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Mobile Science Project: Promoting Active Methodologies through Environmental Workshop in Schools

By Anelise Leal Vieira Cubas, Ana Regina de Aguiar Dutra, Elisa Helena Siegel Moecke, Rachel Faverzani Magnago, Ritanara Tayane Bianchet, Karina Suldovski Pilarski & Marina Medeiros Machado

University of South Santa Catarina

Abstract- The main objective of this project is to investigate how active methodologies, based on workshops with environmental themes, can help high school students to learn subject matter in the area of the chemistry, physics and mathematics sciences and enhance their awareness of the importance of the preservation of the planet. In this study, 13 schools were visited in 4 years. During this time they participated in workshops that involved the use of residues to produce new materials, to provide environmental education regarding the reuse of waste and concepts embedded in the chemistry, physics and mathematics sciences. The results highlight that most of the students (98%) found the Mobile Science project interesting, 97% enjoyed participating in the workshops. Regarding the content of the workshops, 92% of the students answered positively; that is, the workshops were related and helped to understand the exact sciences. The Mobile Science project is part of the Unisul´s actions aligned to sustainable development goals (SDGs), UN 2030 Agenda.

Keywords: environmental education, pedagogical practices, mobile science, active methodologies, workshops.

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Mobile Science Project: Promoting Active Methodologies through Environmental Workshop in Schools

Anelise Leal Vieira Cubas [α], Ana Regina de Aguiar Dutra [σ], Elisa Helena Siegel Moecke [ρ], Rachel Faverzani Magnago [ω], Ritanara Tayane Bianchet [¥], Karina Suldovski Pilarski [§] & Marina Medeiros Machado [χ]

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I. Introduction

According to the PISA (International Program for Student Assessment) 2015 report, which evaluates the knowledge of 15-year-old students in mathematics, reading and science, in 72 countries, Brazil has not advanced in recent years, reaching 63rd in science, 59th in reading and 66th in mathematics. Given this scenario, developing initiatives, such as new pedagogical practices is necessary to improve these results in future evaluations.

In schools in the UK the Rotherham THAW project was developed (Taking Home Action on Waste), being the first to seriously attempt to systematically measure the impact of school-based waste education on levels of recycling and residual waste in homes in neighborhoods of the schools. The results have provided conclusive evidence that such education programs can play a key role in developing children's knowledge regarding sustainable waste management (Maddox et al., 2011).

Author α σ: Professor in the postgraduate in Environmental Sciences - University of South Santa Catarina (Unisul), Palhoça, SC, Brazil. e-mails: ana.dutra@unisul.br, anelisecubas@gmail.com

Yeung et al. (2017) have identified factors in these teaching approaches that lead to success. In terms of knowledge acquisition and behavioral changes, the quantitative results suggest that the pre/post-test in-group differences were significant in both groups. More importantly, a significant positive change in attitude was observed in the gaming simulation group only. In the interviews, participants attributed effective knowledge acquisition to the active learning element in class, while the characterization of cognitive dissonance triggered in the gaming simulation induced subsequent effective changes.

It is important to understand and analyze the conceptions that the teachers have at different levels of education (primary, secondary, and higher education), regarding the paradigm in which environmental education (EE) is treated as a methodology strategy and designed for this practice. The researchers sought to detect possible reductionism, determinism and fragmentation in the conceptions of these teachers. The results show that there is interest in a reflexive view that is closer to complex thought in the treatment of EE. However, reductionism was associated with the difficulties inherent in its practice in which the treatment of EE is placed as well as the methodological strategies used and/or designed for this practice (Valderrama-Hernández and Limón, 2017).

Stegmann & Westhuyzen (2014) highlighted an initiative called Remida in Hamburg, Germany. This project collected residues and wastes from small and large companies to be used by schools, or other institutions, for creative projects. In this activity, school classes of all ages visited the center to select materials and gather inspiration for their work. In this way, the children learned essential life skills of good recycling skills and how to contribute towards a cleaner environment, both being essential life skills.

In their studies on the theme "Development of Ecological Place Meaning" in Bronx Borough of New York City, observed that urban environmental education helps students to recognize ecological features and practices in cities. Through narrative research with educators and students in urban environmental

education programs, the value and practice of developing this meaning of ecological place is understood. So, the project help students appreciate the ecological aspects of cities and develop their imagination in terms of how their environment could be improved (Russ et al., 2015).

In Vietnam, they developed a project related to the environmental education of elementary school students. The study surveyed 247 students in January 2014 at two primary schools to assess the students' knowledge regarding solid waste management. Students had a basic understanding of the environment, but their knowledge of this theme was limited. A year later, an environmental education workshop was held with the students. The results showed that 96% of the students were interested in activities involving solid waste management. Also, the study found that there were changes in the students' knowledge before and after the environmental education activities (Hoang and Katoh, 2016).

Karatekin (2013) studied the perception of elementary students regarding environmental problems via the mind mapping technique. The research involved 88 students in 5th, 6th, 7th, and 8th-grade classes at an elementary school in Ankara, they were asked to draw their own mind maps related to environmental problems. These maps were then qualitatively analyzed through documental review. The results showed that elementary students were most concerned about environmental issues, 'such as air and water pollution, waste issues, and global warming. Students had a low level of confidence regarding solutions to environmental problems.

In Israel, the "green school certification" took place, which is a sustainability program that which is a sustainability program that contemplates changes in school operations, introducing sustainability content into the school curriculum and building links with local communities, seeking to change students' attitudes (Goldman et al., 2018).

Environmental education (EE) is a way to promote coastal literacy among elementary school students by applying an integrated and interdisciplinary approach. They examined the collaborative process of creating interdisciplinary and participatory EE activities in a public elementary school in São Sebastião (Brazil), a place with rich and diverse ecosystems but subjected to severe anthropogenic stressors. This collaborative process of approaching socioenvironmental problems aimed to give students an integrated and interdisciplinary view, potentially contributing to future coastal management decision processes through public participation, to empower stakeholders and activists (Santos et al., 2017; Roczen et al., 2014).

Considering the International Student Assessment Program (PISA), according to Tokarnia (2016), the 15-year-old students assessed obtained a score that placed them below level 2, considered 'appropriate' in the three areas assessed by PISA. On separating the results, it was observed that in the sciences 56,6% of the students were below level 2 and only 0,02% were at level 6 (the maximum level in the evaluation). In reading, 50,99% were below level 2 and 0,14% reached the maximum level. In mathematics, 70,25% were below the appropriate level and 0,13% reached the highest level in total; 23141 students from 841 schools around Brazil participated. Most of these (77%) were enrolled at high schools, with 73,8% in-state networks and 95,4%in urban schools.

The University of Southern Santa Catarina approved a project with the CNPQ (National Council for Scientific and Technological Development) with the aim of investigating how active methodologies based on workshops can affect students' learning in relation to chemical, physical and mathematical sciences and to increase students' awareness of the need to preserve the planet. Human behavior has become a threat to environmental sustainability, principaly during the last three decades, one of the most influential initiatives towards environmental protection and increased environmental consciousness is the solidification of environmental education (Ntanos et al. 2018).

UNISUL, founded in 1964, is a university established by the Municipal Government of Tubarão, Santa Catarina, Brazil. It aims to promote education, science, culture, sustainable social development with the creation and diffusion of technology, primarily in the region in which it is located, through a series of projects related to the growth and local capacity building, aiming for a more sustainable future. Prioritizing actions involving teaching, research and outreach, UNISUL promotes Environmental Education in different social centers, such as classrooms, virtual environments, administrative offices, and thus guarantees an important role for the improvement and maintenance of environmental quality.

UNISUL, in its Institutional Development Plan, has Sustainable Development as one of its premises, aiming the institutional growth, ensuring a balance between social, environmental and economic dimensions. Environmental awareness is a topic of great discussion in society, especially in educational organizations. The principle of this policy is the permanent and continuous environmental education, in line with the federal, state and municipal EE law sand norms, focused on the environmental conservation, what is essential to the life quality and sustainability, considering the aspects of the 5R: rethinking, reduce, return, reuse and recycle.

UNISUL, concerned with environmental conservation, life quality and sustainability, reinforces its commitment to society by joining the National Movement for Sustainable Development Goals. Although it is a global mission, Unisul believes that it is

necessary to take local actions so the SDGs are achieved. According to Zamoro-Polo et al (2019), the Sustainable Development Goals (SDGs) constitute a work agenda for the local, regional and international community to ensure a better world for future generations. It is important to highlight that Unisul has a partnership with other international HEIs, within the scope of the SDGs, through a project "Change the Climate: Assuring the Quality of Environmental Strategies in Latin-American Higher Education" (QualEnv), of the Erasmus Program from the European Union. The QualEnv research project has as the main objective implementing environmental practices aligned with the UN SDGs.

Menezes and Minillo, already in 2016, and more recently Sonetti and Lombardi (2020) pointed out that Universities can play a significant role and present themselves as relevant actors in generating knowledge and promoting development. They can also contribute to the implementation of the SDGs, through the actions and activities developed within these environments, which involve teaching, research and outreach with great transformative potential.

With the adoption of the 2030 Agenda for Sustainable Development, Education for Sustainable Development (ESD) is embraced by Goal 4, Target 4.7 of this plan " By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, through Education for Sustainable Development and sustainable lifestyles, human rights, gender equality, peace, culture and nonviolence, global citizenship and appreciation of cultural diversity to sustainable development (UN, 2015). (UN, 2015). ESD is a dynamic concept that includes all actions and challenges towards sustainable development and is at the core of global goals for a sustainable future (Shulla et al. 2019). A decade of education for sustainable development between 2005 and 2014 was declared worldwide by the United Nations. The intended purpose is to promote and more thoroughly focus education as a crucial tool preparing young people to be responsible future citizens, so that our future generations can shape society in a sustainable manner (Burmeister et al. 2012).

In this article, Unisul, besides seeking to achieve quality education for its students, also extends its efforts to give quality to basic education in needy schools in its surroundings.

II. Methods

The research sample was selected by the Regional Education Management, associated with the Santa Catarina State Education Secretariat, with the aid of the research team from the Universidad e do Sul de Santa Catarina (UNISUL). The selected sample comprised of 13 schools, which required innovative pedagogical practices in the area of the chemistry, physics and mathematics sciences, and involved 13 cities and towns (one school per city/town)in the region of Greater Florianópolis (Fig. 1). The work team included six professors from the university who teach undergraduate courses in the areas of environmental and sanitary engineering, chemical engineering, production engineering, and academics from the areas of engineering, information technology and public relations.

Fig.1: Greater Florianópolis region encompassing 13 cities and towns. Source: Google maps adapted.

The data collection was carried out in 2014, 2015, 2016 and 2017. The Mobile Science project has reached 3000 students, of these, 300, from 14 to 17 years old, worked in the workshops and was invited to answer a questionnaire for evaluation purposes.

In this first study, we first located relevant studies based on the following keywords: environmental education, pedagogical practices, mobile science, waste treatment and waste reuse. The databases Web of Scopus, Science Direct and Google Scholar were used as a basis for the literature search. In the second part of the study, the instruments used were photographic records, videos and audio recordings of the students participating in pedagogical activities in the workshops.

In the following paragraphs, the pedagogical activities were carried out in the workshops involving different prototypes of sustainable solutions for environmental issues. The workshops took place in a modified truck designed by engineering students under

the supervision of a team of professors at UNISUL. The workshops dealt with different prototypes of sustainable solutions for environmental issues.

The truck (figure 2 A) was funded the National Council of Scientific and Technological - CNPq), the trailer (figure 2 B) was equipped with lab benches to perform the workshop protocols and cabinets to store the lab materials, lighting and sinks with faucets.

Source: Authors.

Fig. 2: Mobile Science truck (A) and the internal area of the truck (B).

In this study, 13 schools were visited over a period of 4 years. The students had access to the 4 truck workshops. The workshops covered are described below.

A) Production of biodiesel (Fig. 3): in this workshop the students produced biodiesel from residues of saturated frying oil and short-chain alcohols, concepts of chemistry in the reactions of alcohol with oil (transesterification) and environmental education were worked out in relation to the fate suitable for cooking oil residues and the respective environmental impacts caused by incorrect disposal were discussed (Moecke et al., 2016; Maddikeri et al., 2012; Nair et al., 2012).

Source: Authors.

Fig. 3: Biodiesel production workshop.

B) Soap production (Fig. 4): Students fabricated soap from the waste generated during the production of biodiesel (glycerin), and residual oil saturated with high-fat fat-free acids. This workshop addressed the concepts of environmental science related to the reuse of glycerin and frying oil to produce soap, chemistry concepts were introduced, such as the theory behind the saponification reaction called alkaline hydrolysis, and the detergent action of soap, particularly the elimination of fats, and the environmental issue involved were discussed. Bars of soap was obtained from the saponification by mixing the following ingredients: saturated frying oil (high acidity), caustic soda, water, glycerin, and disinfectant.

Source: Authors.

Fig. 4: Students are participating in the soap production workshop.

C) Production of biofilm (Fig. 5): In this workshop, students produced biodegradable films from waste (glycerin) generated during biodiesel production. The students noted that this product could replace conventional plastic produced from petroleum, decreasing the degradation time in the environment. Principles of organic chemistry related to polymerization were also introduced (Liu et al., 2012). Also, the students learned how to produce a biofilm. The polymerization reaction was performed using the following mixture: distilled water, maize starch, glycerin (used as a plasticizing agent), and food coloring. The reaction was performed in a beaker under constant stirring and heating (90°C). The mixture was then poured into Petri dishes, left to dry under ambient conditions, and the obtained biofilm was removed.

Source: Authors.

Fig. 5: Students are participating in the biofilm production workshop.

D) Solar heating workshop (Fig. 6): In this workshop, the students produced a water heater with long-life milk packaging waste (Tetra Pak cartons comprised of paperboard, polyethylene film and aluminum) and PET bottles (from soft drinks). Subjects related to mathematics (trigonometry) and geography (geographical coordinates) were also discussed in this workshop (Xue, 2016). The cartoons were painted black, to retain the heat from the sun and the PET bottles were used to protect from external influences, such as wind and rain. Water pipes were also painted black and passed inside the bottles to allow the transfer of heat from the packs to the water. With this system it is possible to heat the water to 55 degrees Celsius.

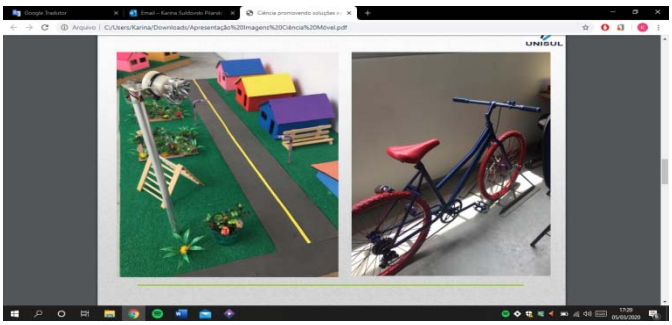
Source: Authors.

Fig. 6: Students are participating in the solar water heating workshop.

