machines, unavailability of personnel protective devices e.g. Lead rubber shield, lack of workplace monitoring, unavailability of personnel monitoring, lack of portable radiation surveying instrument e.g. survey meters, unavailability of installed protection instrument e.g. area radiation monitors, airborne contamination monitors, lack of periodic quality (integrity) checks on the personnel protective devices e.g. lead rubber aprons, lack of re-training, poor supervision and lack of immobilization devices [11,12].

The risk groups associated with PPP projects in general are political, economic, legal and natural while the radiation/operation risk relates to radio-diagnostic services. The types of risks encountered in PPP projects may be affected by a number of factors, such as the type and scale of the project, the country where the project is located and the sector of the economy [13] meaning, the significance of a particular risk and preferred risk allocation can differ from sector to sector and/or from country to country.

Therefore, there is a need to analyze and manage this on a context specific approach [6, 7]. This could help the public and private sectors reduce time spent in risk negotiation and allocation.

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### Materials and Methods

This study was a prospective cross-sectional survey carried out in four selected radiology departments in Nigerian hospitals involved in PPP projects within a period of twelve months (January 2017 to December 2017). Risk identification is the first step in risk assessment and a total of 35 risk factors for PPP in Radio-diagnostic projects were identified after conducting a literature review.

The target survey respondents belonged to four categories: (i) investors from the private sector involved in radiology PPP projects. (ii) Hospital administrators involved in radiology PPP projects (iii) radiologists and radiographers involved in PPP projects (iv) academics who have gained in-depth knowledge of the PPP model through research. The reason for the inclusion of academics is because their views are widely believed to be reliable [6].

A total of 122 questionnaires were sent out but only 82 (67.21 %) were returned for data analysis. Five-point Likert scale was used for measurement and each respondent allocated each of the 35 risk factors with it.

Regarding risk allocation; 1= solely allocated to government, 2=mainly allocated to government, 3= equally shared by government and private investor, 4=mainly allocated to a private investor, 5= solely allocated to a private investor. Statistical

**Table 1. Background information of Respondents**

Years	Frequency	Percentage
Working experience of survey respondents (years)		
< 1	2	3
1-5	19	23
6-10	17	21
11-15	20	24

Package for Social Sciences (SPSS) version 17 was used for the analysis.

### Results

Table 1 shows that very few of the respondents (n= 2; 3%) had industrial experience of less than one year, and the highest count (n=20; 24%) worked up to fifteen years. Twenty-two (29%) worked for more than sixteen years but only two (3%) were exposed to PPP setting for those number of years.

Table 2 shows that 55% of the respondents preferred the risk from government corruption to be shared between the public and private sectors and assigned zero% to the private sector. None of the political risks were allocated to the public sector with percentage scores above 50%. Amongst the economic risks group, foreign exchange rate fluctuation (57%) was the only risk allocated to the public sector with percentage scores above 50%. Price change with a percentage score of 47% is the only risk that is mainly assigned to the private sector.

Out of thirty-three key risks in this study, eighteen (55%) were preferably shared between the two sectors. Ten have percentage scores above 50%. This cut across all the risks groups.

**Continuation of table 1**

16-20	18	22
> 20	6	7
PPP experience of survey respondents		
< 1	2	3
1-5	36	44
6-10	42	50
11-15	2	3
16-20	-	-

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**Table 2. Risk Allocation of PPP in Radio-diagnostic facilities in Nigeria**

Risk groups	Risk factor	Allocations				
		Solely allocated to Government (%)	Mainly allocated to Government (%)	Equally shared by Govt & Private investor	Mainly allocated to Private investor (%)	Solely allocated to Private investor (%)
<b>Political group</b>	Government corruption	22	22	55	-	-
	Government intervention	33	31	25	3	6
	Public credit	4	33	59	3	-
	Naturalization/exploration	16	25	54	5	-
	Poor public decision-making process	5	35	60	-	-
	Political/public opposition	11	27	59	-	4
	Political interference	24	48	24	4	-
<b>Economic group</b>	Foreign exchange rate fluctuation	57	8	25	9	-
	Inflation	35	27	20	18	-
	Interest rate fluctuation	45	18	18	18	-
	Financial risk	8	-	74	10	8
	Debt servicing risk	10	10	54	18	9
	Price change	9	-	37	46	9
	Expense payment risk	-	10	55	35	-
	Projects/operation changes	10	10	45	17	18
<b>Legal group</b>	Legislation change	33	43	7	17	-
	Imperfect law and supervision system	26	50	16	9	-
	Change in tax regulation	33	41	-	17	9
<b>Natural group</b>	Industrial strike	39	20	31	10	-
	Terrorism (Force majeure)	29	29	32	-	10
	Unforeseen weather/geotechnical conditions	20	29	41	-	10
	Environmental risk	20	29	41	-	10
	Poor knowledge of radiation protection	18	18	45	18	-

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<b>Operation group</b>	Lack of periodic quality assurance checks on the x-ray machines.	9	28	45	9	10
	Unavailability of personnel protective devices e.g. Lead rubber shield.	9	37	28	17	10
	Lack of work place monitoring.	17	18	38	17	10
	Unavailability of personnel monitoring.	9	27	37	18	10
	Lack of portable radiation surveying instrument e.g. Survey meters.	17	18	37	18	10
	Unavailability of installed protection instrument e.g. Area radiation monitors, airborne contamination monitors.	9	37	37	17	-
	Lack of periodic integrity check on the personnel protective devices e.g. Lead rubber aprons.	9	45	28	18	-
	Lack of re-training.	10	9	81	-	-
	Poor workplace supervision.	9	18	45	28	-
	Lack of immobilization devices	9	9	54	18	10

### Discussion:

The survey result presented in a table shows the preferred risk allocation choices expressed in percentage. There is no political risk that is solely retained by the public sector (government) with percentage scores above 50%. Previous studies in Italy, United Kingdom and China show that political risks were preferably allocated to the public sector [13, 14, 6].

In this study, foreign exchange rate fluctuation is the only risk solely allocated to the public. This could be attributed to the prevailing instability in foreign exchange rates and high inflation rate in Nigeria and their effects on various economics Variables [8].

Price change is the only risk that is mainly assigned to the private sector. This could be based on the assumption that the private sector is stronger and will have the capacity to respond to market changes faster than the bureaucratic bottlenecks that are associated with the public sector [5]. A study in the United Kingdom

assigned (70%) of the risks to the private sector [14].

In this study, 55% of the risks were preferably shared between the two sectors. This does not agree with previous studies where only the natural risks was shared between the public and private sectors [6, 14, 15]. It thus suggests that PPP projects in Radio-diagnostic facilities in Nigeria places responsibility on both parties and it is not willing to absolve either of them from any of the categories of risks.

Twenty-nine percent of the respondents have working experience greater sixteen years but only three percent of them have worked in a PPP setting for that number of years. This indicates that the concept of public-private partnership is still new amongst the operators of radio-diagnostic facilities in Nigeria. Therefore, their perception of risks and risks allocation might evolve with time as they gain experiences.

### **Conclusion**

The risk allocation model for PPP in radio-diagnostic facilities in Nigeria suggests that the political, economic, legal, natural and operation risks should be shared between the public and private sectors. The concept of public-private partnership is new therefore the perception of risks and risks allocation might evolve with time.

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