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The Impact of Information Technology on Entrepreneurship: A Case Study of Technology Incubation Center Kano Nigeria

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Abstract:
It is now a common knowledge that Information Technology has revolutionized virtually every aspect of human endeavor; it has impacted immensely and positively on the development of entrepreneurship, creation of jobs and business opportunities virtually throughout the globe. IT is "an umbrella term that includes computer hardware and software; digital broadcast and telecommunications technologies as well as electronic information repositories such as the Web or those found on CD-ROMs. IT also encompasses a number of continually evolving range of elements that further includes television, radio, mobile phones, office automation equipment, electronic teaching aids, etc. This work aims to investigate the extent to which IT is being employed by Technology Incubation Center Kano to achieve its set objectives. The work also concludes that the golden aims of Technology Incubation Centers in the Country could be achieved more efficiently and more cost effectively if IT is made good use of. Also, the IT sector itself holds in its ambit a myriad of entrepreneurship opportunities that can be harnessed to poster both financial and technological advancement of the country.

Keywords: *Technology incubation centre, information technology, mobile phones, small scale enterprise*

1. Introduction

The level of unemployment in Nigeria is quite frightening. The over dependence of oil sector by the county's economy is a major concern. The failure rate of start-up enterprises need be addressed. Technology Incubation enhances entrepreneurship. Information Technology, IT, in turn makes Technology Incubation Practices efficient and cost effective. The impact the IT may have on incubators motivated our research. Technology incubation program is introduced into Nigeria in 1989 with the aim of assisting the small budding enterprises to overcome the initial hurdles that in most cases cause the early mortality of small scale enterprises in the country. It is also to provide viable research and development and other technology into profitable enterprises. It serves as a functional linkage between Research and Industry. This is achieved by providing the critical institutional support needed by these entrepreneurs at greatly reduced cost. It is a Federal Government effort, in collaboration with state governments and other stakeholders. Start-up enterprises are admitted into the Incubator as tenants and after graduation follows the post-incubation survival scheme which is designed to ensure that graduated enterprises were not allowed to be swallowed by the harsh and competitive business environment immediately they graduate. Kano State has an incubation center established in 1994 with the aim of developing entrepreneurship in the state.The vision of the program is to make Nigeria a technological competitive nation through the commercialization of research and development results and other innovative efforts using technology incubation as a tool. Young entrepreneurs are admitted into the incubator for a period of time at the end of which they graduate into wider economic environment, in most cases industrial estates and/or complexes as financially viable and free standing enterprises. The most viable incubation tool for achieving the above and similar objectives, the world over, is IT. IT facilitates activities necessary for successful incubation by making it efficient and cost-effective. This will be elucidated later in this paper.

IT is defined variously by many writers. (Babawuro, 2006) defined Information Technology as a technology involved in acquiring, storing, processing and distribution of information by electronic means (including radio, television, telephone, computers etc.). It is also defined as "an electronic technology for collecting, storing, processing and communicating information" (Butcher, 2003). Wali (2001), sees IT to comprise of various kinds and sizes of computers. The computers are connected via telephones to facilitate the sharing of the data they house and the data comes in many forms such as texts, sounds and pictures. IT has over the years revolutionized the way people think and act. Through IT a lot of businesses were created, technologies improved, processes of decision making simplified, manufacturing, training, teaching and learning made more efficient and cost effective. So this work is

aimed at researching the impact and the extent to which IT is being employed in fostering entrepreneurship activities in Technology Incubation Centers. Major issues to look at are availability, accessibility and use of IT facilities in our technology incubation centers. Generally, we are to investigate the extent to which IT is being employed by Technology Incubation Center Kano to achieve its set objectives. The work also concludes that the golden aims of Technology Incubation Centers in the Country could be achieved more efficiently and more cost effectively if IT is made good use of.

