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# RELATINGTHE APPLICATION OF MANAGEMENT SCIENCE (MS) SKILLS IN DECISION MAKINGIN NIGERIAN MANUFACTURING ORGANIZATIONS TO PERFORMANCE OF THE ORGANIZATIONS: ASTUDY OF SOME SELECTED FIRMS IN ENUGU STATE NIGERIA

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Business environment in recent times has become very complex and uncertain. So the of rule of the thumb (guess work, personal judgments, assumptions, hunches etc) in decision making is no longer feasible. The upsetting rate of business failures in this part of the world, attributed majorly to wrong decisions based on the rule of thumb have made it necessary to ascertain the nature of the relationship between the applications of Management Science (MS) skills in decision making in manufacturing organizations and performance of these organizations in Nigeria. Survey research design was used for the study involving the use of questionnaire for data collection. Population of study includes 86 decision makers in the selected organizations. The entire population of study was used since the size of population is manageable. Data generated was analyzed based on the research question. The study revealed that there was a significant correlation between the application of MS skills in decision making and performance of the manufacturing firms studied. The paper concludes that significant correlation exists between the application of MS skills in decision making and performance in the manufacturing firms. The paper therefore suggest that manufacturing organizations such as INNOSON Nigeria Limited, and Juhel Pharmaceuticals Emene should make training to acquire MS Skills an organizational wide policy because of its relevance to effective decision making and its eventual impact on organizational performance.

**Keywords:** Management Science Skills, Decision Making, Organizational performance, Nigerian Manufacturing Industry.

## INTRODUCTION

In centuries past, Management experts: Max Weber, Henri Fayol, Fredrick Taylor and Peter Drucker (to mention but a few) have developed and established Management theories, structures and systems some of which have endured up to this time. Henri Fayol's "Administrative Management principles" elevated the study of Management from the shop-floor to the total organization; Max Weber's concept of bureaucracy provided a structure to organize specialized functions and to standardize procedures to achieve maximum efficiency and Taylor's "scientific management" movement of the early 1900s held that the scientific observation of people at work would reveal the single best way to do any task; these theories though subsequently tempered with behavioural approaches and contingency and systems theories, they still maintain an enduring effect on management thinking right up to the present day when technology has connected and wired the entire world , turning it into a global village (Murphy, 2013).

"The rule of thumb" i.e. relying on guesses, hunches, intuitions, assumptions, judgments based on past experiences, work records and events; which was the traditional method of making Management decisions and solving organizational

problems. This was the case before the dawn of the 19th century when Fredrick Taylor came up with the scientific Management theory that herald the birth of Management Science (MS). In 967, management science was first applied in solving Management problems; Stafford Beer regarded that as decision science (Mingers & White, 2010). It came handy as competition in the recent business world has turned crazy and more aggressive. Many complex planning, resource allocation and priority setting problems throughout industry and business have defied simpler decision making procedures; Management Problems with high stakes, involving human perceptions and judgments, call for a more rational and scientific approach to their solution (Kanwal-Rai,2004).Management Science (MS) explains the method of improving management decisions using models developed for the purpose; including the use of scientific, statistical and analytical procedures to Management problems/ decisions. The ability to apply science to Management effectively makes one a Management Scientist; and for decision makers to apply MS effectively they need MS skills: analytical and critical thinking skill, Creative and innovative thinking skill and then Problem solving skill.

For every organization that has been established there exist a set of objectives/ goal, no organization exists without objectives hence achieving these objectives makes it successful. In order to achieve this set of organizational objectives, resources are being used; these resources are usually limited, no organization can boast of having sufficient resources, no matter how buoyant the organization may be (by resources we mean: human resources, financial resources, raw materials and equipment and other facilities available to the organization). In order to procure and commit them optimally, mangers need to make ideal decisions, which will thus determine the extent to which these resources are successfully used to achieve objectives (that is what management has been about). The objective of every organization (profit making, nonprofit making, manufacturing or service) has always been productivity, which implies making maximum profit with minimal cost. Given that resource are limited, it therefore lies in the hands of managers of these resources (as a duty and responsibility) to optimize their usage. The optimization of the use of these organization resources require that in performing their managerial functions, managers at all levels have the responsibility of making decisions on the best possible way to optimize and commit organizational resources in order to efficiently achieve organizational objectives; this is what Management has always been all about. Though there are lots of definitions of management, some authors such as, Griffin (2000); Williams (2005); Wright and Neo (1996), Eze (2006); Egbo (2007) and Koontz, O' donell and Welhrich (1983) are all in agreement that Management involves making decisions on the efficient and effective allocation of organization's available resources through some basic functions (planning, organizing, directing, controlling and coordinating) towards achieving the objectives of the organization (Udeze, 2013).

