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Adequate Funding Panacea for the Development of Cyber Security Programme in Tertiary Institutions in Nigeria

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Abstract: This paper discussed the importance of funding the cyber security programme in Nigerian tertiary institutions. The paper is a review paper that depends on secondary data. The secondary data were collected from print and online publications. The paper revealed that funding a cyber security programme would lead to the effective implementation of a cyber security curriculum, employment of adequate staff for smooth implementation of the programme, provision of adequate infrastructure facilities, provision of adequate instructional resources, and development of research in cyber security. Based on these findings, the paper recommends special funding plans for the implementation of the cyber security programme in tertiary institutions by the federal and state governments; private institutions and international organizations should support the funding of cyber security in tertiary institutions. The head of the Department of Cyber Security Programme should look outside the box and come up with strategies for internally generating resources to support the funding of cyber security in tertiary institutions.

Keywords: Cyber Security, Tertiary Institutions

1. Introduction

Tertiary education in Nigeria aims to provide accessible and affordable quality learning opportunities in both formal and informal settings to meet the diverse needs and interests of all citizens. Its goals include offering high-quality career counseling and lifelong learning programmes that equip students with the knowledge and skills necessary for self-reliance and workforce success. Additionally, it addresses skill shortages by producing skilled manpower aligned with labor market demands, while promoting scholarship, entrepreneurship, community service, and fostering national unity and international understanding [1]. Tertiary education is an organized educational system that is consciously designed for manpower production, in-service training, and national development. Tertiary education is an education that advances teaching, research, and community services for national development. Tertiary education is an education industry that is meant for the production of manpower and national development via the implementation of teaching, research, and provision of community services [2].

Tertiary institutions in Nigeria offer a variety of academic program that includes cyber security programme. The cyber security programme provides students with a comprehensive understanding of the principles and practices of securing computers, networks, and electronic data from unwanted intrusions and attacks. This programme covers topics such as data encryption, access control, risk management, and incident response. Students also learn about the latest technological advancements and industry best practices in the field of cyber security. This programme is designed for individuals who are interested in pursuing a career in cyber security or for those who want to enhance

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their knowledge and skills in this rapidly growing field. By enrolling in this programme, students will gain the necessary skills and expertise to protect organizations from cyber threats and safeguard sensitive information [3]. From the above, tertiary education in this paper is seen as an education industry that deals with the production of manpower and is actively engaging in solving national problems via teaching, researching, and provision of community services.

Recent developments, according to Nigerian Universities Commission [4], in computing, network technologies, internet, and cloud technologies have generated the need for reliable and secure exchange of digital information that is vital to most human activities such as banking, medicine, infrastructure management, and elections. As the use of information technology expands, so are the potential consequences of cyber-attacks, and the need for a skilled workforce to prevent and defend against them. However, the pool of available talent to build and certify applications designed to withstand attacks, diagnose, and prevent security intrusions is inadequate to meet the growing needs all over the world. Government agencies, business organizations, industries, and the military are scrambling to find qualified professionals to safeguard their systems, businesses, and infrastructures.

The focus of the cyber security programme, according to the Nigerian Universities Commission [4], is to equip students with sufficient knowledge and skills to minimize and prevent cybersecurity threats and incidents. Students are also equipped with demonstrable abilities to gather, analyze, and present evidence of any cybersecurity bridges in the organization in a professional way. The graduates of this programme will understand the impact of cybercrime on business and the public and be able to identify and implement specific security practices, features, and techniques to enhance the security of computers, computer-based systems, and cyberspace. The issue of cyber security has become increasingly prevalent in today's digital age, especially in tertiary institutions in Nigeria. Adequate funding has been identified as a crucial element in addressing this issue and promoting the development of effective cybersecurity programmes in these institutions. With the increasing reliance on technology and the internet for academic and administrative purposes, the need for strong cybersecurity measures cannot be overstated. However, due to limited financial resources, many tertiary institutions in Nigeria struggle to establish and maintain robust cybersecurity programmes.

The solution to this problem lies in adequate funding. By providing sufficient financial resources, tertiary institutions in Nigeria can equip themselves with the necessary tools and technologies to effectively combat cyber threats and protect sensitive information [5]. Based on this, the paper seeks to examine the benefits of adequately funding cybersecurity programmes in tertiary institutions in Nigeria.