What are, generally the achievements of Kano Technology Incubation Center? What impact IT facilities and infrastructure have on the success of our technology incubation centers in producing and developing entrepreneurs with competitive advantages? To what extent are IT facilities and infrastructure used in administration in our technology incubation centers? Pertinent questions to be asked in this regard are: What IT facilities/infrastructure is ideally required in an incubation center in order to achieve its objectives in an efficient and cost effective manner? What IT facilities are available in the incubation center for tenants training purposes? What IT facilities are available in the incubation center for administrative purposes? Are tenants given access to the IT facilities provided for their training? Are the incubator tenants able to make use of the IT facilities provided for them? If not, why? It is believed that answers to the above research questions will address the problems stated below. Unavailability of IT facilities in our incubation centers; Inaccessibility to IT facilities by tenants of incubation centers; Inability of incubator tenants to use IT facilities despite its availability and accessibility; Failure of tenants, administrators, and graduates of incubation centers to harness the multiple advantages brought about by IT to the business environment.

2. Background

IT comes about from a marriage between computer technology and communication technology. This marriage has revolutionized the entire human endeavor to the extent that the difference between the developed, the developing and the under-developed world is hinged around availability, access and use of IT. It offers many advantages and opportunities that could be harnessed to foster and facilitate the achievement of any goal; be it educational, financial, technological, medical, governmental, etc.IT is driven by the convergence of computers, telecommunications and traditional media, crucial for the knowledge-based economy of the future. Rapid advances in technology and the diminishing cost of acquiring the new IT tools have opened new windows of opportunity for African countries to accelerate economic growth and development. The goals of achieving a common Market and an African Union can benefit immensely from the revolution in information technology. In addition to fostering intra-regional trade, the use of IT could also accelerate Africa's integration into the global economy (NEPAD, 2001). According to (Bowie, 2000), Internet is an instrument of communication that has great potential for positive change in promoting free speech and other democratic principles. To many users, the Internet is an empowering technology, which enables individual communities and even nations to improve their conditions, and which offers a strategic advantage in the knowledge-driven economy, opening up new opportunities to enjoy a better quality of life(Bowie, 2000).The positive contribution of IT to economic growth and innovation in emerging and advanced countries has been repeatedly established through both quantitative and qualitative research on a macroeconomic level, IT usage has been shown to be correlated with global competitiveness, total factor productivity growth, increases in GDP, and many more direct economic benefits (Jorgenson, 2005). The World Bank identified a strong relationship between Gross National Income (GNI) and IT development (as measured by the World Bank's IT Development Index, or IDI) (Measuring the Society, World Bank, 2010). It has been found that emerging countries with stronger IT infrastructures attract significantly more business from off shoring, outsourcing, and foreign investment (Laura and Rachel, 2006). IT has also been found to improve enterprise performance in emerging countries by increasing sales, employment, profitability, labor and total factor productivity (World Bank, 2006). AWorld Bank study of 120 countries found that every increase of 10 percentage points in the penetration of mobile phones in emerging countries increases economic growth by 0.8 percentage points. The economic impact in emerging countries is, in fact, much higher than in advanced countries (World Bank, 2006). In one survey of innovative enterprises in Europe, IT enabled about half of all innovations introduced in recent years (Koellinger P, 2005). Across the European Union, 32 percent of companies reported innovations, with IT enabling half of the product innovations and 75 percent of the process innovations (E-Business Watch, 2006).The pervasive use of IT, including hardware, software, applications, and telecommunications, drives entrepreneurship and innovation in virtually every market sector, from farming to computing and government services. Some of the ways in which IT supports entrepreneurship and innovation include: Increases interconnectedness and collaboration; Allows smaller, entrepreneurial companies to compete in global markets; Lowers the cost of entry for new entrepreneurs; Facilitates research diversification and interdisciplinary approaches; Enhances the ability of entrepreneurs to develop new business models, products, services, and processes; Shortens product development cycles; Provides new tools to create, organize, store, and transmit information; Supports disruptive business models that transform industries; and Facilitates faster access to regional and international markets.

3. Methodology

In this research, a quantitative approach will be used by formulating some hypotheses and collecting quantitative data through questionnaires. Chi-square statistical tools are then used to test the validity of the formulated hypotheses. Case study approach is considered to be suitable for the purpose of this research because Technology Incubation Center Kano is chosen, out of 27 such centers in the country, as a case study.

