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Application of Probability Theory in Small Business Management in Nigeria

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Abstract
The paper is on the application of probability theory in small business firms in Nigeria. It looks at the rate small business firms fail despite the programmes of government directed at their survival. The continued failure has resulted in a wide gap between the haves and the have-nots. The application of probability theory in small business is examined to find the implications and in restoring the gap between the rich and the poor through better and informed decisions. The survey design was adopted in the study. The instruments for gathering data for the study were mail questionnaire and interview guide. The population of the study was 1625 small firms in Enugu State, South East Nigeria. A sample size of 345 small firms was considered adequate for the study. The findings indicate that probability theory has wide application in small business firms; probability shows specificity in business situations and is inevitable in this era of information overload caused by ICT. It is recommended that small business firms especially those in the fashion industry should learn and apply probability theory since there line of business was more prone to chance occurrences.
Keywords: Probability Theory, ICT, Specificity.

1. Introduction

Decision-making has remained a front line function of managers. No doubt managers are paid mainly for making decisions. These decisions are varied and pervade all the departments and levels in any organisation. Many small business firms and indeed big firms survive where others fail. The reason for failure or survival of firms is based on the quality of decisions by the managers/owners (Okeke, 2009:18). In this era of globalisation and information and communication technology, the world has compressed to a village and only informed decisions can ensure that firms navigate, survive and the thrive.

Information, in the wake of globalisation may not be in short supply, but the astuteness of the manager in being proactive and taking timely and accurate decisions determines the wellness of the business firm. Decisions are hardly taken on the basis of certainty. No man claims absolute knowledge of all the variables or the probability of all the variables that impinge on a decision but decisions are still made on daily basis. These decisions affect human capital, machines, information technology, finance and materials, which are the resources of any firm. Since all variables and or outcomes cannot be known with certainty, the probability of each variable or outcome may be determined to aid decision and the decision process. Probability, which is the chance of an uncertain event happening, can be learned and applied in business (Sims 2001:25). It is common knowledge as Olagunju (2005:11) reiterates that any attempt made to reduce the level of uncertainty in the decision making process will to a large extent increase the chances of intelligent and well-informed decisions. This means that risks in business will be avoided or minimized if future events are accurately estimated or forecast. This can only be possible if we improve our knowledge and application of probability theory in business. The choice made between or among alternatives is what is usually called decision-making. Choices to invest in a stock, to increase inventory level, to increase advertising level, to market a new product or support a given political party or candidate are laden with uncertainties, yet they are made on daily or routine basis.

In the small business firms, the problems of decision-making are more pronounced and the incidents of wrong decisions are higher (Eboh 2009:87). The focus of this study is on how to determine and apply in a business situation the probability of occurrence of any outcome/event, and how to determine the quality and accuracy of information available in this period of information overload.

1.1 Statement of the Problem and Objectives

Small businesses in Nigeria have continued to fail despite government facilitative agencies. The failures of these businesses tend to indicate an internal operational procedure dislocation. As Idemobi (2008:2) insists, the biggest resource of any entrepreneur is himself. His activities to a large extent determine how far he will go in

the competitive environment. According to Chukwuemcka (2006:18) the competitive environment faced by small businesses is compounded and complicated by ICT. The total result is that poverty continues to mount and the gap between have and have-nots is fast approximating the distance between heaven and earth (Udeze, 2000:12-18). A new thinking has to be evolved. The sole proprietor's internal organisational tactics, processes and tools of decision making must be examined. The study therefore looked at one of such management tools - probability to find out to what extent its application has contributed to the present situation and poverty in the land with emphasis on small businesses in Enugu metropolis of Enugu State.

The main objective of the study was the determination of application areas of probability. The study had the following sub-objectives:

i. To find out the relationship between quality decision and the probability approach applied
ii. To find out the relationship between experience in decision making and probability approach for a given decision
iii. To find out whether small business firms are more prone to chance occurrence than other businesses.
iv. To find out the areas in small business where probability theory can be applied, and
v. To find out the impact of information and communication technology on the use of probability theory in small business.

In order to accomplish the objectives, the following questions were asked and answered:

i. Is there any relationship between quality of decision and probability theory?
ii. Is experience an alternative to probability theory?
iii. Do probability approaches show some forms of specificity?
iv. Are there areas probability theory can be applied in small business?
v. Has ICT negatively affected knowledge of probability in small business?