Hence in order to effectively manage organizational resources, the right decisions regarding the commitment of available resource in order to help achieve organizational objectives, is expected. In performing the traditional managerial routine functions: planning, organizing, directing, controlling and coordinating; managers definitely make decisions, Managers encounter complex situations as they perform these functions; decision making therefore becomes the way out of these difficult/complex Management situations and problems. Decision making has always been an integral part of Management. Ugwu (2008) asserts that Managers spend 90% of their official time making decisions; this indicates that, no matter their level, Managers in performing all the traditional functions of Management make decisions and therefore spend more than three quarter (¾) of their official time making critical decisions on a daily basis for the attainment of their organization's objectives.

These decisions involve the mobilization and allocation of organizational resources; decisions of what to do, how to do it, who to do it, with what should it be done, what quantity should be used etc. Decisions that could Marr or make the organization, Decisions that could "upgrade" i.e. turn the organization around or "upside down," Decisions that could solve or aggravate Management problems. The efficacy of these management decisions and choices determines the performance of the organization. The effectiveness/efficacy of these organizational decisions therefore depends on the techniques and skills applied in making such decisions. The exposure of the decision makers (managers) to the skills and tools required to make efficient decisions is equally important. Though these traditional structures passed to us have endured, some of them have become slower and by day unable to withstand the pressure of rapid change in a hyper competitive world caused by intense innovation and technological change (Murphy, 2013).

## STATEMENT OF THE PROBLEM

Before the emergence of MS, the "rule of thumb" was applied in solving management problems and making decisions. Some decision makers continued with the rule of thumb while some switched to the MS techniques. Recent technologies have led to a new information/knowledge-based economy in which the business environment has become increasingly uncertain; organizations amazingly complex, while customers have become more aware and knowledgeable and therefore more demanding. Competition in the marketplace has become very stiff. All these have increased the magnitude of management problems. Therefore making them more complicated and ambiguous and subsequently defying the traditional methods of decision making. Effective Decision making and Management are no longer matters of guesses, hunches and judgment based on experiences giving the complexity, uncertainty and

ambiguity of the environment. It has become necessary to select the best from a multitude/range of alternatives, arrive at optimal solutions/decisions in risk dominated environment to solve complex management problems. The ambiguity in objectives, information, alternatives and lack of probability in the present business decision making environment has made decision making an uphill task. Making an effective decision hence requires a more superior technique. The drastic and desperate nature of recent management problems demands that more rational, drastic and desperate techniques/measures be used in solving them after all desperate problems requires corresponding desperate measures.

Managers who have experienced the changing nature of work, complex organizations environment, customers' constant changing expectations, have responded to these changes by applying a more rational technique, through the application of MS skills to beat these complications. However, some other organizations have folded up as soon as they started, some have been stagnated due to inefficiency resulting from wrong choices made regarding the commitment of the available resources; most managers have sent their organizations to their early graves, objectives are never achieved because resources have been misallocated and misused. Inappropriate and wrong choices were made which have jeopardized the many objectives of the organization. The alarming rate of failure in businesses due to wrong decisions in the optimization and commitment of organizational resources have created the need for this study.

## OBJECTIVE OF THE STUDY

The specific objective of the study is to ascertain the nature of the relationship between the application of MS skills in decision making and performance of the selected Manufacturing Organizations.

### Research Question

This research question was used:

1. What is the nature of relationship between the application of MS skills in decision making and performance of the selected Manufacturing organizations?