After the pedagogical activities, was applied a questionnaire to gain information on the students' perceptions regarding the activities. So, asked the following questions: Did you find the Mobile Science project interesting? Did you enjoy participating in the workshop? Was this workshop related to knowledge of the subject addressed? This workshop helped you understand the contents of the subject addressed? Do you intend to go to university? If you answered yes to the previous question, would you like to graduate in environmental sciences, chemistry, physics and mathematics sciences? If you answered yes to the previous question, did the workshop influence this decision? Did the project help you to comprehend the importance of separating waste? Did the project help you to comprehend the reuse of waste to produce new products? The answers to the questionnaire are presented in the results section.

There was a second data collection in 2019 that covered 11 schools located in the Greater Florianópolis region, specifically the cities of Florianópolis, Palhoça, São José, Biguaçu and Antônio Carlos, with a reach of approximately 1000 students. The students had access to the truck's first three workshops and to an additional workshop on renewable energy.

E) Renewable energies (Fig. 7): In this workshop, concepts about renewable energies are presented, citing examples and definitions of the three main types (wind, solar and hydraulic), as well as their advantages for the environment. This workshop has three models with LED lights for demonstration; each model has a device for functionality, being a pinwheel, a photovoltaic plate, and a bicycle.



Source: Authors.

Fig. 7: Models for renewable energies.

In this second data collection, a questionnaire was not carried out; only testimonies were heard from students who participated in the pedagogical activities, which had positive evaluations about the subjects covered. Instruments such as photographic records and videos of the participating students were also used.

Regarding the limitations of the study, we recognize that our findings may be specific because they relate to pedagogical practices involving the environmental issues observed in this state in Brazil. Contributions from other Brazilian states would allow us to extend the empirical configuration and to understand whether the results obtained can be generalized. Another limitation, that represents an opportunity for new research is that the monitoring of the grades obtained by the students during the five years of the research project would provide useful information regarding whether there was enhanced learning on the part of the students. The study can also be expanded to include other types of pedagogical content and not just those related to the chemistry, physics and mathematics sciences.

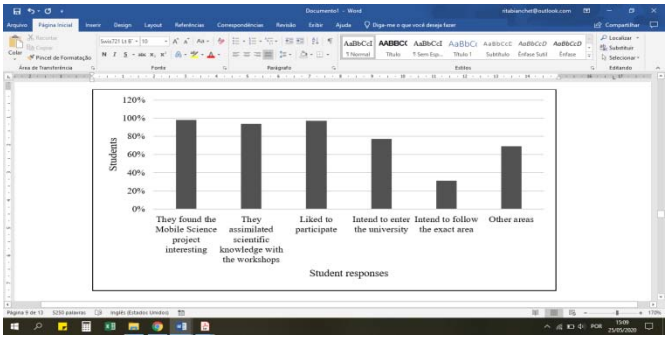
III. Results and Discussion

This project allowed public school students to understand and explore the concepts of environmental science and the basic principles of the exacts sciences corroborating the Sustainable Development Goals, specifically Objective 4, which provides for ensuring inclusive and equitable quality education and promoting lifelong learning opportunities for all (Moyer & Hedden, 2020).

Simsekli (2015) also examined the effect of environmental education practices on the awareness of students in elementary education, focused on the environment in general and the specific environmental problems in the region. The findings of the study revealed that, after the implementation of the practices, there was an increase in the number of students who became aware of the problems in their environment and their causes, and they were able to propose solutions for these problems. Also, there was an increase in the number of students who volunteered to take part in environmental activities within or outside the school.

We sought to organize the workshops in such a way that the students could create prototype or product

from residues. These products or prototypes remained at the schools for the teachers to make use of them in the teaching of their subjects and exhibit them at science fairs. Graph 1 shows the main responses given by students participating in the Mobile Science project in the period from 2014 to 2017:



Source: Authors, 2019.

Graph. 1: Student responses regarding the mobile science project.

There is a predominance of students who found the project interesting (98%) in the same way as those who assimilated scientific knowledge with the workshops (94%), consequently they liked to participate in the offices (97%). A higher percentage was expected. However, 77% of students intend to enter the university. For those who answered that they intend to take a course in the areas of environmental or chemical sciences, physics, and mathematics, 36% considered that the workshops influenced this choice. 81% of the students said that the workshops helped to understand the importance of waste separation and 80% understood that the waste could be reused to produce new products, most students (98%) found the project interesting to enjoy the workshop. The importance of addressing both practice and theory was confirmed by the fact that 94% of students connected knowledge of the exact theory of scientific disciplines with workshops. Although most schools visited have laboratories, they have not been used frequently, and teachers have said that there is a shortage of materials available for practical classes.

Many cities where the schools visited are located do not have higher education institutions, yet 77% of students intend to continue their studies, 31% in the areas of environmental or chemical sciences, physics and mathematics. The workshops with chemical content involved reactions and the students were enthusiastic when they saw the transformation of frying oil into biodiesel or soap, or the production of biofilm from corn, and glycerin (a waste product from biodiesel production).

After verifying the analysis of the questionnaires and the testimonies reported by the students orally, it was observed that the activities carried out during the workshops sensitized the students to the importance of preserving the planet. Recycling is perceived as the main means to achieve environmentally responsible behavior and students do not see the relationship between their materialistic consumption and the environmental consequences. Achieving sustainable development will require joint global actions to advance from "light green" sustainability education to combat consumption, as an important issue in modern society, to the most fundamental transitions required in lifestyles and values (Goldman et al., 2018).

According to Mello and Lemos (2019), environmental education has the role of making human beings aware of their integration and dependence with Nature, to make them understand the true principle of sustainability, that is, live without compromising the current generation as well as the future ones. Thus, the presence of these pedagogical activities directly contributes to a favorable view of sustainability by the students; it also helps to ensure that knowledge is disseminated to more people, whether in the community or family environment.

Aydın-Güç et al. (2014) carried out research to create awareness of the importance of mathematics for the prevention of environmental pollution, an issue which science teachers need to address. The results obtained from the study indicated that prospective teachers were unable to associate the prevention of environmental pollution with mathematics before the task-process developed. In contrast, their ideas changed for the better towards the end of the study and they were surprised by the importance of the use of mathematics for the prevention of environmental pollution.

A study on teaching versus the environment highlighted that when environmental preservation is used in an integrative context for teaching, students perform better than their peers in assessments on reading, mathematics, and social studies. Most students, also to achieving higher grades, were more involved and enthusiastic about the learning process. Environmental education plays a crucial role in children's education, familiarizing them with the concept

of sustainability and developing their environmental consciousness. Also, teachers need to live in an environmentally conscious way and to represent the standpoint of sustainable development and its practice, to motivate the students. A curriculum that incorporates natural science and methodological elements contributes to the successful development of positive attitudes toward sustainability, as well as the formation of adequate skills and key competencies (Stronck, 2005; Major et al., 2017).

In this study, the students observed real products being produced during the workshops from waste, that is, biodiesel, which fuels the bus that takes them to school (in Brazil 8% of vehicle fuel is biodiesel), soap for hygiene purposes, biofilm used to pack food, and a solar system to heat water.

IV. Conclusion

This project was able to verify that active methodologies applied through workshops with environmental themes have a positive influence on students in terms of learning subjects related to the chemistry, physics, and mathematics sciences and can enhance their awareness and appreciation of the importance of the preservation of the planet. Also, the university can improve its dialogue with the surrounding community, as observed with the Mobile Science project, enabling better contact between academic researchers and high schools. The results obtained in this project are important for both the university and the schools, mainly benefitting the high school students, who gained knowledge from the workshops, making them rethink their perception of materialistic consumption and re-explore the possibility of continuing their studies in higher education. The team of university professors and the students strengthened the Mobile Science project, which involved extension into the community and research activities, working on interlinking themes, aimed at the complete training of a citizen in matters including environmental education. Unisul sought through this project to contribute to the achievement of SDG number 4, which deals with quality education. The activities involved high school students and Unisul students, with the theme of preserving the planet. Studies show that strategies to promote sustainability are developed successfully in projects that unite university team (professors and students) and high school time (professors and students), bringing advantages to both sides, being able to improve its dialogue with the surrounding community, enabling better contact between academic researchers and high schools (Berzosa, 2017; Berchin, 2018; Berchin 2017; Casarejos, 2017).

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Thought, Energy, Time and Social Confines of Knowledge

By Syed V. Ahamed

City University of New York

Abstract- In this paper, three virtual but dimensioned entities are used to contain knowledge; while it is by itself abstract. Knowledge resides in knowledge-banks of computers and the Internet. More importantly, knowledge resides in all living species. The main emphasis is on the human species that construct their personalized knowledge structures and banks that they deploy to resolve their personal Needs. Such needs drive behavior and adaptive. Both these human characteristics are alive and get influence by human interaction. These dimensions have human (thought), scientific and physical (energy and time) orientations. It becomes feasible to build a hyperspace for knowledge and confine it in the three dimensions of thought (anchored in the personality of an individual), energy, and time (both anchored in both physiological and physical spaces). We present the personality aspects based on the human needs that drive the human being (a noun object, n) to perform actions (one or more verb functions v) in intelligent steps (convolutions ($*$) between n's and v's) to gratify the needs. Needs are inherent in human personality to maintain life.

Keywords: knowledge, time, human interactions, human thoughts, noun objects, verb functions, convolutions, knowledge and time.

GJHSS-H Classification: FOR Code: 970116

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Thought, Energy, Time and Social Confines of Knowledge

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Abstract- In this paper, three virtual but dimensioned entities are used to contain knowledge; while it is by itself abstract. Knowledge resides in knowledge-banks of computers and the Internet. More importantly, knowledge resides in all living species. The main emphasis is on the human species that construct their personalized knowledge structures and banks that they deploy to resolve their personal Needs. Such needs drive behavior and adaptive. Both these human characteristics are alive and get influence by human interaction. These dimensions have human (thought), scientific and physical (energy and time) orientations. It becomes feasible to build a hyperspace for knowledge and confine it in the three dimensions of thought (anchored in the personality of an individual), energy, and time (both anchored in both physiological and physical spaces). We present the personality aspects based on the human needs that drive the human being (a noun object, n) to perform actions (one or more verb functions v) in intelligent steps (convolutions (∗) between n's and v's) to gratify the needs. Needs are inherent in human personality to maintain life. Time enters the overall schema by two different venues; first, elements of time Δt's that are necessary for n to perform v and to derive a gratification of the need; and second longer duration of time T that is involved in learning from the experience of gratification at different levels in humans, computer memories and Internet knowledge bases.

Historically, human comprehension has evolved enough to group the sequence (n∗v) over the element of time Δt as a finite element of knowledge Δk. The connectivity between these many elements (n, v, ∗, Δt, and Δk) can now be symbolized as (Δk= n*v; during the interval, Δt = t to t+Δt). Now it starts to become more and more feasible to track numerous Δk's by tracking (n, v, ∗, Δt)'s and build a larger body of knowledge (K= ∑ Δk's) over a longer duration (T= ∑ Δt's). These relations are not algebraically or numerically accurate because the physical dimensions for mass, length, time, and permeability (M, L, T, and μ) were never designed to hold human personality, emotions, needs, and levels of gratification in human beings. However, the conceptual linkages are as valid as the accuracy of numerical and mathematical relationships in the physical or scientific domain. We hope that computer science, knowledge society, and the Internet age will be able to rationalize and quantify knowledge science over the next two or three decades.

Keywords: knowledge, time, human interactions, human thoughts, noun objects, verb functions, convolutions, knowledge and time.

Author: Professor Emeritus, Computer Science, College of Staten Island, City University of New York, NY 10316.
e-mail: profahamed@gmail.com

I. Introduction

a) Knowledge Science as a Scientific Discipline

Knowledge can be a computational entity that can be processed as numerical, logical, and/or informational entities in computers and networks [1, 2]. The command languages and processing architectures for knowledge systems become progressively more intricate, elaborate, and structured [see Chapters 5, 6, and 7 in Reference 2]. Though, more complex knowledge processing systems can be construed and built dependably as the knowledge bases and knowledge management systems now distributed throughout the Internet and knowledge web sites. Even though such knowledge systems do not function as precisely, accurately and dependably as the more established computer systems, they perform more precisely, more accurately and more dependably than the human counterparts who also process knowledge to find one or more solutions to the real problems in life and society.

A framework of measuring, quantifying, and predicting knowledge in any particular direction defined by the Dewey Decimal Systems or the Library of Congress classification is presented in Reference [3]. Such knowledge-centric objects (*KCOs,* see footnote 1, Section 1.2) can indeed be constructed in the memory systems of computers. These *KCOs* have volatile and dynamic boundaries that couple with the human mind/ psyche or with other *KCOs* to image the reality of the physical space. The attributes and bondage of the *KCOs* are altered by the knowledge systems much as the numerical values and their dependencies are altered by the CPUs and programs of computers.

b) Fragmentation of Knowledge

Elements of knowledge (shortened as *kels*[1] to represent knowledge elements) exhibit laws of chemistry

[1] A series of symbols are used in the paper to build a strategy for the design of the language of knowledge and its mechanics, and constructs. Knowledge and elements of knowledge are represented as *k, K, Δk, ΔK,* and as *kels or KEL or KEL's*. The symbol *bok* or *BOK* is used to denote a body of knowledge (also denoted as knowledge centric objects or *kco's*) at an intermediate level during the processing of knowledge. These *bok's* or *kco's* are generally held in Knowledge Cache's in the knowledge processor unit or the KPU. The nouns objects are represented as *n, n's, no, no's, N1, N2, NO, NO's, etc*., The actions are represented as *v, v's, vf, vf's, V1, V2, VF, VF's,* etc. Convolutions as represented as * or *'s. The arrow (→) represents the direction that the action is directed towards or the flow of time to

as the chemical elements bond with other elements and generate new compounds and molecules. In the domain of knowledge, the laws of convolution with other *kels* are flexible and adaptive, but maintain rationality for the mind to perceive knowledge in its microscopic or macroscopic formats in the real world and the mental space. Both the real world and mental space spans nations, cultures, and societies.

Knowledge in human activity blends like chemistry within species in nature. In most instances, larger bodies of knowledge are composed, enhanced, used, and utilized to benefit the existence of society. The fundamental precept behind all the widespread generalities is that the lives of all species are based on dynamic actions of objects that make life feasible by prolonged strings of actions continually in the time dimension. Objects and actions trigger the mind into a life-form based on the answers to seven basic questions; *why, who, what, how, when, how long, and where*. The mental coordinates are established. Information is processed and knowledge is acquired. The long cycle from prior knowledge to the derived new knowledge continues ad infinitum

The strife between good and evil is the theme of vicissitudes in lives. The inner self that refuses to accept anything but the best leads to the search for the best for each one (i.e., each noun object(s), *no* or *no's*) with honor, justice and dignity accomplishing the each one of the deeds (i.e., each verb function(s), *v* or *v's*) in a tactical and socially acceptable way (*). In a nutshell, the theme of activity becomes (*no* → * → *v*) or (*no('s)* **'s* → *v(s)*) in a time sequence that a machine can execute with the probabilistic result(s). The central processor unit (CPU) of such a machine follows a series of executable statements that can be written down as {∑ ((*no* → * →*v*)) from *' t'* to *'t+Δt'*} in real-time. The motivation (why) for the *no* (who), the (what) actions (*v's*) in real-time duration from *'t'* to *'t+Δt'* (when and how long), and a probable outcome after an interval are established.