To answer the questions and achieve the objectives of the study, the following hypotheses became imperative:

i. There is a significant relationship between quality decision and probability theory
ii. Experience is an alternative to probability theory
iii. Probability approaches show forms of specificity
iv. There are areas of application of probability in small firms.
v. ICT has negatively affected knowledge of probability theory in small firms

2. Review of Related Literature

2.1 Theoretical and Conceptual Framework

Probability theory is the science of uncertainty (Mason and Lind, 1993:162). This theory allows the decision maker with limited information to analyze the risks and minimize the gamble inherent in making a decision. The earliest application of probability theory was in gambling. The theory of probability was first developed in the 17th century when gambling games were analyzed by the French mathematician Blaise Pascal (Rosen, 1991: 250). Pascal in his studies of probability discovered properties of binomial co-efficient. In the 18th century, another Frenchman, Laplace, (1749-1827), who was also studying gambling defined the probability of an event as the number of successful outcomes divided by the number of possible outcomes. The popular opinion is that combinatories and the probability theory share the same origins. The works of Laplace in the two areas afford great opportunity to introduce probability as a ratio of favourable outcomes to total number of outcomes of an experiment. Although Laplace is known for his contributions to celestial mechanics, the study of the motions of heavenly bodies, his work *"Traite de Meuninque Celeste"* is considered one of the greatest scientific works of the early 19th century; he made efforts in probability theory. Laplace was one of the founders of probability theory and made many contributions to mathematical statistics. His work in the area of probability documented in his book *"theories Analytique des Probabilities" became* the foundation of early probability theory and mathematical statistics.

The history of probability theory that links it with gambling was corroborated by Webster (1992:124) when he states "history is filled with references to the principles of probability. In the 1600s, Jacob Bernoulli (1954-1705), a member of a Swiss family of mathematicians, set forth many of the basic laws of modern probability, Thomas Bayes (1702-1761) and Joseph Lagrange (1736-1813) were also among the early pioneers of probability theory". He (Webster) suggests that early accounts indicated that probability had its origin in ancient forms of gambling and games of chance. Webster's account continued with a graphic exposition by Gerolamo (1501-1576), where it was stated that almost 2000 years ago, Roman soldiers originated many of our present day gambling games just to pass the time between their campaigns to subjugate most of the civilized world.

No doubt, what started as a pass time activity of soldiers has become a veritable tool for business growth

and survival. It is also not surprising that gambling has brought one of the best tools of management because man has since been faced with adaptability and survival instincts from the medieval times. The nature of man is economic and plans, programmes and procedures are usually adopted in the best economical manner. The small business arena is replete with stories of failures, upstarts, start-ups, navigational problems and most recently de-marketing (a self defeatist approach) as found among banks in Nigeria. The economic meltdown has not helped issues either; probability theory which originated in the 17" century from gambling clamours for adoption in Wall Street, Allen Avenue, Kubua, Okpara/Garden Avenue, etc; all in Nigeria. The world has grown beyond gambling with its crudest notation of unplanned chance game. The new thinking is on how business can survive through programmed change and proactive ingenuity of entrepreneurs and business managers in the face of globalisation (Anyanwakoro, 2009:134).

The basic theoretical framework is as Mason and Lind (1993:162) put it, "since there is considerable uncertainty in decision making, it is important that all the known risks involved be scientifically evaluated". The implication of the above statement is that decisions and outcomes should not be left to chance. Where information or data are available, a secure approach should be to scientifically analyze them. This presupposes a procedural approach, which lends itself to replication. The statement does not suggest that every amount of information regarding a situation must be obtained before a decision is taken. It rather can be interpreted that probability theory is necessary when there is limited information to analyze the risks and minimize the inherent gamble in the decision-making arena.

Probability, conceptually, according to Mason and Lind (1993:163) "is a measure of the likelihood that an event in the future will happen; it can only assume a value between 0 and I inclusive". The above definition of probability is corroborated by Webster (1992:12) when he states "probability is the numerical likelihood, measured between, 0 and 1 that an uncertain event will occur". Before taking up other concepts of probability we must understand that events occur at random. Since random events engage our attention in the world of business, probability may be defined as the chance of a random event happening. It is also noteworthy that probability can be measured in fractions, e.g. ½, $^1/_3$, ¼, $^1/_{20}$ etc. and decimal e.g. 0.01, 0.03, 0.4, 0.6 etc.