## CONCEPTUAL FRAMEWORK

### Management Science and its Skills

The term Management Science (MS) can also be called Decision Science: it can also be called Operational Research (OR), though Stafford Beer (1967) called it "the business use of "OR". MS Employing techniques from other mathematical sciences, such as mathematical modeling, statistical analysis, and mathematical optimization, operations research arrives at optimal or near-optimal solutions to complex decision-making problems (Wetherbe, 1979).

This can also be likened to the use of scientific and analytical methods, which could be why in Litterer (1978), quoted in Ewurum (2010), MS was defined as "the application of scientific methodology in making more explicit, more systematic and better decisions."Consistent with this, MS was also defined as a discipline that deals with the application of advanced analytical methods to help make better decisions." In addition, it was pointed that MS (OR) is at times considered as a sub-field of mathematics. Scientific and analytical methods simply mean rational and logical reasoning and approach to the development of models that explain and predict real-life and real-world situations and/or behaviours. Although businesses and management may not seem like pure science, many of their underlying discipline involve scientific ideas e.g. accounting, economics, production and operations management are based on the pure science of mathematics. Marketing and Human resource management (HRM) are based on the behavioural science of psychology and sociology. All these disciplines made observations about their environment (e,g. the effects of advertising on market) and describe and analyse them to provide information. The process of observing, describing, analyzing and drawing conclusions forms the basis of scientific methodology. When we apply this process to management, we call it MS, hence thus decision involving MS are usually rational, clear, superior, reliable and usually more effective (Dewhurst, 2002).

### Management Science skills

Those who have acquired the MS Skills are referred to as "Management Scientists". MS Skills simply put, justifies the proficiency required to apply or use the scientific or analytical methods in the improvement of management decision making. The acquisition of the knowledge or know-how of how to apply the scientific or analytical methodology in solving management problems or making management decisions is what we call MS Skills. The ability to comprehend and

manipulate scientific and analytical methods/techniques in making decisions is also known as Ms Skills (Cottrell, 2011). The following make up the MS skills:

**a. Analytical and Critical thinking Skill**

Analytical and Critical thinking Skill is that skill that gives that decision maker the ability to visualize, articulate, and solve both complex and uncomplicated problems and concepts and make decisions that are sensible and make decisions that are sensible and based on available information. Critical and analytical thinking means looking very closely at the detail of information and not taking what you have read or heard for granted **, y**ou are expected as an analytical thinker to be very critical of your sources, using evidence that has been well researched rather than just your own opinion or what friends think. Analytical thinking will also mean that a decision maker will be able to critically scrutinize, analyze and examine information before accepting it. This will enable the decision maker to choose only correct and reliably rational information that will in turn give rational/effective decisions (Cottrell, 2011).

To think analytically involve describing a skill like driving a car. It can be taught, learned and it can improve with practice; but like many other skills like riding a bike, it is not learned by sitting in the classroom and being told how to do it, analysts learn by doing it (Heuer, 1999).

Analytical skills will help decision makers to be able to cope in the real world, relate to the ability to identify and articulate complex issues or concepts, evaluate solutions and reach a sound conclusion. This could include:

- Seeking out relevant information
- Evaluating information effectively, identifying key concepts
- Consider various ways of assessing the issue or topic
- Reaching a logical conclusion or recommendation
- Also, with analytical thinking, you use facts to support your conclusion and train of thought. On the other hand, critical thinking is more of an opinion-based style of thinking. Analytical skills lead you to have a more focus and stream-lined approach to solution finding where critical thinking skills can go around in circles infinitely. When you have a complex-problem or solution to find, you would use your analytical skills.

**b. Creative or Innovative thinking Skill**

According to Brown (2011) Creative thinking skills use very different approaches to critical thinking skills; it involves a much more relaxed, open, playful approach. Creative thinking skill is about a decision maker's ability to make innovative imaginations and suggestions; seeing potentials in every opportunity that shows up. This can require some risk-taking. Creative thinking skills involve such approaches as:

- Looking for many possible answers rather than one.
- Allowing you to make wild and crazy suggestions as well as those that seem sensible.
- Not judging ideas early in the process - treat all ideas as if they may contain the seeds of something potentially useful.
- Allowing you to doodle, daydream or play with a theory or suggestion.
- Being aware that these approaches necessarily involve making lots of suggestions that are unworkable and may sound silly.
- Making mistakes.
- Learning from what has not worked as well as what did.