The parameters listed above are entirely programmable as operators, operands, and operational codes, in knowledge machines. The machine emulates the actions, behaviorism, and modality. The most probable outcome is stacked away to be combined with other executable statements. The series of actions can thus be optimized for the most desirable (expected) result from any social, corporate, national, or any strategic result.

c) Human Factors Involved

i. *Syed Revise this section*

The expenditure of energy to function causes its depletion and reduces the tendency to remain active indefinitely. A sense of balance between the extra expenditure of resources and the expected gain in the marginal utility that is thus derived curtails excessive effort in any given direction. The balance becomes global and a sense of fairness and justice prompts most humans to be generous and positive based on gratification and peace. The Second Law of Microeconomics becomes the basis for the human race to progress in a positive direction.

In the other direction, when resources are limited, the conflict between self-interest and fairness starts to surface. The fears of the future sometimes dominate to obliterate the glory of being righteous in the past. Greed and negativity sets in. The first and second need levels from the Need Pyramid [4] projected into the future, cast a grim shadow over the fourth and fifth levels of need-gratifications from the past. Fear of fear makes the insecure drown in greed, hate, and violence.

The knowledge machine is more than a communications tool. It has all the potential of being an intelligent partner to interact and act as a highly logical human or a highly emotional companion. During training the machine, the machine acquires the personality of the "other" interactive human. The machine personality is augmented by internet knowledge bases that provide, validity, verification to provide answers for the saint (with positive priming of the machine functions (such as the knowledge-operation codes (*kopc's* of a KPU [5]) and connectivity to intellectual and verified KBs).

Conversely, a negatively primed machine can also provide for the mafia and thugs by connectivity to mafia and their associated knowledge bases. Also, the machine acquires the most desirable interface for the interacting human based on the "mood" of the user, just as a therapist would adjust the sessions based on the attitude of a patient. Human temperament though highly variable is accommodated by appropriate macro commands at the interface.

The two vividly different philosophies of human thought are founded on the elite processes for the social betterment by the practice of truthful, virtuous, and beautiful deeds in society one side and on the despicable processes for social contamination and its downfall. The emulation of the human behavior of the elite is feasible by positively primed Knowledge Machines (KMs) [6] and conversely, the emulation of the deceitful, arrogant, aggressive, and hate-ridden actions of the perverse groups of the population, for social erosion of established ethics and morals. Knowledge machines being mindless can address both sides of human nature and personality.

accomplish the action. Time is represented as *t,* Δ *t,* and *T* Capitalization indicated larger entities, lower cases indicate minute or localized entities and Δ indicate elemental entities. The knowledge operations and processes are further explained in Appendix A

d) Dyadic Interactions And Time Lapse During Interaction

Time is of the essence in all knowledge-generating processes. An example of a two object *N1* and *N2* is presented in Figure 1. *N1* initiates a verb function *V12* directed at *N2* with a convolution *1 which is responded by *N2* directed back at *N1* with a convolution *2. During this transaction, an element of knowledge ΔK_{12} is generated. Conversely, after the response, another element of knowledge ΔK_{21} is generated. A series of these exchanges generate two bodies of knowledge *bok12* and *bok21*. A profile of relation between *N1* towards *N2* and conversely between *N2* towards *N1* gets developed and retained in the perceptions of *N1* and *N2* respectively. Certain social protocols and codes are embedded during the interactive process.

It can be seen that if the interaction id between two human beings *N1* and *N2*, then the personal attributes of both are invoked. Likely primed humans interact according to the code of ethics in their way and depend on the intelligence of each.

II. Bilateral Human Relations

Bilateral human relation between two individuals *N1* and *N2*, depicted in Figure 1 is a symbolic model of the interaction process. Both *N1* and *N2* have Needs to be satisfied and assets to satisfy. However, social interdependencies force most individuals into a negotiating stance (dashed lines in 1) when the needs of *N1* may be adequately satisfied by personal assets or better satisfied by the assets of *N2* and *vice versa*. Even though this computational model is symbolic and number oriented, it reveals computational cycles and the instability that can arise in real life and in the computational processes, which follows the interactive process.

Largely, in just societies, the laws of fair trade tend to equate the net worth of assets exchanged thus maintaining a framework for stable and repeated social interactions. Many variations and exploitations are possible due to ignorance, greed, or cruelty. To deploy such situations the use of the five variable *l, m, n, j,* and *k* becomes appropriate. However, two such sets of variables l_1, m_1, n_1, j_1, and k_1 for *N1* and l_2, m_2, n_2, j_2, and k_2 for *N2* become necessary. Besides, any nonlinearity between the attributes of *N1* and *N2* also need consideration.

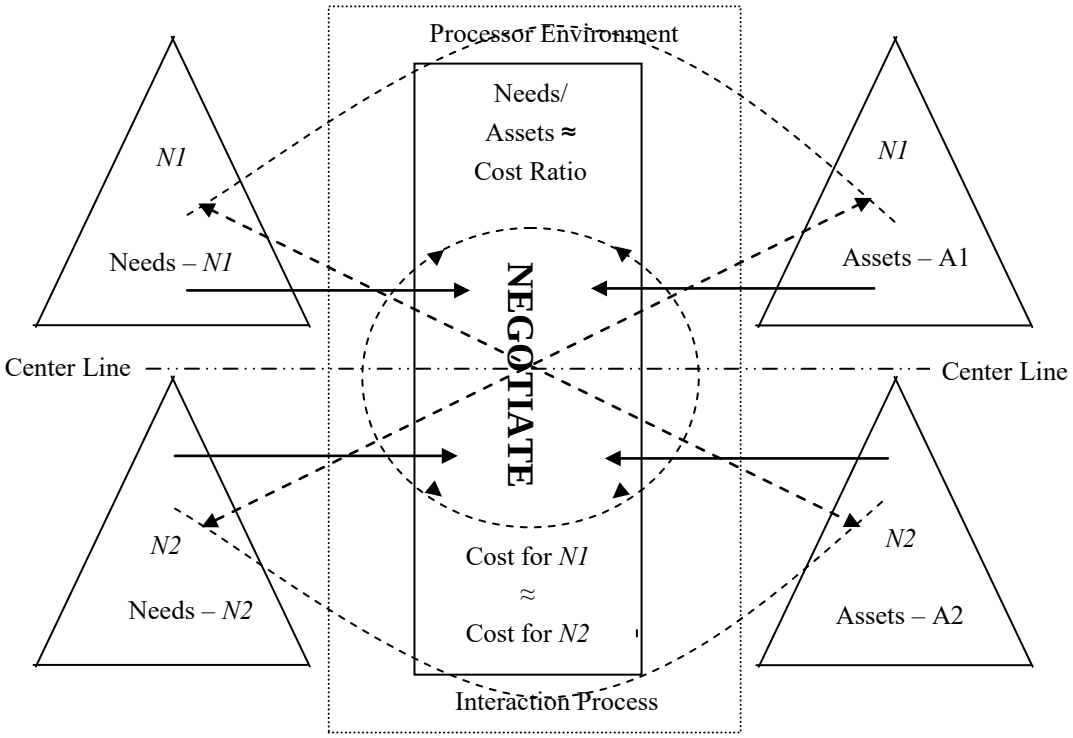

Figure 1: Depiction of a bilateral framework of relation between two intelligent objects (such as two individuals). In the knowledge processor (KPU) or machine environments the each object influences the response in a symmetric fashion. Asymmetric relations occur when one objects has power or authority (such as social position, boss, ownership of resources, etc.) over the other.

Many thousands of types of human attributes, their nature, and the numerical range of the variables and their interrelations account for the innumerable types of human interaction. The KPU of a knowledge machine is thus capable of simulating the entire spectrum ranging from an insignificant exchange of trivialities to a cruel war between nations. Figure 1 depicts a bilateral interactive model for interaction for two individuals. The role of the two individuals is reversible and the centerline of symmetry runs horizontally through the computational model. Further elaboration of this diagram results in a more comprehensive computer model presented in Figure 2.

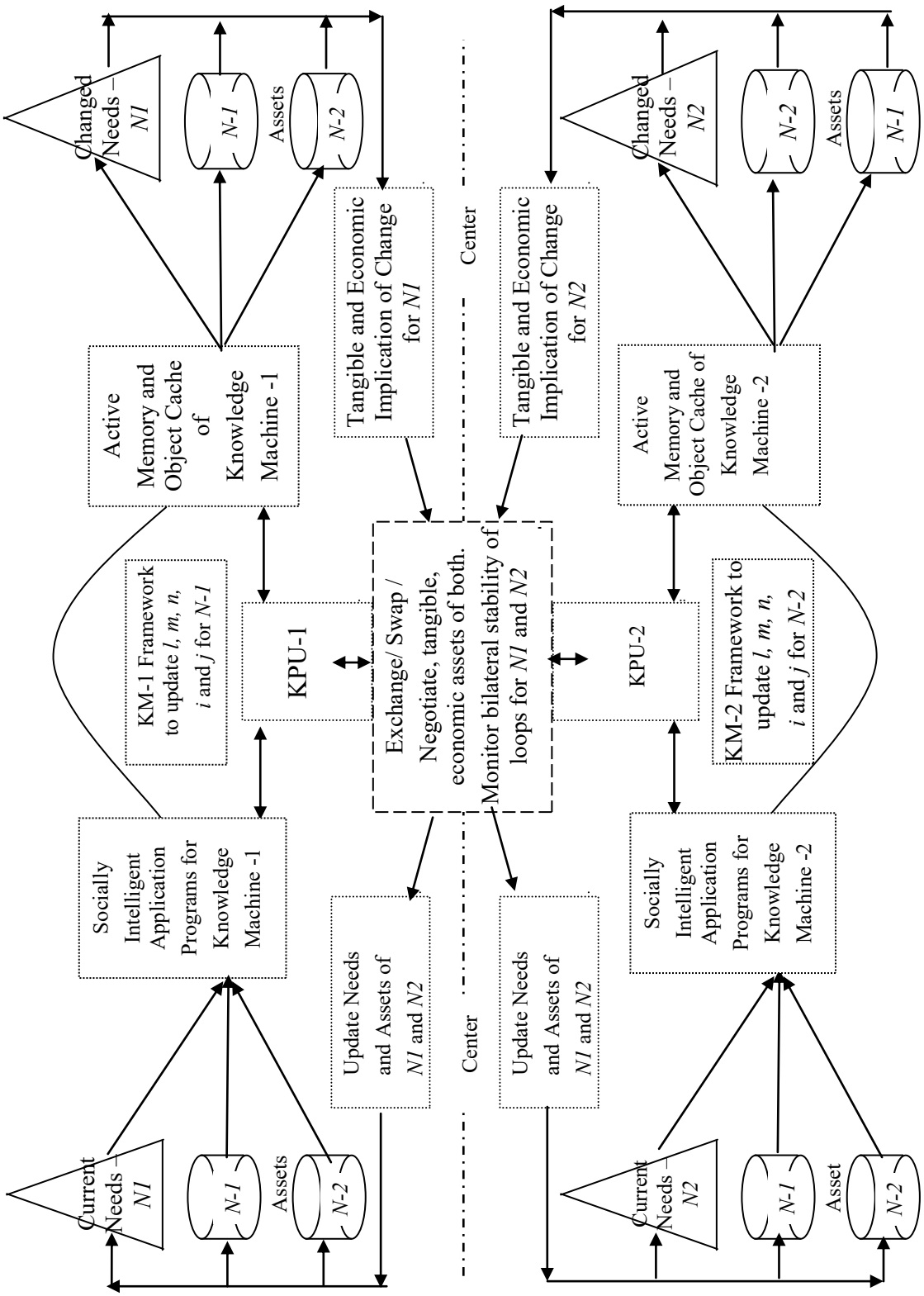

Figure 2: Schematic of Negotiation process between N1 and N2 with updates for human variations l, m, n, i and j.

a) Human Interactions

A systems model for human interactions ranging from interpersonal relations to Labor-Management negotiations of the nature depicted in Figures 1 and 2 are presented in References [7, 2]. Mathematical models of human interactions are presented by Roman, et al, [8, 9] and Pen [10] present the symmetric interactive processes. The nature of the interactive process is based on an economic exchange of assets offered and concessions received by both parties. Four possible outcomes predictable by the models are (1) smooth convergence to a mutually satisfactory result for the interacting parties; (2) oscillatory convergence; (3) oscillatory-divergence without any agreement resulting from the interaction; and (4) smooth convergence without an agreement. In such interactive processes, instability and oscillations result in a waste of time.

Such a framework becomes applicable as (intelligent) objects undergo a process in the KPU environment of the KMs. The oscillations can take on numerous forms in the intelligent object behavior. On the one hand, the response can object over/under reaction, out of context responses to certain verb functions (*VF*), yet on the other hand, the response can be opposite of that expected for any predefined *VF*. Rational or irrational behavior is feasible thus invoking two (logical or illogical) reactions from the other party. Briefly, the rational-logical interactive mode leads to a convergent and sensible interaction, while irrational-illogical mode leads to the most severe (even destructive) oscillations and/or divergent interactions.

The control of such oscillations lies in the predictive capabilities of each/both parties to the final and desirable goals for both parties. In essence, the mechanics of the systematic processes of interaction between intelligent objects, in reality, is portrayed by the status of the objects and their attributes in the knowledge machines. Intelligent objects and knowledge machine would be able to function at two levels. Level-1 functions monitor the progress towards the achievement of goals in a mutually beneficial fashion, whereas level-2 functions track the stability of the negotiating process and monitor the status of the objects and their attributes from becoming, divergent, explosive, and mutually exclusive. The KPU [5] thus functions at an "intellectual" level (level-1 functions) and an "emotional" level (level-2 functions).

In abused knowledge machine, psychotic and abnormal behavior of intelligent objects is forced by implanting oscillatory and abrupt changes in the values of *l, m, n, j,* and *k,* for evaluating the response(s) of the object(s). Bilateral instability in the parameter (*l, m, n, j,* and *k*) values is likely to be a cause for conflict, confrontation. A series of violent and turbulent changes can only lead to war and destruction.

III. Basic Truisms for Needs, Satisfaction, and Energy

Knowledge science methodology can be implemented by novel computer architectures. It was conceived and presented [6] as far back as 1993 and 1994. Knowledge science as a scientific discipline was presented in 2006 [11] and further expounded in 2009 [2] based on the theory of knowledge. The convergence of knowledge science, computational programming, and its machine implementation as they can be implemented in the Science of Medicine was presented in 2013 [12].

In this section, we present a matrix approach to the uneven flow of knowledge in social and cultural settings. Knowledge is always in a state of transition and flows from one or more social or a natural source(s) to one or more receptors, the delay and dispersion of knowledge are related to the media characteristics represented as a matrix. The source and receptor characteristics also play a part in the communication of one element of knowledge (symbolized as a *kel*). These *kel*s being of any size and nature can be integrated in a coherent and cogent fashion to make microscopic or macroscopic bodies of knowledge in organized, structured, and sensible knowledge in the human minds and in addressable segments of knowledge bases in networks and on the Internet. Small and large bodies of knowledge (symbolized as *bok*s) can thus be organized, reorganized; processed and reprocessed; retrieved and stored; adjusted and organized; and optimized and enhanced to suit the reality of most social and scientific settings.