While Mason and Kind (1993) and Webster (1992) aptly indicate that the measure of probability is between 0 and 1, some authorities take this for granted. Nwabuokei (1996:131) dwells on probability theory and states, "it is concerned with the study of random events". He (Nwabuokei) further sees random events as events, which may occur or fail to occur when a statistical experiment is performed. Lueey (1988:7) sees probability as "the quantification of uncertainty". Okeke (2001:107) however joins Mason and Lind, and Webster and sees probability as "a measure of the likelihood of an event occurring and it always takes values between zero and one, both inclusive". It is clear that in business, probability connotes the same meaning of determining the likelihood of an event happening with a measure between zero and one, both inclusive.

The concept of probability comes with three other important concepts: experiment, outcome and event. An experiment is the observation of some activity or the act of taking some measurement. Okeke (2001:107) sees experiment "as an act or process that leads to a single outcome that cannot be predicted with certainty". It is clear therefore that an experiment can be planned and controlled, while forces beyond the control of the experimenter set others. An outcome, particular result of an experiment, can be favourable (desired) or unfavourable (not desired). An event is a collection of one or more outcomes of an experiment. A graphic example is used below to drive the above definitions home. **Experience**: Observe whether or not a car starts when ignition is turned to the "on". **Possible Outcomes:** Yes it starts, no it docs not start. **Possible Event:** It docs not start

2.2 Random Variables

Random variables have probability of occurrence. When variables can be counted they are said to be discrete. The probability distribution associated with discrete random variable is called discrete probability distribution. Technically, some random variables consist of exclusive and exhaustive outcomes; such random variables result in discrete variables and hence discrete probability. In business, the number of defective items from production lines, number of telephone calls, number of industrial accidents etc is often encountered. The probability of such events will enhance decision, definitely.

2.3 Relationship between Events

The probability of an event occurring can be made easily if the relationship between the events is known (Orga, 2009:23). Events relate to each other in different ways and should be known before a proper or correct estimate of the probability of occurrence is made. Five relationships between events are usually considered in business. They include mutually exclusive, collectively exhaustive, independent, complementary, and joint events. The probability of winning a contract after winning another depends on the relationship If the contracts are not mutually exclusive, the probability of the first will not affect the second and vice versa.

2.5 Cost and Probability

Cost has become a major factor in business consideration whether or not for profit organisation. Probability helps to reduce cost. Nwabuokei (1986:215) in showing need for sampling insists that, "the need for statistical inference is dictated, among other things, by the fact that it is usually an expensive venture to carry out complete enumeration of all the units in the population". Probability as a tool for statistical inference provides us with a technique of obtaining estimates of unknown population parameters, with desired degrees of precision, by studying associated sample statistics. The average monthly income, the population of defectives, etc can be estimated if probability theory is applied.

2.6 Approaches to the Study of Probability

There are usually two broad approaches to the study of probability: objective and subjective. Objective approach is subdivided into classical (a priori) and relative frequency (posteriori). Mason and Lind (1993:167) state that, "classical probability is predicated on the assumption that the outcomes of an experiment are equally likely". It should be noted that the assumption of mutually exclusive and collectively exhaustive set of events is also important. In this case, the classical case, the probability of an event can be found as a ratio of the number of favourable outcomes to the total number of possible outcomes.

The classical approach was developed and applied in the 16th and 17th centuries to games of chance such as cards and dice. We may not need an experiment (in the strict sense of it), to determine the probability of a head turning up when a fair coin is thrown up once. The logic is that since there are two faces of the coin, and the coin is supposedly a fair one, only one face will be up at a time, therefore the probability of head is 0.5 or ½ or 50 per cent. This scenario is possible in all binomial events in business. The manufacture of defective or non-defective items, stock in or stock out etc; are common place and the probability can be estimated, measured and analyzed (Ezeodili, 2009:1 8-30).

The classical approach is â priori approach and it is a before event approach of determining probability of an event happening. The relative frequency approach allows events to unfold. The probability of an event happening in the long run is determined by observing what fractions of the time events happened in the past after a large number of observations (Okeke. 2001:110). This simply means that the probability of a favourable event can be found as the ratio of number of times event occurred in the past to the total number of observations. A study may be commissioned to determine the probability that a particular business graduate will be employed in an area other than his or her course of study. If out of seven hundred (700) observed graduates of business, only forty (40), worked in their area of study, the probability of a freshman, after graduation, getting a job say in marketing department instead of accountancy will be 0.057. This indicates a remote outcome, so it is less likely that a graduate of business gets a job in his/her area of study after graduation. This is typically, a relative frequency approach.