Creative thinking really involves:

✓ **Decision maker's State of mind**: Creative thinking is as much about attitude and self-confidence as about talent. Creativity is often less ordered, structured and predictable Creativity and emotions

✓ **Creativity and emotions:** Strong emotional self-management is often needed in order to allow creative thinking states to emerge. It is important to be able to cope with risk, confusion, disorder and feeling that you are not progressing quickly.

**Techniques of Creative thinking**

Decision makers can think creatively in several ways. Some of these techniques as spelt out by Cottrell (2011) are:

- Brainstorm ideas on one topic onto a large piece of paper: don't edit these. Just write them down.

- Allowing yourself to play with an idea whilst you go for a walk.
- Draw or paint a theory on paper.
- Ask the same question at least twenty times and give a different answer each time.
- Combine some features of two objects or ideas to see if you can create several more.
- Change your routine. Do things a different way. Walk a different route to college.
- Let your mind be influenced by new stimuli such as music you don't usually listen to.
- Be open to new ideas: find ways of making things work and push the idea to its limits.
- Ask questions such as 'what if….?' Or 'supposing….?'

**c. Problem solving Skill**

We all solve problems on a daily basis, in academic situations, at work and in our day-to-day lives. Some of the problems that are typically faced by management are stated below as range of problems solved by MS in the next point. Being able to assess all aspects of a problem or situation and evaluating the possible ways of resolving it, is what problem solving is about. Solving management problems and making management decisions requires that the manager should possess the right skills to resolve these problems, and the personal resilience to handle the challenges and pressure they may bring.

They may need to be able to: Evaluate information or situations, Break them down into their key components, consider various ways of approaching and resolving them and decide on the most appropriate of these ways. Solving these management problems effectively especially with the complexity that comes with them requires both analytical and creative skills**,** depending on the problem and the manager's role in the organization. Analytical and critical thinking skills help managers to evaluate the problem and to make decisions, logical and methodical approach is best in some circumstances: for example, you will need to be able to draw on your academic or subject knowledge to identify solutions of a practical or technical nature. In other situations, using creativity or lateral thinking will be necessary to come up with ideas for resolving the problem and find fresh approaches. Some other prominent skills needed in problem-solving are team working**,** communication, persuasion, negotiation, Initiative, Logical Reasoning and Persistence; it also requires Statistical skills, a Strong background in data base management control and manipulation of information, computer programming skills and Ability to analyze problems and build mathematical models to develop solutions and arrive at quality decisions. These skills are also important in finding solutions to problems involving people (McNamara, 2018). Fundamental steps in problem-solving: identify the problem, define the problem, examine the options, act on a plan and finally look at the consequences.

**Range of Management problems that can be solved by the Application of MS includes:**

- Scheduling airline (both plan & crew)
- Complex decision making (arriving at the optimal solutions or near optimal
- Managing the flow of water from reservoirs
- Identifying future development paths for the telecommunications industry.
- Problem of maximization of profits, performance and/or minimization of risks, loss, cost.
- Establish the information needs and the right systems to supply within the health service.
- Identify and understand the strategies used by firms for their job information systems.
- Can be used for soft-operational analysis which concerns methods for strategic planning, strategic decisions.

The use of mathematical Models do not come up in challenges like this, non-quantitative models and used. (www.linkedin.com/skills/skill/operations)

**Steps in Management Decision making applying MS techniques/skills**

Making decisions with MS requires that scientific procedures be followed in the decision making process. Opentextbc (2017) lists the following steps:

1. Observation of the problem environment following the awareness of a problem, the management scientist closely observes the widely cause of the problem with a view of making corrections.
2. Analysis & definition of problem; this involves:
   - Stating the objectives of the research
   - Clearly defining the problem in terms of the type and also the nature of its solutions.
3. Develop models (a representation of reality) to help solve the problem
4. Acquiring input Data: The collection of data here depends on the type of model chosen. The type of model, gives us insight as to the kind of data to collect.