Literature Review

The cybersecurity programme is the introduction of big data analytics, cyber threat intelligence and cyber conflict, deep and dark web security, cyber threat hunting, monitors and controllers, artificial intelligence, cyber defense applications, and surveillance in cyber defense operations (Nigerian Universities Commission [4]). The cybersecurity program is an academic program that focuses on cybersecurity

The Nigerian Universities Commission [4] stated that the philosophy of the cyber security programme is to build capacity and develop human capital in the field of cybersecurity, to safeguard business transactions, corporate assets, critical infrastructure, and all cyber operations in cyberspace, nationally and globally and the objectives are to:

1. Produce graduates with requisite foundation knowledge of cybersecurity, skills, and strategies that would enable them to detect and prevent cyber-fraud
2. Empower graduates with the ability to analyze cybersecurity threats, attacks, and risks for organizations, with the capacity to develop detective codes and supportive software agents to address cybersecurity threats

3. Develop graduates with knowledge of cryptography and steganography for the privacy of information on computer systems and digital forensic science techniques for the detection of cybercrimes
4. Produce graduates who can think critically about cyber intelligence security issues, develop and implement tactics strategic to cybersecurity, drawing on national and international recent case studies
5. Prepare graduates for the purpose of self-employment, cybersecurity-based job placement, and professional practice in government and industries.

The Nigerian Universities Commission (CCMAS) also observed that the cyber security graduates would be expected to have the following:

1. Soft skills of excellent presentation and communication skills, ability to clearly articulate complex cyber-concepts and usage of active listening skills.
2. Technical skills in understanding the architecture, administration, and management of operating systems, networking, and virtualization software; usability of firewalls and network load balancers; software development concepts and software analytics skills; common programming languages; and obtaining cybersecurity certifications essential and prerequisite for employment.
3. Implementation skills of cyber hunting, cyber intelligence, and cyber threat modeling, vulnerability assessment, identify the cybersecurity controls in place and how they are used, and use of the coding skills to write codes that automate cybersecurity tasks. Also, cybersecurity students will be required to have the following 21st-century skills: problem-solving skills, critical thinking, communication skills, creativity, collaboration, information literacy, global awareness, innovation skills, and social skills.

2. Materials and Methods

This paper is a review paper. The paper used secondary data. The secondary data were collected from print and online publications. Content analysis was used to select the final literature used.

3. Results and Discussion

Data Analysis on Benefits of Funding Cyber Security Programmes in Tertiary Institutions in Nigeria

Adequate funding of cyber security programmes in tertiary institutions in Nigeria will lead to the effective implementation of cyber security curricula, employment of adequate staff for smooth implementation of the programme, provision of adequate infrastructure facilities, provision of adequate instructional resources, and development of research in cyber security.

Effective implementation of cyber security curriculum

Adequate funding of cyber security programmes in Nigerian tertiary institutions will support the effective implementation of the cyber security curriculum. Opined that the three prong missions of a university management and for implementation of school curriculum, namely, teaching and learning, research and innovations, and extension services, involve building infrastructures, utilities and facilities, relationships between and among higher education institutions within the country, across nations and continents [6]. It also involves acquisition of smart and complex technologies, qualified human capital and recurrent expenditure for the payment of salaries and allowances, accreditation exercises, staff development programmes, organisation of conferences, seminars and workshops, travels, maintenance of infrastructure and utilities and maintaining peace and security on campus. All these activities involve huge sum of money. In short, the business of university management and administration is a very expensive venture; it is capital intensive, and demands adequate funding to provide the resources. Funding can also

facilitate the implementation of training programmes for faculty and students, raising awareness and promoting a culture of cyber security within these institutions. This, in turn, can lead to a more proactive approach towards cyber security and help mitigate potential threats before they can cause harm (PIP 2025). Adequate funding will help to implement the curriculum of cyber security programme in the tertiary institutions across the country.

Employment of adequate staff for smooth implementation of the programme

Adequate funding of cyber security programme will guarantee employment of staff for the implementation of the cyber security curriculum in various institution especially academic staff. Viewed academic staff as an individual that is employed in a higher institution to provide the services of teaching, research and community services [7]. Academic staff is a professional, engaged in the tertiary institutions to provide academic services that includes teaching, researching and provision of community services. The job functions of an academic staff includes; presentation of lectures, preparation of lecture plan, organization of instructional resources, students assessment, project supervision, script marking, record keeping, committee assignment, supervision of examination and practically work execution. Adequate provision of funds will also help to provide training and retraining programme. Adequate funding will support motivation packages and improved welfare scheme.