The subjective approach is a personal thing based on experience or expertise. Subjective probability as Nwatuokei (1996:141) informs "is the likelihood of a particular event happening that is assigned by an individual based on whatever information is available". This means that subjective approach could be resorted to when no previous records exist, and when the event has not happened before, This also suggests that expert opinion may be all that is necessary, for instance in business, to develop a new product or employ a new appraisal method.

It should be recalled at this point, that prominent mathematicians like John Venn, Thomas Bayes. Pierre Laplace among others had done tremendously well in the area of probability theory. Thomas Baycs, a reverend minister in a bid to answer the question he posed “does God exist? Came up with what Laplace called Bayes Theorem. Simeon Poisson and JameS Bernoulli made outstanding contributions to the area called discrete probability. Some of these authorities sought probability from effect to cause; others from cause lo effect. In this area of conditional probability, Bayes gave an astounding formula.

$$P(A/B.) = \frac{P(A).P(B/A)}{LP(A).P(B/A)}$$

2.7 Decisions in Management

The rapid development made in areas such as operational research, which deals primarily with the quantitative basis for decisions and the works of Chester Bernard and Herbert Simon have lent recognition to management decision-making. Lucas (1978:165) defines decision as "the selection from alternatives". Life is an endless process of selection, either consciously or unconsciously from alternatives. Unconscious selection comes about automatically perhaps partly resulting from instinct and partly from the training and conditioning to which an individual has been subjected from birth. Enudu (1991:18) believes that "conscious selection is itself affected by all sorts of attitudes and the values of which a person may be unaware".

It presupposes that a good manager anticipates arrival of difficult problems requiring logical analytical decision-making and tries to set in motion the machinery for providing the necessary information and also

appropriate analytical techniques. Managers of small businesses must make out time for analysis of the nature of problems and examination/evaluation of the alternative solutions with their likely consequences. Big organisations can survive by organisational "fiat" (Nwachukwu, 1988:129). This means that large organisations have considerable powers of survival. This is not the same with small firms which most of the time have their survival built on luck rather than any conscious effort to survive; decisions here are rarely programmed.

Decisions are of long range and short-range types. Enudu (1992:25) writes that the long-range decisions are taken at the top and cover company policies and broad objectives. Short span decisions are made at lower level management and cover specific problems and milestones often in specialized functional areas. In all fields of management, costs of alternative lines of action have to be assessed when making decisions; the assumption is that managers seek the cheapest way of achieving a result. Costs are affected by quality of output, equipment, the business system and wider environment and reliability of machines and suppliers. All decisions involve the cost-benefit analysis to obtain optimal solutions to the problem.

Only a decision that considers all the impinging factors (constraints) can be termed 'optimal'. If quantitative estimates of say costs and gains can be placed on different brunches of a decision tree and if in addition, estimates can he made of the probabilities of events over which the decision maker has no control, then we may work back through the tree. Where probabilities come into it the expected value of the different branches may be calculated by multiplying the cost or gain of each by the probability and adding. The highest expected value of gain or the lowest expected value of cost is chosen.

The preceding explanation is adopted from the work of Richard Bell on the *Principle of Programming* as quoted in Lucas (1978:102); "The Bellman's principle of optimality states that an optimal policy implies that whatever the initial state and the initial decision, the remaining decisions must be optimal; with regard to the state resulting from the first decision" This is the working back process,

Imaga and Dibua (2004:51), quoting Imaga state that "the quantitative techniques are becoming so fashionable and indispensable to modern business analysis that no one completely figure blind can afford to remain comfortable in this field in the years to come". The above statement has come true. There is no aspect of business management that has not now gone quantitative", for instance, staff turnover, appraisal of staff, recruitment, inventory management, operational research, small business management and ratio analysis and others. The certainty and clarity of decisions are key issues and problem solutions are made simpler by the application of the quantitative methods. Probability theory being an aspect appears sine qua non to decision making especially at the top level irrespective of the size of the business.

2.8 Characteristics and Challenges of Small Business Firms

Small business is no doubt important in entrepreneurial promotion and economic development of any nation. The absence of entrepreneurial skills and spirit of self-reliance among our graduates are responsible for the present level of unemployment. The current effort to re-structure and re-focus graduates is in line with the changing realities of our present society; getting a business started and running it is no less a herculean task more so when the proprietor is not abreast with modern techniques of planning, probability theory inclusive. Business insolvency leading to bankruptcy or liquidation (failure) is something we can never really predict with absolute certainty (Idemobi 2008:140). We can however avoid it by looking at symptomatic issues like dealing with sales, erosion of working capital, declining profit and increasing debt burden. These symptoms of failure are the precursor of bankruptcy or liquidation, which may be predicted by the application of simple probability techniques.