*W*hen perfect knowledge is being perceived, we present nine basic questions that are logically centered around the active verbs (symbolized as *v*s), participating nouns (symbolized as *no*s), and their interrelations (symbolized as * or convolutions) that constitute the pursued knowledge. In answering these questions entirely, a framework of perfect knowledge will be gained, if the answers have a scientific basis or explanation. In real-life situations, partial answers to a selected subset of these nine questions are generally sufficient to carry on a function or a dialog in a pragmatic sense. Answers to one or two of the nine questions do not present significant, useful, or pertinent knowledge and such answers generally degrade the quality of knowledge. The methodology and frame-work are presented in detail to expand and to enhance the pursued knowledge to a targeted goal, even though it may not by an optimum or a perfect goal.

Knowledge has been an integral part of all life forms since millennia. Modern machines offer new tools and technologies to use and reuse knowledge in ever-expanding ways. Their positive deployment has helped human progress as much as its abuse has caused

wars, destruction, and social stagnation. In hindsight, abuse has always retarded the flow towards the betterment of society. Numerous social scientists have highlighted the cause and effect relationship of the social forces on the human inertia to the toil make building elegant knowledge and social environments.

A universal platform for the integration of social science is desirable to make knowledge a science and then to use the computer, network, and Internet technologies to accelerate the positive social movement despite the social resistance by reason and methodology, rather than by force and violence. The positive conserves human energy and offers more lasting solutions.

In this vein, we suggest the use of machines that can serve as computer-aided knowledge systems that handle the rationale and logistics beside the deployment of constructive knowledge. A mathematical framework is also proposed that can formulate the basis of discovering knowledge behind the obvious information to make the proposed solutions enduring and sustainable. Longer-lasting stable solutions to most knowledge-based problems make the investment in knowledge science attractive.

The delay in social media cannot be undone, and all communication systems suffer from the setback. Delay in social and human communications systems can be very long slowly depriving the utility of the original knowledge. In some cases when the original knowledge is based on extreme truisms, immortal beauty, and/or universal virtue, the knowledge itself assumes a flavor of immortality. For example, Boolean algebra, Tesla's conception of rotating electromagnetic fields in polyphase motors, Rumi's verses, Buddha's teachings carry their validity, appeal, and integrity after many centuries. The converse statement is equally true; e.g., Bush's lies about the weapons of mass destruction (*W*MD) in Iraq followed by Tony Blair's acts of a war based on falsehood; Vietcong's brutalities and Ku Klux Klan's assertion of white supremacy have all brought unwarranted disarray into the world. The matrix of communication is frail, time-dependent, and it can materially change the contents of any body of knowledge (*BOK* or *bok*). Knowledge machines deserve to be made secure against the abuse by manipulative folks!.

The emotional and value of knowledge content becomes dependent on the Social (S) Media matrix that can drastically alter received signals. Then this matrix is tuned with average transmitter (e.g., a newscaster), average unbiased media channel (e.g., a university broadcast system), and an average unbiased receptor (e.g., a typical college student), then the chances are that the received signal is a faithful replica of the transmitted signal. But this situation is hypothetical and in reality, every received element of knowledge gets tainted to some extent other. However, in the vast majority of cases, the receivers generally get enough coherent knowledge to exchange ideas in human dialogs.

a) Complete Knowledge

Knowledge at any stage is imperfect; imperfect and incomplete may be, it still conveys necessary information to abide by the laws to survive, live, and even progress by controlled measure(s) over finite durations of time. In a limited sense, order and organization appear to dominate what is known in answers to a set of logical questions about anything, any time anywhere and in any social and cultural context. The saving grace lies in refraining from asking the question(s) that intellect cannot resolve and the mind cannot perceive. Human and mental resources are constrained, if resources are not the limit, life-span is.

In a very rational way, one can seek the answers to *W*hy? *W*hat? How? *W*ho? *W*here? *W*hen? Duration (or how long?) for any element of knowledge, only to be frustrated that innate and unrestrained curiosity has no logical or rational end. A combination of these questions posed together will only cause more frustration for the mind and disarray in the thoughts. *W*hen appropriately constrained, the answers to these questions lead to well structured and duly ordered solutions to many scientific and social problems. Given any body of knowledge about anything, an intelligent human or machine can query in at least seven different ways (each by itself or in combination(s)) repeatedly to reach the frail edge of what is known.

In the knowledge domain, where every microscopic element of knowledge rests in a noun object, a verb function to and from other noun objects, inappropriate convolutions, has no immunity from these questions. However, this quest leads to a few guideposts. The answers to at least some of the questions form a stable neural net in the brain to encompass a noun-object, a verb-function, or a convolution in their rights that can form linkage to such other cluster(s) and the neural net can grow larger and larger and become more and more stable. If the answers are derives based on science, truisms, social benefits, and economic principles, then the borders of rationality are pushed deeper and deeper in the neural nets in the brain; the personality becomes stable and larger tasks (verb-functions) can be accomplished more effectively and more efficiently with larger and larger noun-objects in a refined and orderly fashion.

In a gross and macroscopic form, the fundamental question (*W*hy?) and its answer lead to life itself: since every living member of every species has to sustain its life form, all energies stem from this essential requirement. Physical, psychological, social, intellectual, etc., venues have been carved out for the orderly flow of

these energies over the eons of existence. More recently, computers and networks have altered the flow and storage of knowledge that permits the channeling of these energies in optimal and efficient ways to achieve sets of goals and ambitions. The role of the new advances in technologies become crucial in finding innovations, sciences, and technologies to help mankind a more elated and more civil way to live and exist with nature without destroying it.

In most environments, searching for the answers to the seven basic questions leads to objects and things; their actions and accomplishments; and how these objects do what they have to do or what they have done. Knowledge starts here! Embedded in related objects, actions, and how they blend. Stated more precisely, every module or element of knowledge (*kel*) is founded in one or more noun-objects, one or more verb-functions, and their respective convolutions.

Table I: Seven Logical Questions and Their Implications in the Machine and Network Environments

Question/Partial Answers	Machine and Network Response	Objects (machines), Actions (execute), and Appropriate Convolutions (programs)
1. *Why*? Simply to 2. continue life form 3. *What*? Computer 4. Systems 5. How? Procedures 6. and Creativity 7. *Who*? *HW*, 8. Know. Machines 9. *Where*? (x, y, z), 10. (r, θ, ϕ), etc. 11. *When*? Past, 12. present or future '*t*' 13. Duration? 'Δt'	1. To Generate, Examine, 2. Manipulate, etc. 3. Computers, Robots, Systems, 4. Networks 5. Computer and Machine 6. Aided, Robotic Systems 7. Machine and Knowledge 8. Systems 9. Controlled or Open space 10. environments 11. During execution or Real time, 12. Extended time apps. 13. Execution, loopback, Internet 14. Response time, etc.	Solutions and resolve (routine and special) problems; Information, logical, business, social, etc., issues Application and scientific programs; Procedures, OS *SW*, *HW*/*SW*/*FW*/structures Design and Derive general instructions for machines, their repetitive patterns, protocol, and OSI instructions, etc. *HW* and machine, corporate, cultural configurations, etc. Local machine, and (LANs, *WANs*, global, etc.) network and INTERNET Execution-phase time Line, start to end, discrete, or continuous-time setting Execution time for machines, network process time to execute Internet and machine instructions

*W*hen knowledge elements are broken down into their building blocks, machines become invaluable in reaching targeted goals of speed, efficiency, and accuracy. Computers, networks, and digital systems in the knowledge era have the innate ability to handle knowledge at its lowest to its highest levels in three distinctive ways as follows:

i. Machines can and do grip and load the noun objects (*no's*) from their very rudimentary form as cellular and microscopic objects to large bodies of knowledge as (*BOK*s such as books, knowledge bases (KBs), tables, series, texts, etc., as operands by bringing them (or their address(es)) to the Operand Registers (ORs).
ii. Machines have the innate ability to construct and construe verb functions (*vs*) from nano-, micro-, midsized to macro, to cosmic processes, etc., as operation code by hardware, micro-programmable, or macro programmable codes by bringing them (or their address(es)) to the Instruction Registers (IRs).
iii. Machines have the innate ability to lookup a context-dependent table that selects the appropriate convolution (or a set of convolutions) to combine one or more elements of knowledge or *kel*(s) and assemble a series of context-dependent microinstructions. Machines move the result of it's (address(es)) to the output register(s) or (ORs).

All the software tools and methodologies currently used in computer engineering become applicable in the knowledge domain as knowledge-ware tools and methodologies in building and designing major knowledge-ware systems. We present the

conceptual bridge between computer sciences and knowledge science in Table 1

b) Human, Social and Computational Environments

In human environments, the search for answers to the seven basic questions (*W*hy?, *W*hat?, How?, *W*ho?, *W*here?, *W*hen?, and Duration (or how long?)) leads to pursuit of (social) knowledge. In the computational environments, the search and the continued nature of these answers in the real-time leads to noun-objects, verb-functions, and their convolutions that have significance to the processes and communications of knowledge elements. Typical answers to these questions in the human and social domain as they relate to the computational domain are presented in Table II.

c) EBB And Flow of Knowledge

The velocity of the flow of knowledge is as variable and dynamic as life itself. Static knowledge is no knowledge; instead, it is indicative of a coma-static mind and body of any object or entity. More ever, the velocity is neither uniform in time or space. Hence, the velocity of flow of objects, the rate of flow of activities, and the rate of change of their convolutions all play a role in the flow. Objects and their activities are equally important in all aspects of social and machine tasks. The pattern of the ebb and flow of verb functions, noun objects, and their convolutions can have a commonality in their flow and they are rarely synchronized.

Table II: Seven Logical Questions and Their Implications in the Current Social and Human Environments

Question/Partial	Answers Human and Social Entities	Objects (entities), Actions (perform) and Appropriate, Orderly and Organized (functions)
1. *W*hy? Support of 2. Life Functions. 3. *W*hat? All forms 4. of Digital Systems 5. How? Procedures 6. Creativity. 7. *W*ho? Handheld 8. Know. Systems 9. *W*here? (x, y, z) 10. 't' (Spatial), etc. 11. *W*hen? Past, 12. Present, or Future "t" 13. Duration? 'Δt'	1. To support & gratify the 2. Needs to live and excel 3. All communication and 4. computing interfaces 5. Clicks and/or Operation 6. of the devices and Gadgets 7. Generally, Self or Partnering 8. Individual or organization 9. The current location is 10. generally implied 11. Present (Now) emphasized 12. (Again and again) 13. As Fast as Possible (Again 14. and again)	1. Basic Needs: Freud (3-Layer), Maslow (5-Layer), Ahamed 2. (7-Layer), (Carl Jung, Marx and Mead, Smith, Keynes) 3. Preloaded or Down Loaded Programs in Devices that 4. follow scientific, social, search, and their algorithms. 5. Learn and Use the preloaded programs in social and 6. communication devices. 7. Human(s) and organization(s) partnering with other 8. social entities are involved 9. Distance is generally not an issue because of the 10. network/Internet connectivity 11. 6This is the situation and problem-dependent parameter 12. Execution times for the devices and transit times in the network or Internet and to complete transactions.

Overall Theme: Begin Start→ Restart→ Execute→ Monitor End→ Continue/Finish→ Prolong

IV. Knowledge-Based on Actions (*N*V*)

Knowledge is derived from the gratification of needs of objects (*n's*). Such needs fulfilled by one or more actions (*v's*). Incremental knowledge gained by the process (*n*v*) is arranged and accumulated in the neural nets of the object(s). It is then-onwards intelligently (*) used, reused, modified, enhanced, customized, etc., by objects (including machines and knowledge processors) by being more productive and optimal. Further knowledge exhibits exponential growth; and bears a signature(s) of the factors deployed in the deriving the ensuing knowledge. This axiomatic truth is eternal for every object from microbiological to planetary cosmic entities. It is yet to be confirmed if this axiom is true for virtual objects after verifying if objects can be virtual!

Any object without any need to sustain itself does not need any knowledge. Conversely, since all objects have some definable form or structure, some extent of knowledge in inherent or embedded within its structure. As an extension, the higher the needs and or their structure more knowledge and its structure are embedded or learned to sustain the structure. In an extreme case, virtual objects have linkages to others that define and reinforce their structure. Infinitely virtual objects may not have structure, but that becomes a philosophical issue.

*a) Simplest N*V, (N→V) Knowledge*

For all species, certain actions are necessary to gratify one or more outstanding or deficit needs at any instant of time. These actions depend on thought, energy, time (TET), and social constraints for the entity (*n* or *no, n's* or *no's)* enacting the verb function(s) (*V*, or *vf, v's* or *vf's)*. The role of the intellect becomes evident in the choice and convolution *'s of *v's (i.e. *v)* concerning its optimal gratification of the deficit need(s). Thus, process *n →v* becomes very personalized.

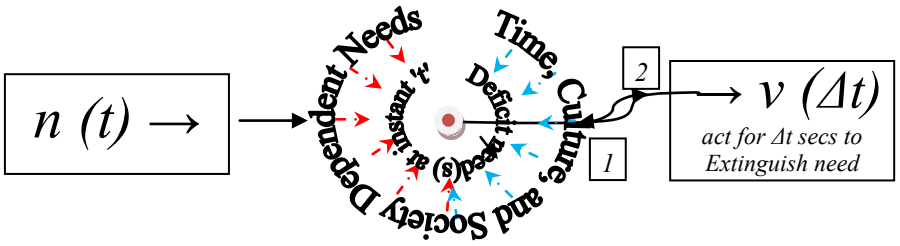

Figure 3 a: A noun object (n) acts (v) or invokes an act for Δt secs to gratify its deficit need. The need is extinguished by traversing the loop (A certain amount of hysteresis is implied in the forward and backward loops from n to v and back from v to n. This loop consumes some energy E and this comes from the TET effort on the part of n.

b) General Structure Of Dyadic Interactions

Interactions constitute relations of species and social entity without any interaction (whatever) is a lifeless social unknown black hole. In a traditional environment of everyday life in the current Internet Age, a scientific basis becomes essential to be precise and computational, the interaction needs a framework and a blueprint even though the format may be violated on many occasions, there a basic theme that can be formally programmed for social machines. The computational space follows this pattern in time dimension thus following space-time coordinates in the memories, processors, and peripherals of the social machines. This space can be traversed, reversed, and optimized for efficient replicas of social interactions, even though social interactions in the real and neural spaces are irreversible in the time dimension. Numerous representations may exist and depend on the type and nature of the interaction. The type of convolution is also contextual and differentiated as **12* or **21* Typical of these interactions are presented as follows:

(n →v and (v→ n); n ↔ v and v ↔ n)

*(n → * → v)* or *(n('s) *'s → v(s))*

*{∑ ((n → * →v)) from ' t' to 't+Δt'*

*n1 * → *v12 →n2* from *n1* to *n2* as action/reaction, and

an element of knowledge (*ΔK12*) is generated after a finite element of time *Δt*

*n2 * →*v21 →n1* from *n2* to *n1* as reaction/action, and

an element of knowledge (*ΔK21*) is generated after a finite element of time *Δt'*.