3.1. Population of the Study

In our case, the intended population are the tenants of Technology Incubation Center Kano.

3.2. Sampling Size and Sampling Technique

In order to carry out the work, 100 people are selected randomly from the Centre and various questioners were formulated in accordance with the research questions

3.3. Research Instruments

In this research work, questionnaire, interview, observation, and secondary data from published and internet sources are used to collect both primary and secondary data. Based on research questions, appropriate questions were formulated for the impact of information technology on entrepreneurship at the Centre. Research instruments are in two forms: with the Staff and the other with the tenants of TIC Kano with the aim of knowing how far has the center being achieving its set objectives, and whether IT facilities are being available, accessible and used in administering the center. Also to know the likely constraint that militates against achieving the desired objectives. Fixed formed questionnaire is used in this research work as it provides ready-made written alternatives from which the respondents can simply select, without having to do any lengthy writings in blank spaces as is required in free formed questionnaire. Unstructured interview is also adopted because of its advantages as outlined by (Leedy and Ormrod, 2001). The following ways are used to collect some data for this research using semi-structured open-ended format interview: What IT facilities/infrastructure is available for training tenants in the incubator? What IT facilities/infrastructure is available for the administration of the incubation center?

4. Result

4.1. Questionnaire Responses

The results of questionnaire responses from the tenants of the KTIC are presented in tabular form as follows:

- Question: What is the nature of your business?

Options	Responses	Percentage (%)
Production	19	83
Services	1	4
No response	3	13
Total	23	100

Table 1: Questionnaire Response1
Source: Questionnaire response from KTIC tenants, September 2015

From the table above, we realize that 83% of the respondents are engaged in production, while only 4% are in the services sector, with remaining 3% not responding to the questionnaire.

- Question: What is the ownership structure of your business?

Options	Responses	Percentage (%)
Sole proprietorship	9	39
Partnership	2	9
Corporate	9	39
No response	3	13
Total	23	100

Table 2: Questionnaire Response2
Source: Questionnaire response from KTIC tenants, September 2015

It can be seen that 39% of the respondents businesses are Sole proprietorship businesses, while 9% are Partnerships and 39% are registered as corporate bodies.

- Question: For how long have you been in the center?

Options	Responses	Percentage (%)
Less than 1 year	3	13
B/w 1-2 years	1	4
B/w 2-5 years	16	70
No response	3	13
Total	23	100

Table 3: Questionnaire Response3
Source: Questionnaire response from KTIC tenants, September 2015

From the above tabulated result we can see that 13% of the responding tenants have been there for less than one year, another 4% between 1-2 years, and 70% between 2-5 years.

- Question: Could you have *access* to the same facilities you are now enjoying if you were not admitted as a tenant of this center?

Options	Responses	Percentage (%)
Yes	6	26
No	14	61
No response	3	13
Total	23	100

Table 4: Questionnaire Response4
Source: Questionnaire response from KTIC tenants, September 2015

From the result above, 61% believed that without the center, they could not have access to the facilities they are using, at least not at the same or lower cost. 26% opined otherwise. This shows that the incubation center has succeeded in providing needed facilities to majority of the entrepreneurs under incubation.

- Question: Could you have achieved the same success you are now enjoying if you were not admitted as a tenant of this center?

Options	Responses	Percentage (%)
Yes	18	78
No	2	9
No response	3	13
Total	23	100

Table 5: Questionnaire Response5
Source: Questionnaire response from KTIC tenants, September 2015.

From the result presented above, we can see that only 9% of the respondents believe that they could achieve the same success even if they were not admitted in the incubation center. But 78% of them are of the opinion that their present success is made possible by the center. This is a positive outcome.

- Question: Does the infrastructure provided in the center facilitate your business activities?

Options	Responses	Percentage (%)
Yes	19	83
No	1	4
No response	3	13
Total	23	100

Table 6: Questionnaire Response 6
Source: Questionnaire response from KTIC tenants, September 2015

The above result shows that 83% have agreed that the infrastructure provided in the center is facilitating their business activities, while the remaining 4% opined otherwise. Although some entrepreneurs in the incubation center believe that still more needs to be done in terms of provision of infrastructure, especially in the ICT sector, yet they expressed some level of satisfaction with level of infrastructure provided in the center.