However, the nature of small manufacturing firms (businesses) makes it difficult to keep tract of the symptoms earlier mentioned and the result is failure or bankruptcy of the firms. The basic characteristics or nature of small manufacturing firms (businesses) sole proprietorship, low capital accumulation, location problems, death of experts, fill in objective and low number in the payroll affect and shape the way they respond to changes. Among the challenges of the small businesses are under capitalization, government policy changes and information overload as a result of Internet access. Others are low education and analytic ability to handle business trend, harsh economic situation and poor infrastructure; including power supply, high cost of living and inconsistent government policy on small and medium enterprises. Societal values, which shifted from honesty to conspicuous consumption and fragrant dishonesty, have replaced hard work with short cuts. Many people believe that in Nigeria, the less you work the more you earn, and the more you work the less you earn (Eze, 2005:23).

The above challenges are enormous and result in high mortality rate of small firms including manufacturing firms. A cursory look indicates many small firms do not last for more than ten (10) months. Government demolition of illegal structures and revocation of lands, high cost of lending (now double digits) and the general economic meltdown or global financial crisis combine to make the establishment and profitable operation of a small enterprise a mirage/an illusion. It is however expected that internal factors of management and sound decision may increase the shelf life (life span) of small business firms.

The technique of probability estimates resulting from accurate record keeping and analysis of data will elongate the life span of small firms in Nigeria.

2.9 Application of Probability in Small Business Firms

Probability theory is today widely applied in many business situations as earlier noted. Some discrete probabilities are applied in production planning and control, while others are applied in lot acceptance sampling. The above assertion too is corroborated by Webster (1992:199) when he states, "probably common business application of the binomial distribution relates to the decision whether to accept a shipment (lot) of goods from the manufacturer; this decision is based on how many defective goods may be in the shipment". It must be realized that firms will generally return an entire shipment of goods if there is evidence that more than a certain number is defective. The determination of number of defective units in a production run, the number of sales expected and number of students who took vacation jobs in a particular company is usually done using binomial probability.

The determination of financial loss associated with a business policy may be done using Poisson probability. Normally if a financial loss as a result of a policy has a low probability, over time, it may be decided that the policy be undertaken irrespective of the loss. Probability (hyper-geometric probability distribution) has been employed in determining the merit of a case of discrimination against women in Johnson District Court in Kansas City, USA, (Webster, 2007). It should be noted that hyper-geometric probability distribution is used if a sample is selected without replacement from a known finite population and contains a relatively large proportion of the population, such that the probability of success is measurably altered from one selection to the next. The impact of queuing system on business may be determined using the exponential probability distribution. This may lead to scraping a system, employing more staff and/or equipment, employing new technology (Lucey, 1988:102). Other types of probability can be employed appropriately to make decisions.

The foregoing not only x-rayed some of the business applications of probability theory but also identified types of probability distributions and the specific areas they can be employed. The discrete probabilities like binomial, Poisson and hyper-geometric are applied where values can be counted like number of defectives, lots, discriminations and average time spent in a queue. The continuous probability distributions like the chi square, normal, student-t etc are employed where the values can assume fractional scale. Examples include consumption of megawatts of electricity, income generation, analysis of customer tax returns etc. The approach adopted not only depends on the type of event but also on experience of the decision maker (Eze, 2005:18) .

Sims (2006:212), assures that experience is the best teacher and many business decision makers desirous of applying probability theory resort to experience- experience in the area of application and expertise in determining the probability of outcome of the event. This statement is allied to the approaches to the study of probability earlier mentioned in the paper. Where the events have occurred several times and where expert advice is sought, experience is resorted to (Eze, 2005:20). The man who had always succeeded would he asked to say something. The success of a surgical operation can be detained **â** priori by the expert surgeon. A business man who has observed events for a reasonable time may hazard a guess, this time. Probability estimate therefore may be based on experience. Small business that lacks the appropriate tools to determine the probability of an event may decide to ask an expert or just hazard a guess.