In formalizing the steps of a typical dyadic social interaction, we present the following steps presented as a noun object *n1* (or *no1*) initiates a verb function *v12* and the mode of interaction is establishes as follows. This basic elementary process is represented as (*n1* v*). Further, broken down this process is written down as:

*(no1 *12 v 12 →no2);* or as *(no1* v 12→ no2)*

This element of any elementary transactional process is shown in Figure 3b as follows:

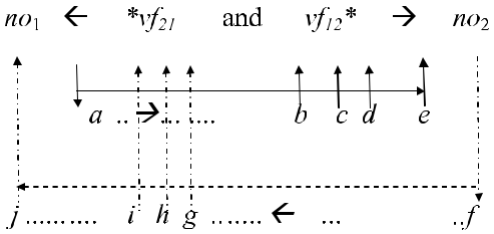

Figure 3b: Sequential diagram of a Dyadic interactions (no1 *12 v 12 →no2); or as (no1* v 12→ no2) or (n1 *12 v 12 →n2); or as (n1* v 12→ n2). Note that noun objects can be represented as no's or n's.

A forward process (full lines) with *a* through *e* steps is followed by a backward process (dashed lines) with *f* through *j* steps. This elemental transaction is repeated many times to depict an entire interaction between any two noun objects *n1* and *n2.*

A computation diagram of the interactive elemental process is depicted in Figure 3c. The dyadic nature of the process is embedded in the symmetry of the diagram. Nature and the interaction can vary indefinitely in real-time making human behavior unpredictable but the machine can guide the verb functions (*v's*) goal-oriented and intelligent (*) when the personal profile of both participants is known or estimated. The case is similar to that of an embedded intelligent agent (IA) making the appropriate changes toward achieving the desired goal. Such adjustments are proposed by Drucker [13] in the Practice of Management of corporations.

c) *Dyadic Interaction-based Knowledge Generation Processes based on V*N, (N1 * V12 → N2), (N2 * V21 → N1),*

Actions are undertaken to gratify any need of an individual (n_1) to affect the need that supplied the motivation to act (*V12*). It may also involve a reaction from another individual (n_2). A dialog is thus started. Positive actions gratify, null actions spend energy but do not gratify, and negative actions further enhance or intensify the need. Hence the effect of social action-reaction also starts to have special features. When the secondary object, N_2 is a machine, network, or a computer, the natural intelligence of N_1 and the Artificial intelligence embedded/programmed in N_2 are invoked.

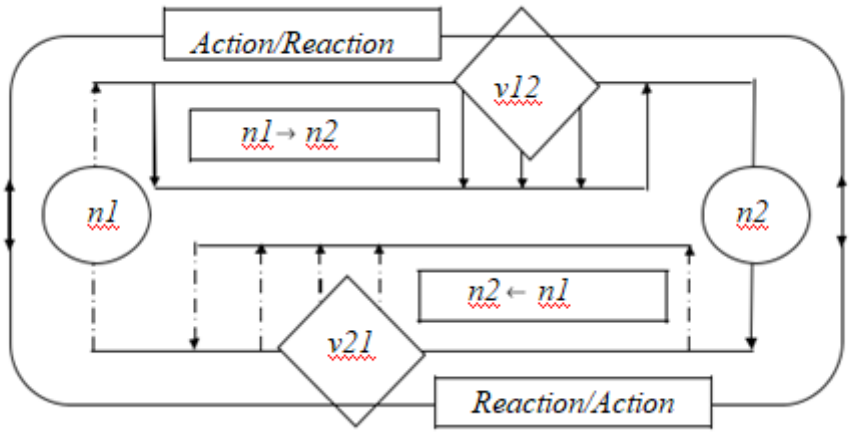

Figure 3 c: Computational Representation of a Dyadic interactions (no1 *12 v 12 →no2); or as (no1* v 12→ no2)

Convolutions (*'s) form the intelligent linkages between Nouns (*N's*) and the Verbs (*V's* or action). Thus the symbols *N*V* becomes an element within (Δk). In general, convolutions (*'s) i., e., the intelligence of the individual deployed in combining the i^{th} *need* with the j^{th} *action* of the individual play a dominant role in the outcome. However, these actions are circumstantial and dynamic. They are alive and individual adding attributes the personality. Integrated over a population in a culture or society, these distributions become significant in defining their response. Derived knowledge now starts to assume a statistical distribution with a mean and variance. When different needs have different intensities of need, then positive, null, or negative intelligentsia deployed over a period from *' t'* to *'t+Δt'* seconds will have negative, zero, or positive effects on the need intensities.

d) *Timing and Sequencing and Structuring of Knowledge*

An accurate mathematical simulation of human interactions is not as practical as much as corporate management is not entirely an accounting program. However, when management and accounting are intertwined the Practice of Management is a practical methodology to control corporations. Whereas accounting, production, and inventory controls are numerical, the human aspect in management still defies numerical analysis. Behavior and control may not be entirely numerical but it supports human relations to be goal-oriented and optimal and remains in the confines of allocated limits of time and be within the accepted norms of the society. These concepts are presented to enhance and guide the human aspects. The role of understanding and knowledge is vital and necessary to prevent humans from becoming robots and to prevent robots from becoming humans. In the intermediate stages, the machines can be built to be humanistic [14] as much as humans can be mechanistic [15] during the Industrial Revolution.

The current semiconductor chipmakers and technologies are unable to manufacture the VLSI chips to embed the necessary IA tools and make the timing

and sequencing numerical and entirely precise. The human touch is left open, beautiful, and almost mystic beyond the reach of numbers and fractions.

V. Role of Knowledge in Human Interactions and Vice Versa

a) Media, Social Setting And Knowledge During Interactions

The interpretation, deduction, and construction of elements of knowledge ΔK and $\Delta\Delta K$ are depicted in Figure 4 when two noun objects *n1* and *n2* interact to gratify their needs and to the benefit of themselves and the benefit of each other. The depiction has two additional parameters $\mathbb{\Gamma}12$ and $\mathbb{\Gamma}21$ to incorporate the media characteristics[2]. The media effects can be reduced to some extent by the receptor but with an additional effort, time, and energy. In a majority of cases, the distortions are uncorrected and the verb functions (*v's*) are misconceived.

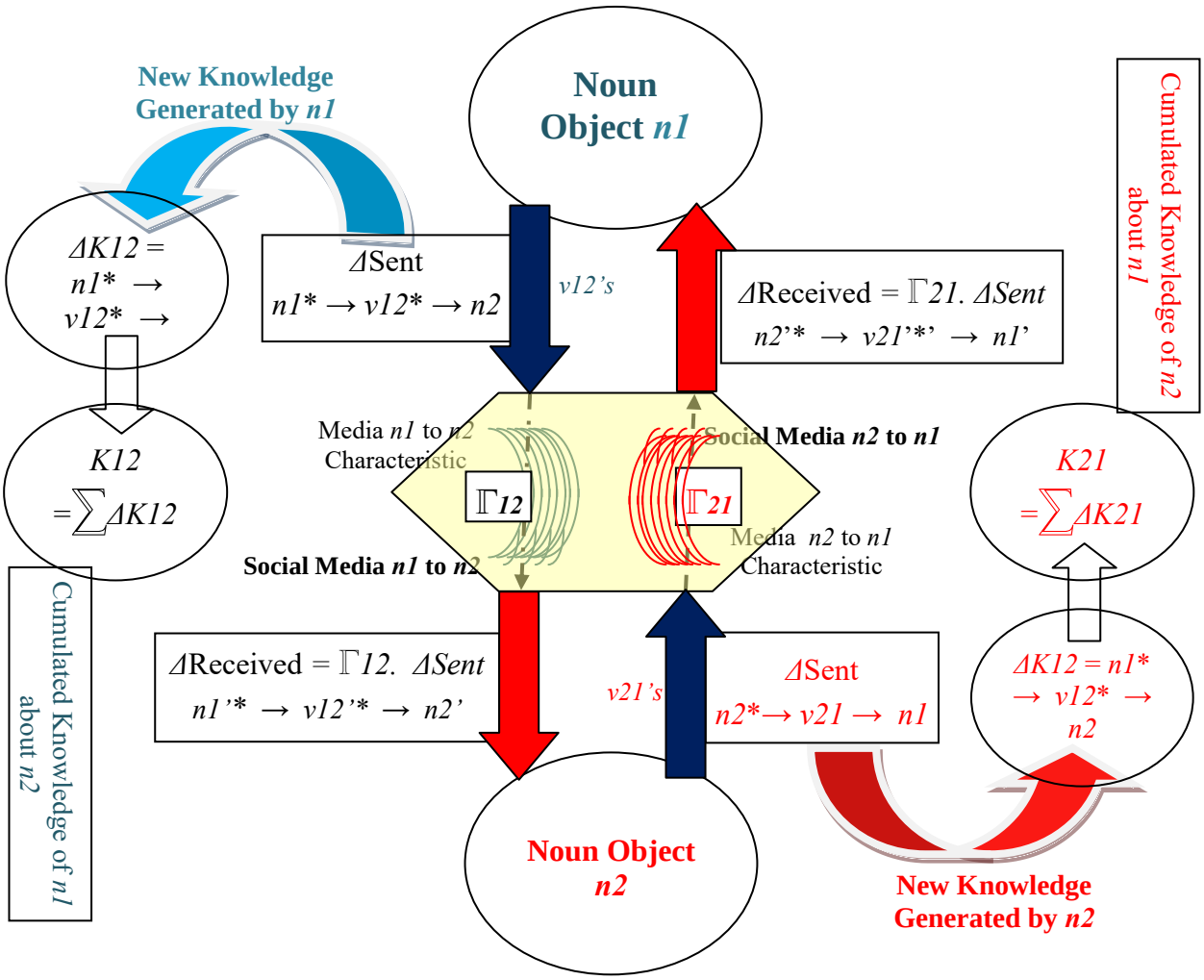

Figure 4: A Complete representation of Dyadic Interaction between n.1 and n2. Blue color is for n1 and Red for n2. The Media box has its own transmission characteristic for the flow of the increments of knowledge ΔK12 ΔK21. So the knowledge sent for each of the increments is not the same as what was received. This occurs because of the differences in the personalities of n1 and n2, the media characteristics, and the instants of transmission and reception. Miscommunications can thus be programmed in this model. Each of the participating objects evaluates the numerous elements (**Δ**K12 and **Δ**K21) received and as K12 and K21. These knowledge profiles help navigate next dyadic session to improve the efficacy of communication or alter the quality of relationship.

[2]These characteristics include the effects that the Media can attenuate and distort human actions and their characteristics. This situation is a vivid reality in audio and video interactions. In reality, the media change the context, the intent and purpose of human interactions. Political and personal gains are accomplished in the current knowledge ear and the Internet age.

The misconceptions in many cases lead to misalignment of the thought processes of both *n1* and *n2* and are a major cause for confusion and conflicts. A reason for disharmony and disarray is implanted. In most cases, the damaged relations occur because of the selfish interest of *n1* and/or *n2* by willful or coincidental events to cause a rift. Actions are not always retrievable and cause permanent changes in the boundaries of humans, societies, generations, and even nations. *W*elcome partnerships and global wars are possible depending on the leadership role of *n1* and/or *n2*. It becomes particularly important that the cooperative or conflicting noun objects *n1* and *n2* be perceptive of the verb functions or *v21's* and *v12's* consistent with the flow of dyadic interactions. Such goal-oriented clues can be programmed by computer systems even though the effectiveness can not accurately be predicted. On a statistical basis, such computerized clues of humanist machines may be trustworthy. In dyadic human interactions, errors are rectified and the boundaries of human relations are reestablished based on prior history.

b) Role of Economics in Human Interactions

Economics plays an implicit role in the negotiations presented in Figures 1 and 2. Largely the benefit derived by *n1* is approximately equal to the cost of assets expended in "buying" such benefits from *n2* and vice versa. Social interactions have a very fuzzy outcome and results. Perceptions of either and/or both *n1* and *n2* play a crucial role. There are six possible scenarios and listed as follows:

a) SUCCESSFUL INTERACTION

$\Delta W^1 \gg P^1$ (viewed by *n1*) $\Delta W^2 \gg P^2$ (viewed by *n2*)

where ΔW^1 is the worth of the benefit received by *n1* and P^1 is the price incurred and delivered to *n2.* Conversely, ΔW^2 is the worth of the benefit received by *n2* and P^2 is the price incurred and delivered to *n1*

b) AGREEMENT, PERCEIVED FAIRNESS IN INTERACTION

$\Delta W1 \approx P^1$ (viewed by *n1*) $\Delta W^2 \approx P^2$ (viewed by *n2*)

c) AGREEMENT, GENUINE FAIRNESS IN INTERACTION

$\Delta W^1 \approx P^1 \approx \Delta W^2 \approx P^2$

d) EXPLOITATION BY *n1* IN INTERACTION

$\Delta W^1 \gg P^1$ (in actuality) $\Delta W^2 \approx P^2$ (in actuality)

n2 comprehends (from its perception that $\Delta W^1 \approx P^1$ or it has no mechanism to alter the prices. This situation occurs when there is coercion by *n1*.

e) EXPLOITATION BY *n2* IN INTERACTION

$\Delta W^1 \approx P^1$ (in actuality) $\Delta W^2 \gg P^2$ (in actuality)

n1 comprehends (from its perception that $W^2 \approx P^2$ or it has no mechanism to alter the prices. This situation occurs when there is coercion by *n2*.

f) UNSUCCESSFUL INTERACTION

$\Delta W^1 \ll P^1$ (Estimated by *n1*) $\Delta W^2 \ll P^2$ (Estimated by *n2*)

c) A Comprehensive Representation of the Role of Knowledge

Two Figures 5a and b depict the representation of interact, negotiate and/or innovate (even love/hate) events between *n1* and *n2.* Such an event can be as routine as a casual conversation or as crucial as a United Nations ceasefire treaty. The effects of social conditions, timing, duration, personality predispositions and media distortions, reporter biases, of the participant are duly considered and included in the two figures. Figure 5b is more inclusive and takes into account the economic balance between the 'give and take' for *n1* and *n2*.

In Figure 5a, the Center Line of activity (all verb forms *V, v, *V, *v, →v's,* etc.) is at the horizontal of the center of the figure, with n1 and n2 occupying the top and bottom half of the figure respectively. All activities pass through the Central Interactive space. The entry into this space passes through two other horizontal lines to represent the media distortions, biases, and the effect of the political maneuvering and manicuring of n1 and n2 each. The arrows pointing upwards into the upper half arrive from n2 and pass through the transmit characteristic of n2 at the lower line and through the receptor characteristics of n1. The converse scenario exists for downward arrows from n1 to n2. This

methodology is borrowed into human communications from Transmission Line Theory and is well documented [16]. The mode of operation is full-duplex [17].