- Question: Does the infrastructure provided in the center ease your start-up financial burden?

Options	Responses	Percentage (%)
Yes	20	87
No	0	0
No response	3	13
Total	23	100

Table 7: Questionnaire Response7
Source: Questionnaire response from KTIC tenants, September 2015

The above result shows that all the respondents (100%), excluding the non-responding tenants, have agreed that the infrastructure provided in the center has the effect of easing their start-up fin

- Question: Does the center provide you with the necessary management counseling assistance?

Options	Responses	Percentage (%)
Yes	20	87
No	0	0
No response	3	13
Total	23	100

Table 8: Questionnaire Response 8
Source: Questionnaire response from KTIC tenants, September 2015

This result table also shows that, with the exception of the non-respondents (13%), all the respondents (87%) asserted that are receiving the necessary management and counseling assistance they needed to succeed as entrepreneurs.

4.2. Responses to IT Related Questionnaire
The responses relating to availability, access and use of IT facilities are summarized in the following table (Table 9).

S/N	QUESTION	RESPONSES							
		YES		NO		NO RESPONSE		TOTAL	
		#	%	#	%	#	%	#	%
1	Do you have access to a computer?	19	83	1	4	3	13	23	100
2	Do you have computer skills?	17	74	3	13	3	13	23	100
3	Do you have access to internet?	15	65	5	22	3	13	23	100
4	Do you have an email address?	15	65	5	22	3	13	23	100
5	Do you know how to use it?	15	65	5	22	3	13	23	100
6	Does the incubation center have any ICT facilities (such as computers)?	20	87	0	0	3	13	23	100
7	If yes, do you have access to such ICT facilities?	20	87	0	0	3	13	23	100
8	Do you use such ICT facilities?	17	74	3	13	3	13	23	100
9	Has your work being made easier and more cost effective by using ICT facilities?	17	74	3	13	3	13	23	100
10	Could the center achieve the same success if ICT facilities were not used?	19	83	1	4	3	13	23	100

Table 9: IT Questionnaire Response

4.3. Interpretation of the Result
From the above result, 83% of the respondents have access to computers and those that have the skills to use is (74%) which is slightly less. It should be noted that the percentage of those that have computer skills is the same as those that makes use of it. This is an indication that lack of computer skills could be a barrier to the use of IT in incubation centers and elsewhere. When it comes to the use of internet, the percentage of those who have access to it and having e-mails and use it falls to (65%). This shows that not all those that have computer skill and have access to it use it to access the internet, and not all of them use e-mailing services of the internet. This calls for intensified sensitization of the incubator tenants on the usage and advantages of the internet to an entrepreneur and his business. We can also see from the above result that although 83% of the incubator tenants believe that the center could not achieve the same success if IT facilities were not used, meaning they appreciate the importance of the role such facilities play, yet it a smaller percentage (74%) of them that use it to their advantage.

5. Test of Hypothesis
The four hypotheses formulated in this project are tested using Chi-Square as follows:

5.1. Test of Hypothesis #1
Hypothesis #1 states that:

- H0: The Technology Incubation Center Kano has no significant impact on the entrepreneurship development in Kano State.
- H1: The Technology Incubation Center Kano has significant impact on the entrepreneurship development in Kano State.

Chi-Square statistical method is used to test the hypothesis at hand. The expression for Chi-Square is given as follows:

$$\chi^2 = \frac{\sum(f_0 - f_e - 0.5)^2}{f_e}$$

Where χ^2 is the calculated Chi-square value, f_0 is the observed frequency, and $f_e$is the expected frequency of the event under study. But before we proceed we need to calculate our degree of freedom, df, from our tabulated result. This is given as:
Degree of freedom,
df = (No. of columns -1) x (No. of rows -1), which in our case is
df = (2 -1) x (2 -1) = 1 x 1 = 1.
Now using 1 as a degree of freedom and 0.05 as our level of significance, α. by consulting the Chi-Square table we have$\boldsymbol{\chi^2 = 3.841}$.