2.10 Decisions Requiring Probability Theory

Decisions requiring probability theory include whether or not a new product could be bought and at what quantity, the quality control test of manufactured products that should lead to better and high quality goods being turned out without testing all the products being manufactured (Webster, 1992:140). The last decision environment requires sampling, as destructive tasks may be required and no company can afford to destroy a large quantity of its goods for the purposes of quality control. Insurance and actuarial practices are firmly based on the principles of probability theory. (Aneke, 2002:171) asserts that the life insurance rates we pay depend on the mortality tables, which are based on the probabilities of death at specific ages. Property and auto insurances are also based on probability estimates. Probability has a role in estimating the number of defective units in the manufacturing process, the likelihood of receiving payment on accounts receivable. According to Webster (1993:123), probability "plays a role on the likelihood of potential sales of a new products and professional odd-making for sporting events". Other business areas in which probability must be sought include decisions on shift of time for a television programme, the profitability of a new developed product if marketed, marriage, make or buy, and voting a particular candidate in an election. Because these areas are full of uncertainty, probability theory is usually adopted in reducing the risks and gamble inherent.

2.11 Probability Theory and ICT

This is the information age. The greatest problem of the business manager today is information overload and the

nature of small businesses is such that they are constantly affected by the physical environment and government policy (Ezeodili. 2009:19). The environment and government policy have witnessed tremendous change in the past eight years following the advent of global system for mobile communication. The world has not been the same again and small businesses have continued to adjust and adapt to the myriad of changes in both the external and internal environment of the business engendered by on line, real lime information flow. Globalisation has turned the world into a global village and things are no longer done in secret. Inventions, oil price changes, new methods etc are found on the Internet and businesses are in constant adjustments. The nature of small businesses hardly allows them to have proactive measures (Rosen 1991:211). The ICT age therefore has made it difficult for small businesses to predict outcomes with any level of certainty. Changes are sure, the magnitude and effect are not known; business management becomes a herculean task.

3. Method and Materials

In the study descriptive survey design was adopted. The study was conducted in Enugu urban, in Enugu State Nigeria. The population of the study was 1,625 small business firms registered with NACCIMA, Enugu State as at 1^{s1} January. 2011. The sources of data were both primary and secondary. The Taro Yamane formula for adequate sample size was adopted which showed that 345 small firms were adequate for the study. Mail questionnaire and personal interview were adopted in the collection of primary data for the study. The questionnaire was made of 20 items, 15 of which were “Yes” or “No", while 5 items were open ended, and 15 items were listed in the interview guide. The questionnaire and interview guide were utilized to collect data for the study from chief executives.

The instruments were tested for predictive validity using Pearson’s Product Moment Coefficient of Correlation. The result yielded 0.85, which was good. The reliability of the instrument was tested using a pilot survey. A further test was conducted using Cronbach’s alpha; it yielded a reliability coefficient of 0.8. The data were analyzed using frequency tables and simple percentages.

4. Analysis and Findings

There was 100 percent response rate.

Table 4.1: Distribution of the Opinion of Respondents on the Impact of ICT on the use of Probability Theory

Responses	Frequency	%
Great impact	297	86.10
Little impact	31	9.00
No impact	15	4.30
Undecided	2	0.6
Total	345	100

Source: Field Survey. 2011

Table 4.1 shows that (297) 86.10 percent of the CEOs) accept that ICT has great impact on probability theory; (31) 9 percent are of the opinion that ICT has little impact while. (15) 4.5 percent believe ICT has no impact and (2) 0.6 percent were undecided.

Table 4.2: Distribution of the Respondents (CEOs) on Areas of Application of Probability

S/N	Areas of Application	Frequency	%
1.	Research	184	53
2.	Sales Forecasting	301	87
3.	Production Planning	207	60
4.	Inventory Control	150	52
5.	Production Control	191	55
6.	New Product Development	125	36
7.	Medicine	40	12
8.	Resource Scheduling	215	62
9.	Acquisition and Replacement of Assets	115	33
10.	Estimation of the Useful life of an Equipment (Asset)	101	29
11.	Quality Control	200	58
12.	Shutdown Decision	112	32

Source: Field Survey, 2011

Table 4.2 reveals that 301 (87 percent) of the respondents (CEOs) were of the opinion that probability is applied in sales forecasting; 180 (52 percent) said application was best for inventory-control, while 207 (60 percent) indicated it should be applied in production planning. Table 4.2 also reveals that 200 (58 percent) of the CEOs indicated quality control for the application of probability. Also 184 (53 percent) insisted that the best area to apply probability was in research, while 191 (55 percent) said it was better applied in production control and resource scheduling. Table 4.2 also reveals that 115 (33 percent) were of the opinion that probability is applied in decisions affecting acquisition and replacement of assets. 101 (29 percent) indicates that probability among other areas is applied in the estimation of the useful life of equipment (assets). 40 (12 percent) were of the opinion that probability is applied in medicine, new product development and shutdown decisions.