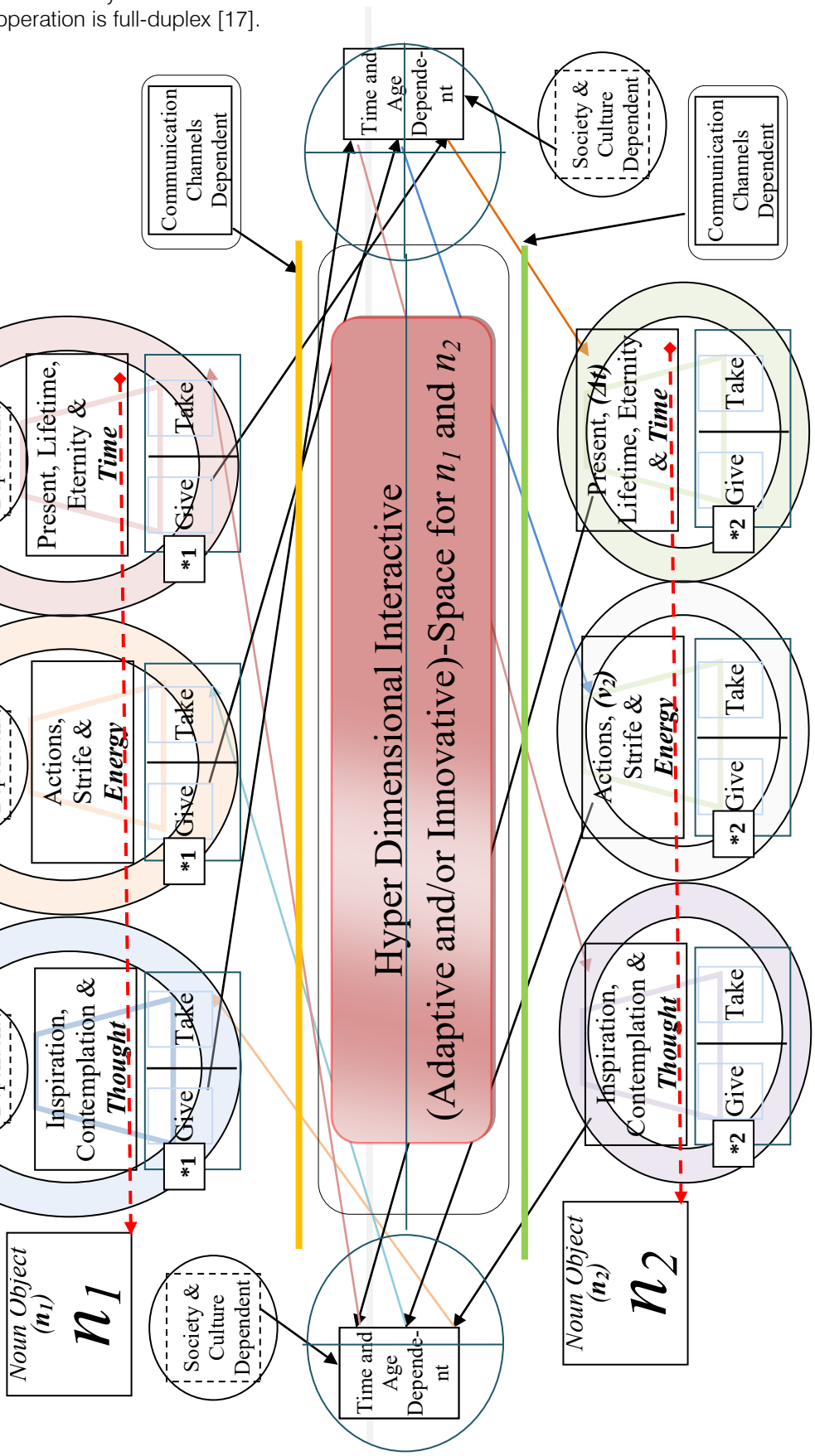

Figure 5 a: Numerous personality characteristics of n1 and n2 get activated during a interactive or innovative event. Typically the 'Give-Take' situation the resource for the event should be treated as 'Give' refers to 'thought, energy and time ot (TET)' and the take refers to the "utility" or the worth derived from the event. An underlying economic transaction occurs and it can lead to the six outcome presented in Section 5.2.

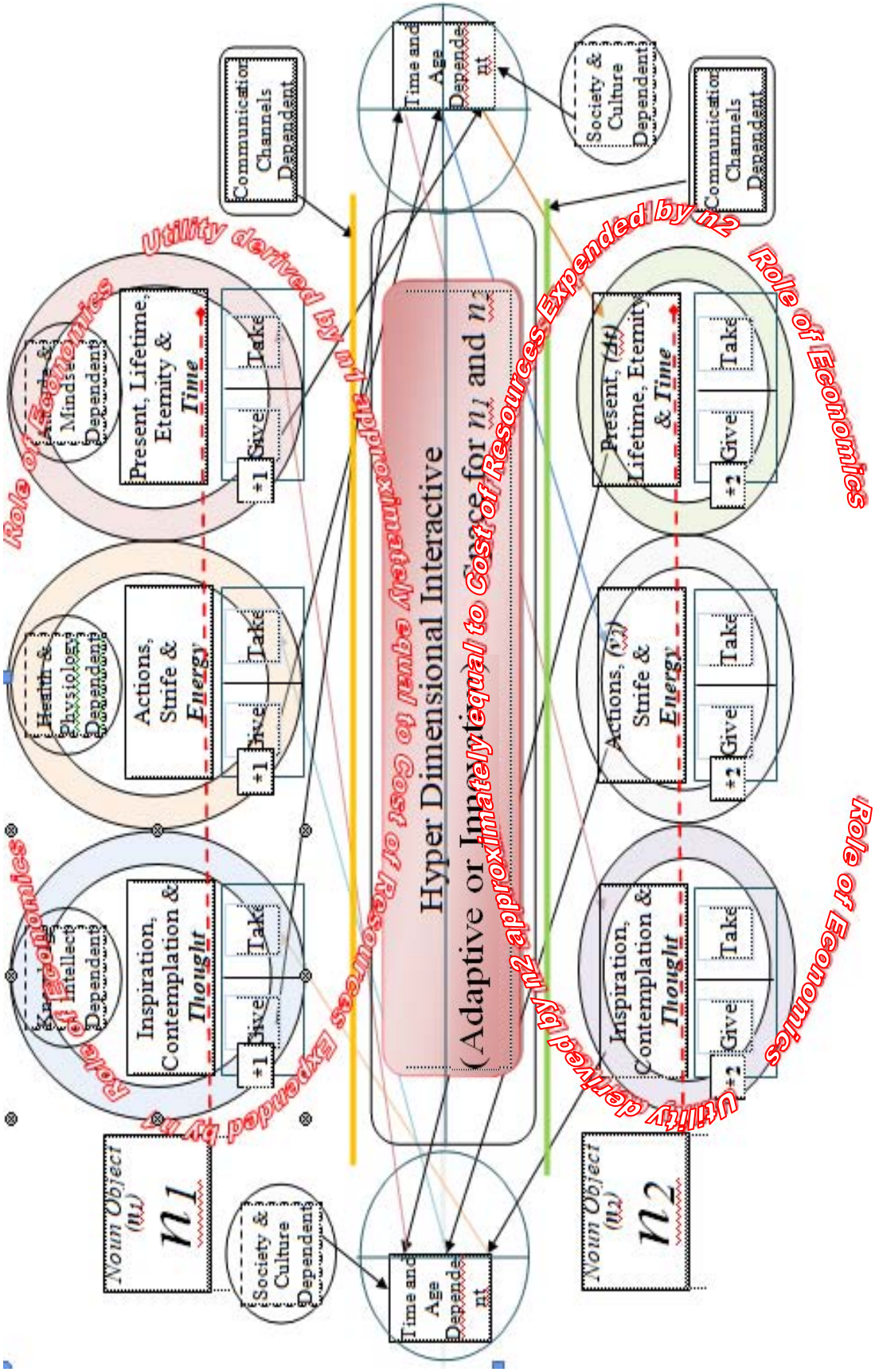

Figure 5 b: The Implicit Factors that affect social interactions between any two intelligent human objects n1 and n2. In all-machine (robotic) environments, the human aspect(s) should be replaced as the embedded/programmed intelligence in the machines (robots). In human - machine interactions, the machine reacts only to extent it has been primed or by the response of intelligent agents programmed in the machine.

Reflection, reverberations, and time delays occur in all instances. All aspects of electrical and optical communication theory are applicable in human communication and the knowledge gained or lost also influenced. The human communications such effects are particularly important, especially during political events.

VI. Conclusions

A methodology and formalism are presented to deal with knowledge from a scientific perspective. The basis resides in tracing the changes in real and perceptual spaces by tracking the causes for their changes initiated by Nature, all life forms, and by machines. The methodology is symbolic and systematic, though not an entirely numerical. On a localized basis, the driving forces and the extent of change in the structure of knowledge may be estimated and linked through the timing and sequence of events that lead to the completion of any event. It is emphasized by the fact that every action in an event requires a finite element of time, however small or large it mat be. Time is of the essence for any event to occur and to change the ensuing structure of knowledge associated with the event.

The linage is established in time-domain; and it is continuous. The equations for the occurrence of verbs within events are by a "cause-effect relationship" rather than a purely numerical equation. The knowledge equations are a new breed of symbolic equations and are not related precisely as the equations as they exist in physical sciences. The principles and concepts are emphasized to traverse the knowledge space initially and this paper should be read as an entry point in the science of knowledge rather than a conclusion of the discipline. The science of knowledge is like the science of management as it is applicable in most corporations. The variability in knowledge science is more widespread since every human, society, culture, and nation is a unique entity. Laws of conduct and behavior become variable but a realm of "order and ethics" exists in all most all transactions and the verb functions within the transactions.

All entities exist because of the underlying needs that drive these entities to exist and survive as objects for their respective lifespan. Eventually, all objects will deteriorate and disintegrate including knowledge objects. The mutual dependence on other entities infuses a rule of fairness and economics to maintain the balance between "give" and "take", even though such balance has been grossly violated in balance with Nature, between humans, societies, cultures, and nations. In a sense, the basis for "good" and "evil" originates in this balance. It may be unseen, but sensed in the many "spaces" within the self, mind, and society. The corners of the profile of the personality of every entity gently float around in these spaces (see Appendix A) every time changes occur.

Highly dynamic and extremely fast knowledge transactions defy their simulations on computer systems in real-time since the CPU and KPU clocks are based on fast Cesium (Cs, atomic number 55) crystal clocks. These clocks are deployed for computer and network functions but it is doubtful if the lattice vibrations in these rare crystals can maintain the flash of genius or the retinal response of a human or an eagle eye. The AI programs and utilities that surround humanistic machines will definitively retard their simulation thus reasserting the supremacy of mind over matter and a even greater supremacy of mind over machines!

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Appendix A

Symbolic Representation of Knowledge Functions

A1 ARROWS

➔ Forward knowledge process, i.e., the effect of the prior element on the following element.

Backward knowledge process, i.e., the effect of the following element on the prior element.

➔ Generates a result or results. Can also modify the following verb *v* or a noun *n* in all spaces

➔ -Or modifies the status in knowledge space but on the prior *n* or v, in knowledge spaces

➔ -Generates a result, or results in a verb *v* or a noun n, and both directions

A.2 NOUNS and Noun Objects

Nouns are objects that initiate verbs and verb functions. They affect other nouns and noun objects (including themselves). These objects are affected by such verb function. The status is altered and during the verb is active the verbs which take a finite amount of time.

n, n's, no, no's, N1, N2, NO, NO's,

A.3 CONVOLUTIONS

A convolution process of interaction with *n* or *v* usually occurs between *n* and *v* or *v* and *n* that can be unidirectional (i.e., -, or ') or bidirectional (i.e., ' -) in its general form. This function of this symbol is contextual, syntactic, and semantic; and it can depend on *n* and/or *v*. The time forwardness is depicted by the direction of the arrow for the effect of the convolution as * or *'s

A.4 VERBS and Verb Functions

A verb function or simply a verb associated with *n.* All verbs do not interact with all nouns and vice versa. When attempted in illegal context the knowledge machine generates an error message

v, v's, vf, vf's, V1, V2, VF, VF's, BoK, bok, BOK, etc.,

A.5 KNOWLEDGE ELEMENTS

k, K, Ck, ΔK, and as *kels or KEL or KEL's,* bok, BoK, BOK are also bodies of knowledge that can serve as nouns depending on the context of other *n's* and *v's*.kels. One or more elements of knowledge (in the knowledge space) associated *kels* or with (*n v*), one or more *kels*, are generated during or after the process

KELs ↔ (*n*v*). (Italicization of n's and v's does not have any significance).

A.6 PROCESSES

(n → v and (v→ n); n ↔ v and v ↔ n)

(*n → * → v*) or (*n('s) *'s → v(s)*)

{∑ ((*n → * →v*)) from *' t'* to *'t+Δt'*

*n1 * → *v12 → n2*

*n2 * →*v21 → n1*

*N*V*, (*N → V)*, etc.

A.7 SPACES

RS Physical and Rea lspace with (x, y, z, t; r, θ, ϕ, t; r, θ, h, t; etc.) coordinates in which reality occurs

NS Neural space for thought and comprehension; it is real space in the physiological sense

SoS Social Space for humans and *KCOs* in dealing with social problems

Memory systems space in computer and network systems for computational tools, algorithms, etc.

MS Mental space derivative from NS

PS Psychological space with emotional ties to physical or mental objects, convolutions, and verbs

KS Knowledge space(s): Subset(s) of mental space in the human mind, or superset/subset of the memory allocated for knowledge functions in knowledge machines. The main memory is thus tiered into three layers, operational or systems space, a knowledge space, and a real/simulation/application space for computing in the real physical/computational space. Human beings routinely deploy different KSs to store knowledge accumulated in different disciplines, or about totally unrelated noun objects. During solutions to knowledge-based problems, these spaces (RS and PS, RS, and SS) get interdependent and work coherently to solve knowledge-based problems or create new knowledge that can be mapped into the real-world as inventions or modifications of existing systems. Mapping back and forth from RS from and to KS are both feasible in knowledge machines as much as mapping to and back from SS to RS.

A.8 INCREMENTAL CHANGES IN THE STATUS OF *N* AND *V*

ϕ An incremental change associated with the process (*n* v*) in the real space RS ≠ 0, but finite however small or large it may be and equals (*n' B n; ' B* ; or *v' B v*); ϕ can be sub-microscopic or super-cosmic, where *B* is any verb function upon or influence.

A corresponding change associated with the process (n v) in the knowledge space KS ≠ 0, but finite however small or large it may be and corresponds to real space change (n' B n; ' B ; or v' B v); ψ can be tiny and incomprehensible or engulf the entire neural space (NS).

A.9 TIME

Time in all spaces. Reversal of *'t'* is not possible in real space and MS but is feasible in KS, SS. Also used as a symbol in analog and continuous functions *δt* or *t, T* by undo or undelete commands on the machines. Further, the time to complete any process in the real and/or knowledge spaces is *t, Δ t,* and *T.* A span of time and *δt* or *Δt*. Localized numerical operation is possible in all spaces but global reversal are impossible in any space. .