5. Developing and testing solutions: At this stage the researcher manipulates the model with the new test to determine its effectiveness.
6. Analysis and Results: Here the effect and implications of the solutions to the problems of the organization as a whole is being accessed.
7. Implementation: the solution is implemented and monitored to ascertain its efficacy.
8. Use of Models: models are representations of the reality. A guide to understanding a problem. e.g. of models are: budget, balance sheet, income statements etc.

**MANAGEMENT DECISIONS AND MS/OR SKILLS**

It makes sense to make the best use of available resources. Today's global markets and instant communication means that customers expect high-quality products and services when they need them, where they need them. Organizations, whether public or private, need to provide these products and services as efficiently possible and this requires careful planning and analysis which is the hallmarks of good OR/MS. This is usually based on process modeling, analysis of options or business analytics (decision science)". In business, predictive models exploit patterns found in historical and transactional data to identify risks and opportunities. Models capture relationships among many factors to allow assessment of risk or potential associated with a particular set of conditions, guiding decision-making for candidate transactions (Coker, 2014).

Since management consists, largely, if not exclusively, of the making and implementation of decisions, it is axiomatic that organizations must be concerned with improved decision-making process. Also the objective of decision analysis is to help a decision maker think hard about the specific problem at hand, including the overall structure of the problem as well as his or her preferences and beliefs. Decision analysis provides both an overall paradigm and a set of tools with which a decision maker can construct and analyze a model of a decision situation (Robert & Reilly, 2017).

The obvious reason for studying decision analysis is that carefully applying its techniques can lead to better decisions. But what is a good decision? A simple answer might be that it is the one that gives the best outcome. This answer, however, confuses the idea of a lucky outcome with a good decision. Suppose that you are interested in investing an inheritance. After carefully considering all the options available and consulting with investment specialists and financial planners, you decide to invest in stocks.

If you purchased a portfolio of stocks in 1982, the investment most likely turned out to be a good one, because stock values increased dramatically during the 1980s. On the other hand, if your stock purchase had been in early 1929, the stock market crash and the following depression would have decreased the value of your portfolio drastically. Was the investment decision a good one? It certainly could have been if it was made after careful consideration of the available information and thorough deliberation about the goals and possible outcomes. Was the outcome a good one? For the 1929 investor, the answer is no. This example illustrates the difference between' a good decision and a lucky outcome: You can make a good decision but still have an unlucky outcome. Of course, you may prefer to have lucky outcomes rather than make good decisions although decision analysis cannot improve your luck, it can help you to understand better the problems you face and thus make better decisions (Robert & Reilly, 2017).

Adelson and Norman (1969) observed that improved/efficient decision is what we get when MS/OR techniques are employed in decision making, when decision makers have MS/OR skills (i.e. they usually employ the use of analytical techniques during decision making or occasions demanding the making of choices regarding the use of organizational resources).If OR/MS is to be of assistance to decision-makers, it is important that its techniques rest on a foundation of a sound theory of decision. It is this sound theory that gives a decision its credibility and classifies it as "improved". It is on the basis of the above that MS is defined as the use of advanced analytical techniques to improve decision-making processes. People with skills in OR/MS hold jobs in decision support, business analytics, marketing analysis and logistics planning also called industrial engineering. It is recognized therefore in its ability to use rational, systematic and scientific methodologies to improved decisions which help arrive at optimal or near optimal solutions to complex decision-making problem that gives us "improved" or "right" and credible decisions and not "lucky" or "guessed" decisions as Mc Donald put it.

Murphy (2013) believes that Conventional theories and practices as laid down before now no longer provide the necessary guidance and support for decision-making in a world of change, complexity and uncertainty. This, he argues should herald the move towards a new management paradigm, in terms of which the management function will be radically redefined to take emerging realities into consideration. According to him, if companies are to prosper to be drivers of their industries, they will need to proactively embrace a new management philosophy that is cognizant of the dynamics of information science, accelerating change, a borderless world, the holistic approach, the New Sciences, as well as the growth of technology. This is in cognizance with what Vinge (1993) who terms it "the dawn of the Technological Singularity."