Provision of adequate infrastructure facilities

Adequate funding of cyber security programme in the tertiary institutions in Nigeria will lead to provision of adequate infrastructure facilities in the various institutions. Lawinsider viewed infrastructure facilities to mean any works, structures or improvements to land or waters other than Ancillary Project Area Infrastructure which directly or indirectly provide a service or any other benefit to:- (a) the general public; or (b) the Island community, including – (c) offices, depots and staff housing by or for the benefit of the Commonwealth of Australia, the Stapmte, any local government, statutory authority or government owned corporation,(d) any electricity generation, distribution or transmission facility; (e) public education facilities; (f) public health facilities; (g) police facilities; (h) emergency facilities; (i) transport facilities (including pedestrian paths, cycle ways, transfer facilities, freight storage and logistic areas, bus stops and layovers, ferry stops, taxi stops); (j) sewage pump stations and sewage treatments facilities; (k) solid waste transfer and treatment facilities; (l) water supply pump stations, raw water storage, clear water storage, dams, weirs, bore field infrastructure; (m) the things listed in section 24KA(2) of the Native Title Act to the extent that they are not Ancillary Project Area Infrastructure; and (n) any IBIS Store; but not including – (o) Social Housing. Opines that infrastructure represents the aesthetic picture of the school conveyed by the position of structures in relation to one another [8]. It also represents the empirical relevance of the totality of the school environment for the realization of the school business (teaching/learning).

Provision of adequate instructional resources

Cybersecurity instructional resources refer to various materials and tools designed to educate and train individuals on how to secure digital information and mitigate cyber attacks. These resources can include online courses, textbooks, simulations, and hands-on exercises. They aim to provide learners with a comprehensive understanding of cyber threats, potential vulnerabilities, and best practices for protecting sensitive data. By utilizing cybersecurity instructional resources, individuals can develop the skills and knowledge necessary to safeguard their personal and professional networks from malicious attacks. These resources are crucial in today's increasingly digital world, where cybersecurity is a top concern for organizations and individuals alike. Adequate funding of cyber security programme in the tertiary institutions will support adequate provision of cyber security instructional resources. Properly funding of cyber security education in Nigeria will help to fix some of the problems facing the programme and to adequate

provide instructional resources that will aid effective teaching and learning of the programme in the schools. It is evident that adequate funding is crucial for the development and implementation of effective cybersecurity programmes in tertiary institutions in Nigeria. By prioritizing funding and investing in cybersecurity, these institutions can establish themselves as secure and reliable environments for academic and administrative activities (PIP 2025).

Development of research in cyber security

Cyber security programme comprises of teaching and research. Students and academic staff are expected to carry out intensive researches in the implementation of the cyber security in the higher institutions. Noted that the academic staff of these tertiary institutions are compulsorily required to carry out research activities as their promotions and grading are primarily based on their research outputs [9]. Apart from the academic staff being promoted through research publications, research activities help us to know 'best practices in other parts of the world and also add value both to our immediate community and the larger global community. Research conduct according to National Open University in cyber security programme is capital intensive [10]. It requires a lot of both human and materials resources to be able to carry out quality research in cyber security programme. Research can simply be defined as the process of arriving at dependable solutions to problems through planned and systematic collection, analysis and interpretation of data. Research is an important tool for advancing knowledge for promoting progress, and for enabling scholars to relate more effectively to the environment, to accomplish their objectives, and to resolve conflicts. Adequate funding of cyber security programme in the tertiary institutions will help to secure research facilities. Increment in the budgetary allocation of government will support the development of research programme in the universities. Financial support from the private institutions will also assist to develop research programme in the higher institutions. Opined that Funding is unquestionably the most critical factor in university research [11]. Only adequate funding can develop the research programme in the Nigerian tertiary institutions, [12], [13], [14]. In addition, adequate funding can allow for the development of partnerships and collaborations with relevant industry and government agencies, further strengthening the cyber security capabilities of tertiary institutions in Nigeria (PIP 2025).

Findings

The paper disclosed that funding of cyber security programme will lead to effective implementation of cyber security curriculum, employment of adequate staff for smooth implementation of the programme, provision of adequate infrastructure facilities, provision of adequate instructional resources and development of research in cyber security [15], [16].

4. Conclusion

This paper examined the importance of funding the cyber security programme in the Nigerian tertiary institutions. The paper revealed that funding of cyber security programme will lead to effective implementation of cyber security curriculum, employment of adequate staff for smooth implementation of the programme, provision of adequate infrastructure facilities, provision of adequate instructional resources and development of research in cyber security.

Based on this findings, the paper recommends special funding plans for the implementation of the cyber security programme in the tertiary institutions by the federal and state governments, private institutions and international organization should support the funding of cyber security in the tertiary institutions. Head of department of cyber security programme should look outside the box and come up with strategies to internally generated resources to support the funding of cyber security in the tertiary institutions.

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