Responses	f_o	f_e	$f_o - f_e - 0.5$	$(f_o - f_e - 0.5)^2$	$\frac{(f_o - f_e - 0.5)^2}{f_e}$
Yes	18	10	7.5	56.2	5.62
No	2	10	-8.5	72.25	7.225
Total	20	20			**$\chi 2 = 12.845$**

Table 10: Test for hypothesis #1
Source: Questionnaire response from TIC Kano tenants

5.1.1. Interpretation of the Hypotheses

From the above statistical result, were we calculated $\chi^2 = 12.845$, and using the value of the tabulated Chi-Square (3.841), we can conclude that the Null-hypothesis is rejected, and the alternative hypothesis is accepted, based on the fact that $\chi_0^2 > \chi^2_1$, i.e. 12.845> 3.841 (See figure 1).In other words, the Null-hypothesis which states that "The Technology Incubation Center Kano has **no** significant impact on the entrepreneurship development in the State," is rejected, and the alternative hypothesis which states that "The Technology Incubation Center Kano has significant impact on the entrepreneurship development in the State" is accepted.

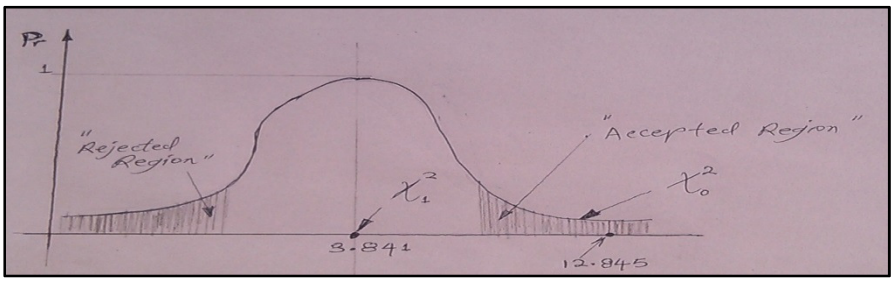

Figure 1: Normal Curve of Chi-Square Values for$\chi 2 = 12.845$.

5.2. Test of Hypothesis #2

Hypothesis #2 states that:

- H0: The Technology Incubation Center Kano has not succeeded in reducing the failure rate of new enterprises caused by start-up hurdles.
- H1: The Technology Incubation Center Kano has succeeded in reducing the failure rate of new enterprises caused by start-up hurdles.

Referring to table 12, which tabulated the responses to the questionnaire related to the hypothesis at hand, we can see that the calculated value of**$\chi^2 = 20.05$.** This is greater than the value found from the Chi-Square table (3.841).

Responses	f_o	f_e	$f_o - f_e - 0.5$	$(f_o - f_e - 0.5)^2$	$\frac{(f_o - f_e - 0.5)^2}{f_e}$
Yes	20	10	9.5	90.25	9.025
No	0	10	-10.5	110.25	11.025
Total	20				**$\chi^2 = 20.05$**

Table 11: Test for hypothesis #2
Source: Questionnaire response from TIC Kano tenants

5.2.1. Interpretation of the Hypotheses

From the above statistical result, were we calculated **$\chi^2 = 20.05$**, and using the value of the tabulated Chi-Square (3.841), we can conclude that the Null-hypothesis is rejected, and the alternative hypothesis is accepted, based on the fact that$\chi_0^2 > \chi_1^2$, i.e. 20.05 > 3.841(See figure 2). In other words, the Null-hypothesis which states that "The Technology Incubation Center Kano has **not** succeeded in reducing the failure rate of new enterprises caused by start-up hurdles," is rejected, and the alternative hypothesis which states that "The Technology Incubation Center Kano has succeeded in reducing the failure rate of new enterprises caused by start-up hurdles" is accepted.