Biography

The author holds his Ph.D. and D. Sc. (E.E.) degrees from the University of Manchester and his MBA (Econ.) from the New York University. He taught at the University of Colorado for 2 years before joining Bell Laboratories. After 15 years of research, he returned to teaching as a Professor of Computer Science at the City University of New York. The author has been a Telecommunications consultant to Bell Communications Research, AT&T Bell Laboratories and Lucent Technologies for the last 25 years. He received numerous prizes for his papers from IEEE. He was elected a Fellow of the IEEE for his seminal contribution to the simulation and design studies of the High-speed Digital Subscriber Lines. He has authored and coauthored several books in two broad areas of intelligent AI-based broadband multimedia networks and computational framework for knowledge. His doctoral students have continued to contribute to knowledge processing systems and wisdom machines proposed by him during 1999 to 2007. In 2004, he wrote the book on Scientific Innovation, for new doctoral students based on his teaching and mentoring the best of his 20 Ph.D. students at the Graduate Center of City University of New York. Much of the innovative feedback has come from the doctoral students mentored during 1990 through 2007. He holds over 20 American and European patents ranging from slip-meters for induction motors to medical networks for hospitals.

The author is obliged to Professors Victor B. Lawrence, George S. Moschytz, Bishnu S. Atal, Nikil Jayant, Stanley Habib, Michael Kress, and Alfred Levine for reviewing the many technical books written by the author. He has continued to author technical books during 2014 and 2016. The thirty chapter book, "The Evolution of Knowledge Science," published by Morgan Kaufmann (ISBN: 9780128093559) presents a comprehensive treatment of theory and flow of knowledge in the society based on a computational and a scientific basis. In this paper, the author generalizes the ideas further and offers a methodology for the mind to explore the (semi-)infinite space of knowledge and wisdom.

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Inventory Management, Organizational Operations and Productivity in Nigerian Companies: A Panacea for Profitability

By Past. Dr. Abomaye-Nimenibo, Williams Aminadokiari Samuel & Godwin Mbang Timothy
Obong University

Abstract- This study examines the effect of inventory management on organizational operations, productivity, as a means of causing the profitability of companies. The study was, therefore designed to study how the manufacturing firms managed their inventory materials. We used questionnaire in collecting our data. The data collected was analysed using spearman's rank-order correlation coefficient and the Pearson product-moment correlation coefficient. The findings indicated that the method used by 7Up Bottling Company to manage their inventories in both raw materials and the finished product was efficient as the amount of naira saved in the course of purchase have more effect on the profitability of the company during production/ selling of the finished goods. Controlled purchasing is found to be cost-effective. The study recommends the following: an adoption and application of the economic order quantity (EOQ) model to save cost and make the operations more efficient.

Keywords: inventory management, inventory materials, operations management, organizational operations, profitability, controlled purchasing, controlled inventory, economic order quantity (EOQ) model, market operations.

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Keywords: inventory management, inventory materials, operations management, organizational operations, profitability, controlled purchasing, controlled inventory, economic order quantity (EOQ) model, market operations.

I. Introduction

a) Background to the Study

In the literature of Production economics, the existence of any business outfit, demands the regular use for inventory management cannot be exaggerated as it is a means for improving the performance of manufacturing industries that will ultimately contribute positively to the growth of any economy. Production Economics according to Abomaye-Nimenibo (2019) is a process in which engaged workers combine various material inputs and immaterial inputs (plans, technical know-how, etc.) to make something out of it for consumption (the output). It is the act of creating production (an aspect of economics), i.e., goods and services which have economic value (economics) and contribute to the utility (economics) of individuals. Production Economics is concerned with the use of a combination of various inputs (including plans and executions) into finished goods and services (output). It is the act of synthesizing goods and services using combined efforts of factors of production with the view of minimizing wastages and losses in-order to bring about profit maximization and high mindfulness of business consciousness. The subject is, therefore, the study of how human beings satisfy their unlimited wants by using the limited resources they have to create or produce the goods and services demanded by individuals; or any activity that is carried out to satisfy human wants (goods and services). It is the means of converting raw materials into finished merchandise suitable for human consumption with the use of labour to create them. Taking an inventory of such materials in their original form or processed state known as inventory management is very crucial. This inventory is taken by measurement in numbers and quantities. For example, a factory may be able to produce 100 million Kia cars in a month with a minimum cost. The number of manufactured cars need to be known as well as quantity demanded within the same period, to ascertain and plan for the production of any shortfall or determine the physical stock level to avoid an unnecessary stockpiling of goods.

The term inventory came into literature in 1601, which is defined as the record taking of current assets of a business that is, the properties owned, commodities on hand, the value of all on-going and completed works still in the company's premises that is yet to be sold, which are capable of easy conversion into liquid cash within a short time. Proper inventory has accounted for continues profitability of a manufacturing firm which calls for thorough research at all times; as it plays a vital role in the management of business operations of manufacturing companies. Having an up-to-date inventory of raw materials in stock gives leverage to companies to operate independently of their suppliers, irrespective of their day-to- day operations, which are

Author α σ: Ph.D, M.Sc., B.Sc. Economics, MBA Management and UD, Personnel Management and Industrial Relations, Director of Postgraduate Studies, School of Postgraduate Studies, Obong University, Obong Ntak, Etim Ekpo Lga, Akwa Ibom State, Nigeria.
e-mail: wasanim2006@yahoo.com
Author ρ: Ph.D Economics in-view, MBA, Accounting, M.Sc. and B.Sc. Economics Senior Lecturer/Head of Accounting Department, Obong University, Obong Ntak, Etim Ekpo Lga, Akwa Ibom State, Nigeria.
e-mail: timothygmbang@gmail.com

not dependent on deliveries from supplies since stocks of the necessary materials are maintained. Accurate inventory control has prevented the loss of billions of Naira annually, had there been the non-accountability of stocks and inaccurate checks and balances.

Inventories, according to Pandey (2004), are stocks of a product which a company manufactures for sale, and components that are of various forms in which inventory exists in a manufacturing firm known to be raw materials, work in progress, and finished goods. Inventory management is therefore, the art and science of maintaining stock levels of a given group of items incurring the least cost consistent with other relevant targets and objectives set by management (Jessop 1999).

The success or failure of any business depends on how it effectively practiced inventory management, to ensure that adequate stock of used or unused materials are in store to avoid stock-out so that production is not disrupted and distribution cycle that is crucial to the survival of all manufacturing companies e maintained, while too much stock is not piled up, so as not to tie down the scarce resources of the company. On the other hand where the resources are poorly handled for lack of proper inventory management can result into scarcity of materials in stock and lead to loss of customers and profit. Inventory management extends not only to raw and finished goods, but also to fixed and current assets, properties, work in progress, office equipment and supplies, business customers, trading partners; and overall operational supplies.

Inventories are important part of, the current asset of large companies; which are approximately 60% of the current asset of large companies. Considering the large sum of money that is committed to the stocking of raw materials, work in progress, and finished goods, it is therefore of paramount necessity that these stocks be managed efficiently and effectively to avoid jeopardizing the profit position of the firm.

Most companies set profit goals, but few set productivity goals. In a growing economy, everyone, including labour, the management or consumer, wins when productivity expands. Growth in productivity can bring immense benefits to the economy. The usefulness of inventory management is often overlooked in most of the industrial undertakings. This aspect of inventory is particularly rewarding in big outfits, being the largest co-partner in the total cost partnership of a business.

Maintenance is a means for improvement of productivity and profitability. As the equipment cost and recurring operating expenditures are generally on the higher side, the formulation of careful maintenance and replacement policy is significant for accomplishing maximum productivity and profitability. Productivity is a crucial area in business and is the primary concern of any nation. Maintenance and replacement policy help the employees to earn more money, and at the same time, helps the management to get additional capital, the shareholder to receive a higher dividend, the government to collect more tax revenue, and improving the living standard of society.

Improved productivity means cost-effectiveness. Thus productivity and cost are inversely related. A rise in productivity implies a fall in the prices of products or services, which culminates into increased profitability. Increase in productivity or productivity growth depends on several factors such as the growth of inputs available for use in a production process, the scale and level of technology used in production, the management techniques, the research and development, and the skill and attitude of the people are of prime importance. Therefore, productivity and profitability are not the same thing, although they have a close relationship. Usually, when productivity increases, the profit should also increase. However, a rise in the product price combined with a fall in factor costs may increase the profitability even if productivity has dropped at the same time. Again, a rise in factor cost coupled with a fall in output may lower profitability although there is an increase in productivity. Thus productivity results in higher profitability, but profitability is not the measure of productivity.

In inventory, there is an optimum level, and inadequate inventory causes loss of sale and disrupts the production process. Still excessive stock level leads to unnecessary carrying cost and obsolescence or spoilage risks. Horngren (2000) defines inventory management as the planning, coordinating, and controlling activities related to the flow of inventory in and out of the organization. So, the profit-making of any manufacturing firm is mostly dependent on the efficient management of its inventory which is the reason for this study by ascertaining that a better stock taking will lead to an excellent performance of a company, that is expected to yield profitable returns.

b) Statement of the Problem

The main goal of inventory management is all about balancing the economics of not wanting to hold less stock or too much stock at any point in time. Return maximization on investment calls for an appropriate inventory present a considerable proportion of a firm's working capital, which is a significant function of the firm's financial manager. However, most managers ignore the saving potential that arises from proper management of inventories, which will save costs and reduce tying down of capital instead, while trying to treat stock as a necessary evil and not as an asset that requires management. Some firms do not or ignore to control inventory holding, and this leads to understocking and causing the firm to stop or slow its operations, and production. To this end, many organizations usually fail to examine its investment in inventory; and instead focus on maximization of returns.

In Nigeria, small and medium firms are increasingly adopting inventory management systems for competitive advantage and improving their operations and productivity. However, the main challenge today among firms in Nigeria is how to obtain their efficiency and improve effectiveness. Firms are known to have a poor inventory management technique, which has negatively affected the firm's ability to service and satisfy its customers. Most firms are in a dilemma as regards how much and when to order and reorder for inventory. The decision as regards the quantity and time of order is also a matter of concern.

The high cost of storage/holding cost of inventory is an issue that affects organizational profit in Nigeria. For lack of proper inventory, a lot of business firms do not declare profits; others operate below capacity; some in the liquidation process and others having poor productivity. There is also a delay in the replenishment of inventories. This study seeks to address these problems enumerated above, to proffer solutions that will go a long way in improving the profit performance, operations, and productivity of an organization.

c) Objective of the Study

The main objective of this study is to find out the effect of inventory management in an organisation, using seven (7up) bottling company as a case study.

The specific objectives include:

1. To observe the effect of inventory management on organizational productivity.
2. To determine the extent to which poor inventory management could affect organizations operations.
3. To assess the extent to which inventory management contributes to the profitability of an organization.

d) Research Questions

For this research study, the following research questions were our guided:

1. How does inventory management affect organizational productivity?
2. How does poor inventory management affect you organization's operations?
3. To what extent does effective inventory management contribute to the profitability of an organization?

e) Research Hypotheses

The following hypotheses were formulated in the null (H_0) form.

1. There is no significant relationship between inventory management and organizational productivity.
2. There is no significant relationship between poor inventory management and the organization's operations.
3. There is no significant relationship between effective inventory management and profitability.

f) Significance of the Study

This research work is useful and relevant to manufacturing firms and the entire society in the following ways:

1. It will help to improve inventory control and management in manufacturing companies as it will enable them to keep an adequate inventory control and ensure that they do not run out of stock or have excess of it, which endangers their liquidity.
2. It will enrich organizations and other sectors of the economy in knowing and appreciating the effects of inventory management in the enhancement of organizational efficiency, which aids increase in profitability and productivity.
3. It will reveal the methods that should be used in preventing mismanagement in companies and business outfits.

g) Scope of the Study

This research study centred on inventory management and organisational profitability covered such areas as storage, transportation procurement, inventory handling planning control, and value engineering, etc. Information was got from the depot of 7up Bottling Company Plc, Port Harcourt, Rivers State.

h) Definition of Terms

There are terms and concepts associated with inventory management, which terms and concept are explained below.

i. *Inventory* is a record of a business' current assets or merchandise, or supplies held in transit at a particular time.
ii. *Inventory Management* is the part of operation management concerned with discoursing and maintaining the optimum level of inventory investment. It is concerned with policy-making on inventing planning and inventory control.
iii. *Inventory Control* involves the regulation of quantities of materials or inventory on hand in such a way as to ensure the meeting of the current needs of the organization while avoiding excess stocking; the calculation is on the rate of withdrawals and the time necessary for replenishment.
iv. *Inventory System* is a set of policies and controls put in place to monitor levels of inventory and determines what levels of stock should be maintained, when to replenished, and how large orders should be.
v. *Reorder level* is the stock level at which further replenishment order should be made.
vi. *Profitability:* The state of yielding a financial profit or gain, it is usually measured by price to earnings ratio; and business can earn a profit.

vii. *Reorder quantity* is the quantity of the replenishment order.

viii. *Stock out:* When an item of stock is required but is not available in-store, then there is a stock out of that item.

ix. *Safety stock*: An amount of stock over of average inventory held in a cushion against stock-out alive to usage or uncertainty of lead time.

x. *Holding/carrying Cost:* These include the cost for storage facilities, handling costs, insurance, pilferage, obsolescence, depreciation, taxes, and the opportunity cost of capital, which is high holding cost that tends to favour low inventory and frequent replenishment.

xi. *Ordering cost:* The clerical expenses incurred in preparing orders, delivery, and material handling costs that are usually represented in a fixed amount for orders placed regardless of the quality ordered.

xii. *Stock valuation:* This is the means of assigning value to items of stock of a company. It helps company management to make inventory level decisions about the type of method to be adopted, such as - last in first out (LIFO) or first in first out (FIFO).

II. Literature Review & Theoretical Framework

a) Theoretical/ Conceptual Framework

The successful functioning of a manufacturing or retailing organization is the holding of inventories as part of their business operation, which makes up the most significant part of their current assets. No firm neglects inventory management or risks its long-run profitability, and it may end up failing in its business. The Microsoft Encarta premium defined inventory as the number of goods and materials in hand. A manufacturer's inventory refers to items ready and available for sale.

Nwaorgu (2005), talk of inventory as a tangible property held to resale in the ordinary course of business, in the production for sale to be consumed, in the production of goods and services.

Morse (1997), defined inventory as a general term describing goods which are held in the storehouse and stockyards, the bulk of which is usually intended for the connection with production or operation activities and also finished products awaiting dispatch to customers.