Table 4.3: Distribution of Firms on their Proneness to Chance Occurrence

	Firms				
Proneness	Apparel Fashion	Restaurant	Technical	Total	%
Highly Prone	216	14	20	280	81
Prone	30	10	75	45	13
Not prone	10	4	6	20	6
Total	256	58	31	345	100

Source: Field Survey, 2011

In table 4.3 shows 280 (81 percent) of the CEOs accept that their business was highly prone to chance occurrence, while 45 (13 percent) believe it was prone and 20 (6 percent) were undecided.

Table 4.4: Distribution of CEOs on the Approaches to Probability

Approach to probability	Fashion/ Apparel	Restaurant	Technical	Total	%
Subjective	48	30	50	125	36
Objective	92	65	65	220	64
Total	140	95	110	345	100

Source: Field Survey, 2011

Table 4.4 shows among other details that 125 (36 percent) of the CEOs adopted subjective approach, while 220 (64 percent) adopted objective probability approach.

Table 4.5: Distribution of Respondents According to Experience and Errors Found in Decisions

Years of experience	No. of times targets were not met/errors found in decision	%
0 - 2	20	40
3-5	18	36
6-8	6	12
9-11	3	6
12-14	2	4
1 5 and above	1	2
Total	50	100

Source: Field Survey, 2011

Table 4.5 shows that between 0-2 years of experience, on the average 20 times (40 percent) targets were not met; while between 3-5 years experience, 18 (36 percent) of the targets set were not met. Also the table 4.5 reveals that between 6-8 years experience, on the average 6 (12 percent) of the time, targets were not met. 9 - 11 years, 3 (6 percent) of the time targets were not met. While for 12 14 years of experience, 2 (4 percent) of the time targets were not met. The table 4.5 also indicates that for years of experience of 15 and above, 1 (2 percent) of the time, the target was not met.

From the analysis, the following areas of application of probability were identified: production planning, inventory control, sales forecasting, production control new product development, medicine, research, resource scheduling, acquisition and replacement of asset, estimation of the useful life of equipment, shutdown decisions, and quality control.

Approximately 67 percent of the chief executives (respondents) believe that probability theory was suitable in sales forecasting, 55 percent believe it was best suited for production control and detection of defective items and taking shutdown decisions, while 53 percent believe research was an appropriate place for probability theory. When asked to rank the twelve areas of application of probability identified, most of the chief executives (70 percent) had the following ranking with sales forecasting as the number one. Others were inventory control, research, product planning, production control, quality control, resource scheduling; acquisition of assets, new product development, shutdown decisions, medicine, and estimation of useful life of assets.

On the quality of decision and probability approach adopted, 80 percent of the respondents who used an objective approach said their decisions were error free. Quality decision was for the purposes of the study determined as proneness to or remoteness from error. At *5* percent level of significance, the difference in the opinions was not statistically significant.

On the place of experience in decision making, it was found that nothing could replace experience. The greater the number of years of practices by the chief executive, the higher the quality of decisions and the greater the use of subjective approach. Knowledge of probability affected its use by even willing chief executives. Most of the CEOs, (15 percent), lacked knowledge of probability theory.

On whether some small businesses were more prone to chance occurrences, it was found that those who engaged in fashion and seasonal sales and production were the hardest hit by chance occurrence. Nothing seemed stable in such businesses as little time was afforded them to make changes before another change became inevitable. At 5 percent level of significance, the differences in the opinions of the CEOs were significant indicating that some businesses were more prone than others. ICT has made it imperative and easy to use probability theory as SPSS and other packages are available.

On the impact of information and communication technology on the use of probability theory, it was found that the rate of change in the economy was further heightened by ICT. Most of the chief executives found it difficult to cope with the rate of organizational change which was triggered by ICT. As one of the chief executives said everybody seems to be on the edge as changes occur almost on hourly basis, and there is need for executive information system.

On the suitability of approaches to particular situations, it was found that objective approach was preferred where records were kept, while the subjective approach favoured people with many years of experience and where the phenomenon or decision .area was new.

5. Conclusions and Recommendations

Probability theory originated from games and gambles of soldiers in the 16th and 17th centuries. The age of this theory notwithstanding, there are only two known approaches: objective and subjective to its study. The experience one has determines to a large extent the approach adopted. Experts and new product developers adopt subjective approach while managers who have record of events or understand the nature of events adopt objective approach. Probability theory can be applied in areas of new product development, production planning and control, quality control, insurance and actuarial practices, games and gambling, stock analysis or inventory control and investment analysis, and business forecasting. Probability theory shows much specificity as the nature of event determines the type of probability approach to employ. It would be wrong to adopt a relative frequency approach when the event can be estimated â priori. Quality decisions will also be assured if the appropriate approach is utilized to estimate the probability of an event.