**Application of MS Skills on Decision making: implications for performance in Nigerian Manufacturing Firms**

MS is actually an approach patronized by Management Scientists in their attempts to come up with Management solutions and decisions that has the ability to withstand the pressure of a complexity-based business world, which is characterized by unexpected change, hyper competition and what it calls the exponential explosion of information science. When Management Science (MS) is applied to decision making it could provide an effective, formal methodology that gives assistance to such complex decision making problems. Applying MS to decision-making problems in Management entails the practical expression/exhibition of MS skills (Murphy, 2013).

Given the complexity in the contemporary organization and therefore management of its resources, MS emerged as a blessing to management of organizations. No wonder Stoner (1982) quoted in Ewurum (2010) points out that "MS seeks to describe, understand, and predict the behaviour of complex systems of human beings and equipments."

All said the objectives of MS remains to improve decisions made by managers at any level through the use of scientific and analytical methods.MS is concerned with developing and applying models and concepts that may prove useful in helping to illuminate management issues and solve managerial problems as well as designing and developing new and better models of organizational excellence. It is further explained that the application of these models within the corporate sector (businesses sector) referred to as MS. The use of MS helps businesses to achieve their goals (arriving at optimal or near optimal solutions to complex decision problems) by the application of scientific methods.MS includes the use of rational, systematic, science based techniques to inform & improve decisions of all kinds. Application of MS is abundant in industries as airlines, manufacturing companies, military, and services organizations and in government. (KanwalRai, 2004).

Apart from natural endowment in problem solving ability, Analytical or critical thinking, computing skills etc, Management scientists are developed through years of study and training in MS as a profession, as a field of study. In addition to managerial skills, managers at all levels should acquire the MS Skills because of the fact that they are always faced with decision making situations. Organizations have gone out to hire management scientists, because their workforce has no MS Skills, this has only increased cost for them, since they are hiring consultants to do the jobs they have been paying their managers to do for them. Globalization of market and operations places tremendous pressure in making timely and accurate decisions using data analysis and more accurate information, this signifies the importance of developing suitable MS/OR techniques and models.

## THEORETICAL FRAMEWORK

Some theories and models in MS/OR include: queuing theory, transportation model, game theory, scheduling, Linear and mathematical programming, decision- support systems, multi- criteria decision making, artificial intelligence, simulation, inventory analysis, project management and a host of others. The following theories are thus reviewed:

### a) Linear Programming

LP is a mathematical model or description of the problems stating relationships which are called straight-line or linear. Linear Programming (LP) is a mathematical model used in finding optimal solutions to problem. These solutions enable managers to make the right decisions that often help achieve organizations objectives or goals (Umoh, 2010).

LP is the most common tool in MS/OR, it is also the management scientists favorite tool because it is simple, easy to understand and robust. By Simple, it means that LP is easy to implement, easy to understand means easy to explain (to your boss) and by robust, it means that it is like the Swiss Army Knife, perfect for nothing but good enough for everything. Though real world problems are close to linearity, none is absolutely a linear problem, which is why it is said in the above that LP is perfect for nothing but good enough for every problem.

Umoh (2010) asserts that the complete mathematical statement of an LP problem includes a set of linear equations which represents the conditions of the problem and a linear function which expresses the objective of the problem. These costs, profits and resources are linked in a linear relationship to form constraints. Onah (2008) also concurred that all LP problems have some common characteristics which enable us to understand and recognize problems that can be solved using LP. These characteristics/properties that provide the structure of an LP model are: An objective function, A set of constraints, A non- negativity constraint, Decision Variables and Parameter.

According to Onah (2008), certain assumptions must be satisfied for an LP model to be used effectively. These assumptions are:

- ✓ Linearity: with respect to the decision variables, the objective function and constraints assume linearity. They produce straight line curves when plotted on graph.
- ✓ Additive: The resources and constraints can be summed up.