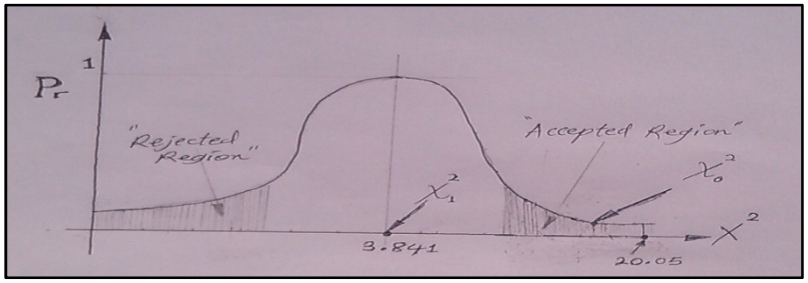

Figure 2: Normal Curve of Chi-Square Values for χ2 = 20.05.

5.3. Test of Hypothesis #3

Hypothesis #3 states that:

- H0: Information Technology (IT) has no significant impact on the operations and management of incubators.
- H1: Information Technology (IT) has significant impact on the operations and management of incubators.

Referring to table 15, which tabulated the responses to the questionnaire related to the hypothesis at hand, we can see that the calculated value of χ^2 **= 16.25.** This is greater than the value found from the Chi-Square table (3.841).

Responses	f_o	f_e	$f_o - f_e - 0.5$	$(f_o - f_e - 0.5)^2$	$\frac{(f_o - f_e - 0.5)^2}{f_e}$
Yes	17	10	8.5	72.25	7.225
No	3	10	-9.5	90.25	9.025
Total	20				χ^2 **= 16.25**

Table 12: Test for hypothesis #3
Source: Questionnaire response from TIC Kano tenants

5.3.1. Interpretation of the Hypotheses

From the above statistical result, were we calculated χ^2 **= 16.25**, and using the value of the tabulated Chi-Square (3.841), we can conclude that the Null-hypothesis is rejected, and the alternative hypothesis is accepted, based on the fact that $\chi_0^2 > \chi_1^2$**, i.e. 16.25 > 3.841** (See figure 3 next page). In other words, the Null-hypothesis which states that "Information and Communication Technology (IT) has **no** significant impact on the operations and management of incubators," is rejected and the alternative hypothesis, which states that "Information and Communication Technology (IT) has significant impact on the operations and management of incubators," is accepted.

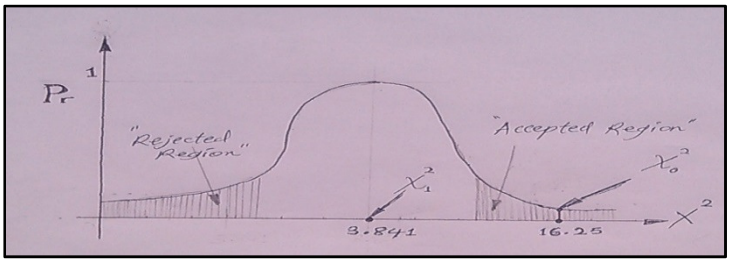

Figure 3: Normal Curve of Chi-Square Values for χ2 = 16.25.

5.4. Test of Hypothesis #4

Hypothesis #4 states that:

- H0: IT has no significant impact on the success of entrepreneurial activities in technology incubators.
- H1: IT has significant impact on the success of entrepreneurial activities in technology incubators.

Referring to table 4, which tabulated the responses to the questionnaire related to the hypothesis at hand, we can see that the calculated value of χ^2 **= 9.850.** This is greater than the value found from the Chi-Square table (3.841).

Responses	f_o	f_e	$f_o - f_e - 0.5$	$(f_o - f_e - 0.5)^2$	$\frac{(f_o - f_e - 0.5)^2}{f_e}$
Yes	17	10	6.5	42.25	4.225
No	3	10	-7.5	56.25	5.625
Total	20				χ^2 **= 9.850**

Table 13: Test for hypothesis #4
Source: Questionnaire response from TIC Kano tenants

5.4.1. Interpretation of the Hypotheses

From the above statistical result, were we calculated $\chi^2 = 9.850$, and using the value of the tabulated Chi-Square (3.841), we can conclude that the Null-hypothesis is rejected, and the alternative hypothesis is accepted, based on the fact that $\chi_0^2 > \chi_1^2$, **i.e. 9.850 > 3.841**(See figure 4). In other words, the Null-hypothesis which states that "IT has **no** significant impact on the success of entrepreneurial activities in technology incubators," is rejected and the alternative hypothesis, which states that "IT has significant impact on the success of entrepreneurial activities in technology incubators," is accepted.