Small businesses are prone to chance occurrences. Also changes affect small businesses quickly. The fashion business is more likely to be affected by changes and their probability of success more difficult to estimate. Information and communication technology has affected small business adversely as information overload has afforded many small business operators little chance to adjust between changes, although, ICT has created more jobs, looking at the number of people involved in GSM operations.

It is recommended that probability theory be applied in sales forecasting, production planning, inventory control, resource scheduling, medicine, quality control, research, estimation of life of an asset, shutdown decisions, new product development, acquisition and replacement of assets and production control. It is recommended that subjective approach be avoided as much as possible, especially where records are kept. It is recommended that small businesses should keep records. Small businesses especially those in the fashion industry, should utilize probability theory as their businesses were more prone to chance occurrences. There should be access by small businesses to internet facility to improve on information gathering. It is recommended that adequate knowledge of probability be amassed to ensure that business decisions are not left to chance. Finally, it is recommended that knowledge of probability theory be made compulsory to students of business to improve its application in a business situation.

References

Aneke, .J. I. (2002) *Insurance in Nigeria*, Enugu New Generation Books
Anyanwakoro, (2009) "Strategies for Creating Sustainable Corporate Improvement in Hanks" E*SUT Journal of Management Sciences*, Vol. 5, No. 1, April.
Chukwucmcka, E.O. (2006) *Public Administration*, Enugu: HRV
Eboh, F. E. (2009) The Role of Organization Development, Consultants and Power Play on the Manufacturing Sector in the South Eastern Nigeria, *ESUT Journal of Management Sciences*, Vol. 5, No. 1, April.
Enudu, T. O. (1999) *Business Policy: An introductory Analysis*, Enugu: New Generation Books.
Ezcodili, W. (2009) Assessment of the Performance of the Public Complaints Commission in Redressing Administrative Delays in Nigeria: A case of Public Complaints Commission Enugu *ESUT Journal of Management Sciences*, Vol. 5, No. 1, April.
Eze, F. O. (2005) Nigerian Public Enterprise and Poverty Alleviation: An Examination of the Relationship Between Electric Power Supply on the Performance of Selected Small-Scale Businesses in Enugu Metropolis, *ESUT Journal of Management Sciences,* Vol. 1. No. 1
Frederick, S and Gerald, J. L. (1995) *Introduction to Operations Research,* USA, McGraw Hill Inc
Idemobi, Ellis (2008) *Starting and Managing Small Business Enterprises Successfully* Enugu: Nolix Educational Publications.
Imaga, E.IJ.L and Dibua E.C.D (2004) *Theory and Practice of Business Forecasting and Decision Analysis,* Enugu: JAMOE Enterprises.
Lucas, H (1978) *Companion to Management Studies: A Survey of Ideas, Theories and Concepts Relevant in Management*, London: William Heinemann Ltd.
Lucey, T (1988) *Quantitative Techniques: An Instructional Manual*, 3rd ed; London: DP Pub.
Mason, R. D. and Lind D. A. (1993) *Statistical Techniques in Business and Economies,* Boston M.A.: IRWIN INC
Nwabuokei, P. (1986) *Fundamentals of Statistics* Enugu: Koruna
Nwachukwu, *C.* C. (1988) *Management Theory and Pra*ctices, Onitsha: African Fep. Pub. Ltd.
Okcke, A.O. (2001) *Foundation Statistics for Business Decisions*. 2nd Ed. Enugu: Macro-Academic Pub.
Okekc, J. 1. (2007). Probability in Business Decisions, *Financial Standard*, Vol. 9, No. 433.
Orga, C. C. (2009*) Probability Theory and Its Applications in Business*, Enugu: Veamaks Publishers.
Rosen, K (1991) *Discrete Mathematics and Its Applications*, 2nd Ed, USA: American Telephone and Telegraph Co.
Sims, R. D. (2006) *Fluman Resource Management: Contemporary Issues, Challenges and Opportunities,* USA: Laf. Age Pub.
Udeze, J. O. (2000) *Human Resource Management,* Enugu Ilugotez
Webster, A (1992) *Applied Statistics for Business and Economics*, Boston M.A.: IRWIN INC.