- ✓ Divisibility: this means that we can divide the products and the resources. Decision variables with non-integers values are permitted.
- ✓ Certainty: The values of parameter are known with certainty and are constant.
- ✓ Non-negativity: Negative values are not accepted in decision variables. It is believed that we either produce nothing (0) or we produce something (1, 19, 500,600 or any figure at all without negative sign)

**Techniques/methods of solving LP problems**

LP problems could be solved through the Graphical method (lighter problems with a couple of variables), Simplex method ( more complex problems with more than two unknown variables) and then there is "the GNU linear programming kit (GLPK) (a software package intended for solving large- scale LP problems, mixed integer programming (MIP) and other related problems".
While the Graphical method involves the use of graph, the Simplex method uses tableau, the GLPK uses a package with the following components: Revised simplex method (for LPs), Prima- dual interior point method (for LPs), Branch- and - bound method (for LPs), Translator for GNU math programme modeling language, Application programme interface (API) and Stand - alone LP/MIP solver glpsol.

**b) Inventory Analysis**

Inventory Management/Analysis is very important to organization especially manufacturing organization. Inventory management solves problems such as what quantity do we produce? and when do we produce? It eliminates wastes and too much costs and shortages in production.(banishing inefficiency) "Inventory analysis is a technique for determining the optimum/optimal level of inventory for a firm. It commonly employs one of the two formulas: (1) Inventory turnover= cost of goods sold + average inventory (2) Number of day's sales in inventory = inventory at the end of an accounting period + average daily cost of goods sold".

This technique helps us to know how much inventory a firm should have at a particular time, when they should place orders and how much order to place. The efficiency in a firm's inventory level and stock safety is the major concern of inventory analysis or management. Through efficient inventory management/analysis/ optimization, a firm's working capital/ production cost could be reduced, thereby giving them enough room to make more profit than their competitors. Most times it is referred to as warehouse analysis. Inventory analysis /theory like any other technique makes use of models. There are three basic types of inventory: raw materials inventory, work-in-process, finished goods (Umoh, 2010).

**d) Game Theory**

Game theory is the mathematical modeling of strategic interaction among rational and irrational agents. It could involve modeling of conflict amongst firms, trading behaviors in the market, political elections, auctions and various sorts of competitions. Game theory throws out competitions/games and strategies stirring up mathematical thinking and arguments which help arrive at a conclusion/decision. (www.coursera.org/.../game theory) According to the Stanford encyclopedia of philosophy (2010), Game theory is the study of the ways in which strategic interactions among economic agents produce outcomes with respect to the preferences (or utilities) of those agents, where the outcomes in question might have been intended by none of the agents. "The Mathematical Theory of Games was invented by John Neumann and Oskar MorgenSternin in the 1944" Stanford encyclopedia.

Game theory is a study of strategic decision making. More formally, it is the study of mathematical models of conflict and cooperation between intelligent rational decision-makers. It is also called "interactive-decision theory.

**METHODOLOGY**

The survey research method was used for the study, with questionnaire as the measuring instrument. Both primary and secondary source of data were used. In the course of the study Questionnaire and oral interview we used to generate primary data. On the other hand, text books and internet were used in the search for secondary data. The technical and strategic nature of the study demanded the use of key decision makers in the selected organization. Ninety (50 managers and assistants from INNOSON Nigeria Ltd and sixty six (36 managers and assistants from JUHEL were discovered in that category from various departments of these organizations making up a population of eighty six (86) decision makers. The study used the entire population as sample size on the count of Census or Exhaustive sampling technique which permits the use of the entire population of study, especially if it is within manageable size.

## PRESENTATION AND ANALYSIS OF DATA

### Data Presentation

Eighty six (86) copies of the questionnaire were administered to key decision makers who make decisions daily on behalf of INNOSSON Ltd and Juhel Nigeria Ltd. All copies of questionnaire were returned and used for analysis.