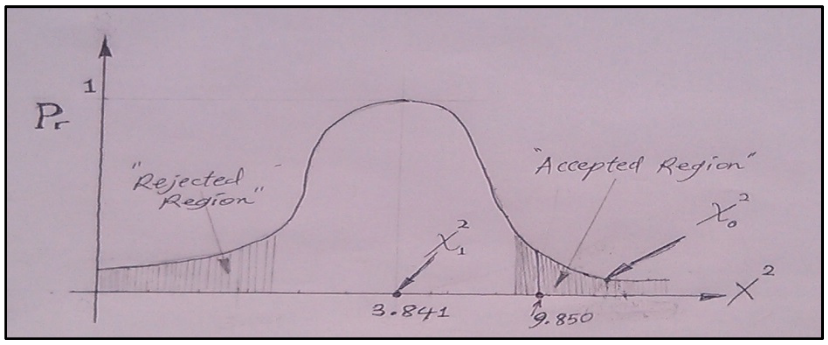

Figure 4: Normal Curve of Chi-Square Values for χ2 = 9.850.

6. Discussions

From the results, analysis and interpretations, the Technology Incubation Center Kano has offered a lot to entrepreneurs in the State to overcome the usual financial, managerial and infrastructural hurdles that cause the failure of start-up enterprises. To be more explicit, the incubation center offers financial leverage by reducing the cost of securing a space within which to start, basic infrastructure such as workshops, offices, printing press, water supply, electricity, machineries, internet access, etc. It also provides management counseling and assistance, lack of which, in most cases leads to premature failure of most beginning enterprises. In addition, it establishes relationships with federal and state universities, polytechnics, research institutions and enterprises (small, medium and large) and links entrepreneurs with such bodies according to their needs and stage of development. The center also provides post-graduation programs that help small scale enterprises survive the turbulent waters of the harsh and competitive business environment.

In terms of information technology (IT), the TIC Kano, has provided computers at the centers' administrators, most of which are networked.

The Kano incubator has provision for internet access using V-Sat controlled by Galaxy backbone and a wireless router to provide internet access and access to the center's e-library to the entrepreneurs located anywhere within the incubation center.

Findings have revealed that IT has significant and positive impact on entrepreneurship development in general, and in Kano State through the agency of Technology Incubation Center Kano in particular.

7. Conclusions

The importance of technology incubator centers in entrepreneurship development cannot be over emphasized. Technology incubation centers serve as fertile land on which small and medium scale enterprises are sawn and grown to harvest. Incubators provide a shared facility for start-up and young firms. Firms in incubators benefit from business assistance services, networking opportunities, and flexible blow-market rental services. Entrepreneur firms enter the incubation centers as tenants, spend a period of time within the facility, and then graduate when the business is viable and could be competitive in the market. Incubators provide tangible benefits to firms, such as lower operating costs and access to services, as well as intangible benefits such as moral support, professional advice from administrators and other tenants, and access to information. On the role IT plays in developing entrepreneurship through the agency of incubation centers, it is evident that it is used by both the administers in running the incubation programs as well as the tenants to operate their businesses cost- effectively. Some entrepreneurs use computers to keep their accounts, as well as product and customer information. The internet access provided in the centers help entrepreneurs to reach far and wide to advertise their products, also to search for relevant information from the Web. Despite the myriad of advantages presented to entrepreneurs by modern IT, yet there are problems in reaping such advantages in our incubation centers. The most important hindrance is lack of awareness of what IT offers to entrepreneurs, as well as lack of computer skills. Yet; entrepreneurs that were not computer literate still use such IT facilities such as GSM phones to access and keep track of their customers. Some use Radio Stations in town to advertise and create awareness to their products. Findings have reviled that IT has significant and positive impact on entrepreneurship development in general, and in Kano State through the agency of Technology Incubation Center Kano in particular.

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