### Analysis of the Research Questionnaires

**Table 1: Responses on the nature of the relationship between the application of MS skills on Decision Making and performance in the Nigerian Manufacturing Industry**

| S/N | | SD | D | A | SA | uncertain | Remark |
|---|---|---|---|---|---|---|---|
| 1 | There is a no relationship between the application of MS Skills on Organisational Decision making and performance in the selected organizations | 20 (23%) | 45 (52%) | 15 (18%) | 5 (6%) | 1 (1%) | Disagree |
| 2 | There is a positive relationship between the application of MS Skills on Organisational Decision making and performance in the selected organizations | 4 (5%) | 8(9%) | 47 (55%) | 24 (28%) | 3 (3%) | Agree |
| 3 | Decision makers exposed to MS skills have better chances of making informed decisions | 5 (6%) | 7 (8%) | 32 (37%) | 40 (47%) | 2 (2%) | Agree |
| 4 | Decisions born out of the application of MS skills significantly improve organisational performance | 10 (12%) | 8 (9%) | 35 (41%) | 32(37 %) | 1 (1%) | Agree |
| 5 | Application of MS skills will improve the quality of organisational decisions | 11 (13%) | 10 (12%) | 42 (49%) | 22 (25%) | 1 (1%) | Agree |
| 6 | Effective decision in the organization does not depend on Managers acquisition and application of MS Skills | 30 (35%) | 25 (29%) | 18 (21%) | 7 (8%) | 6 (7%) | Disagree |

65 (75%) of the respondents were in disagreement that “there is no relationship between the application of MS Skills on Organisational Decision making and performance in the selected organizations, while 20 (24%) are in agreement, 1(1%) remained undecided. This implied that there is a relationship between the application of MS Skills on Organisational Decision making and performance in the selected organizations.

Only 12 (14%) of the respondents were in disagreement that “there is a positive relationship between the application of MS Skills on Organisational Decision making and performance in the selected organizations; while 3(3%) remained undecided, a majority of the respondents 71(83%) were in agreement that there was a positive relationship between the application of MS Skills on Organisational Decision making and performance in the selected organizations.

For the analysis on whether decision makers exposed to MS skills have better chances of making informed decisions; only 12 (14%) of the respondents disagreed to that, while 2(2%) remain uncertain, 72(84%) of the respondents were in agreement to the fact that decision makers have better chances of making informed decisions when exposed to MS skills

67(78%) of the respondents were in agreement that decisions born out of the application of MS skills can significantly improve organisational performance; while 1(1%) remain undecided, only 18(21%) disagreed to that. Hence decisions born out of the application of MS skills can significantly improve organisational performance

21(25%) were in disagreement that the application of MS skills can improve the quality of organisational decisions, a greater percentage of the respondents were of the opinion that application of MS skills can improve the quality of

organisational decisions, only 1(1%) remained undecided. This implies that the quality of decision can improve when MS skills are applied in decision making process.

Majority of the respondents 55(64%) were in disagreement that effective decision in the organization does not depend on Managers acquisition and application of MS Skills, 25(29%) which is a minority were in agreement while 6(7%) remain undecided. This only implied that effective decision in the organization depends on Managers acquisition and application of MS Skills,

## FINDINGS

From the above analyses, the study revealed that a significant correlation existed between application of MS skills on Decision making and performance in the workplace.

## CONCLUSION

The complex (uncertain) nature of the contemporary workplace has compelled decision makers to resort to a more superior decision making procedure as such the success of organizations lies on the quality of decisions made. The quality of management decision hence depends on how equipped and competent the decision makers are i.e. on how much of MS skills they have and can apply on decision making process to help achieve organizational objectives effectively.

## RECOMMENDATIONS

Based on the findings of this study, the following are recommended:

1. Management should help decision makers beef up their knowledge; possession and application of MS Skills to enable them face the challenges associated in making effective decisions in the contemporary ever changing and complex business environments.

2. INNOSON, JUHEL and other success driven organization existing in today's dynamic business environment filled with uncertainty should not only include the use of MS Skills in decision making as a policy but should also commit all efforts and resources towards its implementation This will ensure that, no matter the urgency, decisions must pass through scientific and quantitative methodology (MS).

3. The study also recommends that managers and decision makers should be rewarded or recognized for each decision and problem solved by the use of MS/OR skills and techniques, that will go a long way to motivate them to apply MS skills in making decisions and thus improve the organization's management, enabling/empowering these organizations to stay competitive in today's business environment filled with turbulence and uncertainty.

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