From the above definitions, inventory is an idle stock of physical goods that contain an economic value, and are held in various forms by an organization in its custody awaiting packing, processing, transformation, users to take delivery of them, or awaiting for future sales. Any organization which is into production, trading, selling, and servicing of a product will serve as of necessity, hold stock of various physical resources to aid in its future consumption or sales. Inventory is said to be the necessary evil of such business; when such organizations hold stock for various reasons which include speculative purposes, functional purposes, and physical necessities.

i. *Theoretical background of the study*

The theories of inventory management include the following:

i. Theory of Constraints
ii. Theory of Inventory Control
iii. The Agency Theory
iv. Demand and Supply Model.

a. *Theory of Constraints*

Theory of Constraints is a management paradigm that views any system as being limited in achieving more of its goals by a trivial number of constraints. The theory adopts the common idiom of "a chain is no longer stronger than its weakest link" this means that processes, organizations, etc. are vulnerable because the weakest person or part can always damage or break them or at least adversely affect the outcome business outfit. This theory is a method of identifying the most important factors that stands in the way of achieving a goal and then systematically improving those constraints until it is no longer the limiting factor. The theory takes a scientific approach in improvement of the existing structure; which consists of multiple linked activities, one of which acts as a constraint upon the entire system which should be spotted out and improved upon.

b. *Theory of inventory control*

Large companies use a variety of inventory control theories and mathematical formulas to help them optimize the production of storage of many thousands of units and products to help them minimize cost.

c. *The agency theory*

The Agency theory is a supposition that explains the relationship between principals, and agents in the business. Agency theory is concerned with resolving problems that can exist in agency due to unaligned goals or different aversion levels to risk. The most common agency relationship in finance occurs between the shareholders (principal) and company executives (agents). The relationship between the roles of the management including staff of the organization in the company, compared to that of a principal and agent relationship, which is known as an agency relationship. Agency theory addresses problems that arise due to differences between the goals and desires of the principal and agent. In other words, agency theory makes us understand the relationships between agents and principals. Oye (2006), stated that a possible conflict could arise when ownership of a business is separated from day to day management of an organization.

d. *Demand and supply model*

Lawal (1988) showed the economic model of demand and supply, which necessitates the quantity of inventory at hand at a particular time and price, to react to the prevailing price to bring an equilibrium position through the consensus inventory position at the market price. The Demand and Supply model means that the inventory level is determined when the demand level and the supply level equate.

ii. *Concepts of inventory management*

The determining concepts of inventory management are those of:

The Concept of

a. Just in time
b. Stock turnover
c. Stock valuation
d. Profitability

a. *The Concept of Just in Time (JIT)*

Coyle et al. (2003) defined just in time (JIT) as an inventory control system that attempts to reduce inventory level by coordinating demand and supply by the point where the desired item arrives just in time for use. Lysons & Gillingham (2003) also defined this concept in time system as an inventory control philosophy whose goal is to maintain enough material in the appropriate period and at the right place to make just the right amount of product. In other words, the just in time system suggests that inventories should be available when an organization needs them, not any earlier, nor any later.

b. *The Concept of Stock Turnover*

Stock turnover is any metric that measures the rate at which inventory is used up. It refers to the number of times a company sells its goods and then replaces the supply in a given period, such as one year. It is measured thus:

$$\frac{\text{Cost of sales}}{\text{Average stock held}}$$

c. *The Concept of Stock Valuation*

This concept refers to the process of calculating the value of goods or materials owned by a company or available for sale in a store at a particular time. It is the method of calculating the theoretical worth of companies and their stock. The real use of this concept is to predict future market prices. Stock valuation is based on fundamental aims to give an estimate of the intrinsic value of a stock based on predictions of the future cash flows and profitability of the business.

d. *The Concept of Profitability*

Profitability means the ability to make a profit from all the business activities of an organization, company, firm, or enterprise, thereby showing how efficiently the management can make a profit by using all the resources available in the market. Profitability is the aptitude of earning returns on a given investment for the use of its resources. However, the term profitability is not synonymous with the term efficiency. Profitability is the measurement of performance of a business; and is the yardstick of efficiency that propels a company to perform better in its future operations. Though profitability is a vital benchmark for ascertaining better performance, the extent of profitability cannot be said to be the final proof of how well the business entity has performed. Sometimes satisfactory profit can mark inefficiency and, conversely an absence of yield. The net profit figure simply reveals an acceptable balance between the values received and given out. The change in operational efficiency is merely one of the factors on which the profitability of an enterprise largely depends. More so, there are other factors, which affect the profitability of a firm.

b) Overview of Seven-up Bottling Company (SBC)

Seven-up Bottling Company Plc was founded by a Lebanese on October 1st, 1960, to produce carbonated soft drinks from its set-up plant locations, the first located being at Ijora, Lagos. On the 1st day of production, the company sold a total of 24 crates of its product that is 576 bottles. Although the number didn't win the company any award, it certainly was a significant accomplishment of the company on its first day of business sales.

In creating a favourable conducive climate for her charming operations, the company went into a community relationship. Seven-up bottling company (SBC) plc was the first to introduce wreathing in Nigeria by sponsoring the late and great Mike Bamidele who won a little SBC, plc; and was also involved in the first Miss Nigeria beauty competition, which made the company continue to grow in size and importance over the years. The company still sponsors many sporting and distinctive activities, amongst which are the Pepsi football competitions, Pepsi football league, and Seven-up premier basketball, Mirinda school program, having a special business unit as Pepsi and Miranda.

The company was one of those companies quoted on the Nigerian Stock Exchange (NSE) and went public in 1984. The utmost period of growth for SBC plc began in the early '80s with the Ibadan plant set up in 1980, Ikeja plant in 1981, the Kano plant in 1985, the Aba plant in 1989, the acquisition of John Holt soft drinks with the Kaduna plant in 1989, Benin plant in 1992 and Enugu plant in 2002, with other plants and depots. Seven-up Bottling Company has not less than 37 depots and having dealers in all parts of the country. The present range of products includes seven-up (7up), Pepsi, Mirinda orange, and the latest of its range of products is Mirinda fruit, which was launched in 2002 and then mountain dew in 2008.

c) Corporate Organizational Structure

An organizational structure refers to the working mechanisms of allocating tasks to various units, coordination and supervising them with the view of achieving organizational goals. An organization can be structured in according to its objectives, which determines the mode in which it operates.

The organizational structure expresses the allocation of responsibilities to different functions and processes and also to different entities such as branch, department, workgroup, and individuals. The organizational structure affects organizational profitability in two (2) ways:

The first a company does is to set up standard operating procedures with routine rest, and also determine decision-making processes, and thus to what extent their view enhances the organizational profitability.

Inventory management requires constant and careful evaluation of external and internal factors and control mechanisms through thorough planning and review. Most organizations have a separate department or job function called inventory planners who continuously monitor, control, and review the inventory and interface with production, procurement, and finance departments. In any organization of any size or complexity, employees' responsibility is defined by what they do, whom they report to, and for managers who report to them, which functionalities are shown in figure 2.1, and 2.2 respectively. Responsibilities are assigned to positions in the organization rather than to specific individuals, and the relationships amongst these positions are depicted in the organizational chart as in figure 2.1and 2.2. A well-articulated organizational structure depends on factors, including the type of work performed, its size of the labour force, the revenue generated, the geographical dispersion of its facilities, and the range of its businesses. All organizational structures are designed, and developed to enable the organization to accomplish its work. The structure of every organization evolves as the organization grows and changes over time.

There are four elementary decisions that managers have to take as they developed an organizational structure. First, works were divided into specific jobs such as the Personnel Manager, Inventory Manager, Marketing Manager, etc. as seen in figures 2.1 and 2.2, being referred to as division of labour. Secondly, the jobs grouped, which is called departmentalization. Thirdly, the number of people and tasks were congregated into related trades with certain number of people to be managed by one person or the span of control i.e., the number of employees reporting to a single manager. Fourthly, the level of authority and decision making authority is determined and defined. In making each of these design decisions, a range of choices is possible as to why, how, and when to make them functional.

For example, the accounting department takes care of all accounting matters under the Accounts Manager; all engineers are ceded to the Engineering Department under the Engineering Service Manager. The size of the grouping may not matter on the number of people to be managed or supervised. The degree to which authority is distributed in the organization also varies. Any structure besides the formal one to take its own designed decision is called unstructured, informal, or organic. The number of levels of authority depends largely on the size of the organization, and the jobs in the corporate organizational structure are usually grouped into departments by functions such as Accounting, Sales, Human Resources, Marketing, and Finance, etc. as shown on Figures 2.1 and 2.2.

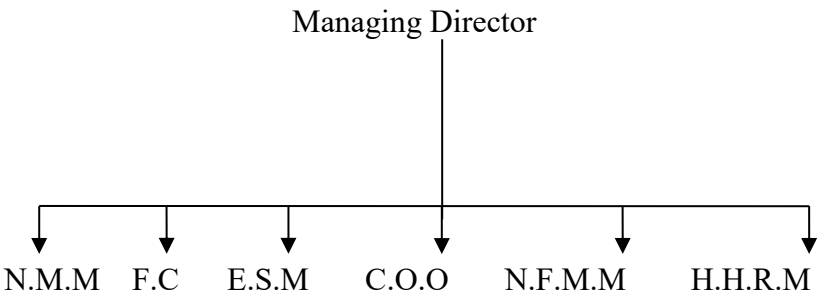

Fig 2.1: Corporate organizational structure

Keys
N.M.M: National Marketing Manager
F.C: Financial Controller
E.S.M: Engineering Service Manager
C.O.O: Chief Operating Officer
N.F.M.M: National Fleet Maintenance Manager
H.H.R.M: Head Human Resource Manager

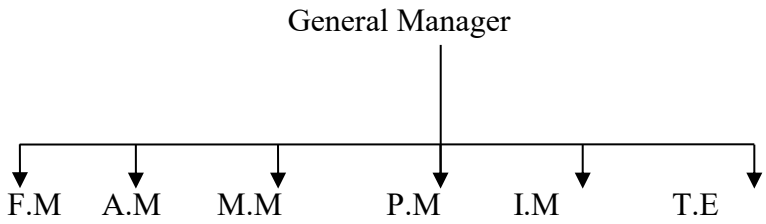

Fig 2.2: Corporate organizational structure

Keys
F.M: Factory Manager
A.M: Accounts Manager
M.M: Marketing Manager
P.M: Personnel Manager
I.M: Inventory Manager
T.E: Transport Engineer

d) Types of inventory/classification of inventory/ inventory levels

Vohra (2008) classified inventories according to the purpose of the organization. He stated that inventories might be maintained for a variety of purposes, and there are five types of inventories that an organization can use for serving these purposes and they include:

i. *Movement Inventories*

Movement Inventories is also called transit inventories. It is because transportation time is involved in transferring a substantial amount of resources; for example, when goods are on transit, they cannot provide any service to the customers.

ii. *Buffer Inventories*

Buffer inventory are stock of basic commodity which were stored under a government directive as when there were excess supplies, and the price of the product was low, which were to be used when supplies fall short; so as to meet up production at periods of high demand and supply. An organization knows its average stock and may deliberately exceed it so as to hold over the average or expected demand. The lead time may be known, but at times unpredictable events could cause the lead times, to vary.

iii. *Anticipation Inventories*

Anticipation inventories are kept for future demand when a company may embarks on the production of other items specially ordered. For example umbrellas and raincoat were store in anticipation of future demand before the rainy season sets in and is kept in store in readiness for the actual demand period.

iv. *Decoupling Inventories*

Decoupling inventory refers to the stock taking of all materials and products in- between the various machines that are being processed in them at the time of disengaging the different parts of the production system. Different machinery and people work at different times to avoid disruption of production.

v. *Cycle Inventories*

Cycle inventories refer to excess purchases in lots of large numbers, rather than the exact quantity demanded at a time. If all purchases are made on exact number demanded, there would be no cycle inventories, and yet shortage in supply will be experienced. Also buying in lots makes the unit cost cheaper than buying in units.

e) Classification of Inventories

According to Lucey (2004), inventories are classified in manufacturing companies as follows:-

i. *Raw materials*

The raw material is an unprocessed natural product used in manufacturing processes to produce a finished good that is in demand to satisfy a human want. Raw materials are those goods that have been procured, and stored for future productions of merchandises and services. They are materials which have not yet been committed to the production of finished goods and services.

ii. *Work in progress*

Work in progress refers to materials that have been committed to production, but the finished goods have not yet been created. In other words, work–in–progress inventories are semi-manufactured products.

iii. *Finished goods*

These are the goods produced out of the raw materials after the production process is complete. They can be said to be the final products of the production process ready for sale.

f) Inventory Levels

i. *Re-order level*

The re-order level is that level of an item that demands replenishment. It also means the reserve level or quantity that reaches the level of new order for replenishment. Pandey stated that the re-order level is that level at which a fresh order should be placed to replenish the inventory. He further stated that some of the points that should be taken into consideration before the determination of re-ordering include lead time, the economic quantity, and the average time. Lead time is the time taken in receiving the delivery of the materials after the order has been placed.

ii. *Maximum stock level*

The maximum stock level is the available storage capacity in terms of cost, the supply of capital, risk of deterioration and obsolescence, and economical purchasing quantities.

iii. *Minimum stock level*

The minimum stock level or Buffer Stock is the actual materials held that are not below the quantity or number at all times so that production is never disrupted for want of stock. The minimum stock level is a precaution mark set to replenish a stock to avoid delays in delivery of new consignments ordered and so certain quantities are kept for delay replenishment which period depends on the rate of consumption during an emergency period. The minimum stock level is the lowest quantity to which a particular product should not be allowed to drop if deliveries are to be maintained (Josph Baggot, 2001). The determinant factor for minimum stock level is - length of time required for the delivery on the part of the suppliers, and for avoidance of late delivery or abnormal usage. Since demand for goods and services varies, and the actual time of delivery of purchased items may can be accurately ascertained, and sudden upsurge in demand of a commodity, there is the need to set aside certain amount or quantity of materials in store, and also to avoid total stock-out, which will be very costly to the firm; then the firm or company must have safety stock to guard against stock-out.

iv. *Optimum stock level*

The optimal stock level is the average level of stock where neither too much or too small quantity of inventory is maintained. The nature and volume of the company's operation determines the optimum stock gauge.

g) Stocktaking Methods

Stocktaking is very necessary for an efficient day to day operation in business organizations to minimize errors that may occur in the course of purchasing and supplying goods. There are two major approaches, they are:

i. *Perpetual stocktaking*

Perpetual stocktaking means nonstop but continued checking of the inventory of stock to keep constant balance of the store records after each receipt and issue of material. It also means the regular taking of account of materials, and comparing with the actual amount or quantity on hand with the stock records to avoid waste, identify shortfall due to wear and tear, or spoilage or pilfering or errors of omission or commission.

ii. *Periodic stocktaking*

Periodic stocktaking is carried out when the store is closed for business, say at the end of the month to take inventory of stock received, and issued out within a particular period; where every item is counted, marked, and valued by a team of stock takers who might be internal or external auditors.

h) Reasons for Inventory Management

There are many reasons why organizations maintain an inventory of stocks. The fundamental reasons for doing so is that it is either physically impossible or economically unsound to manufacture goods and services whenever they are demanded, thereby forcing customers to wait until the goods they ordered for are manufactured. In such a situation, a company will lose all her customers. There are some other reasons for keeping an inventory; they are; the fluctuating nature of the price of raw materials that may make an organization stock up raw materials when their prices are low, and also buy in large quantities and keep, to last through the high price seasons.

Morgan (1960), gave reasons for keeping inventory:

i. To give customers assurance of availability.
ii. To handle production variations.
iii. To provide customer service at all times and in all seasons.
iv. To await shipment to fill unexpected orders.
v. To allow for batch production.
vi. To provide raw materials storage.
vii. To keep storage equipment operational.
viii. To protect against strike and work stoppages.
ix. To be ready when unforeseen circumstances occur.

Pandey (2004) advised that a company should maintain adequate stock of materials for avoidance of an interrupted production for supply to customers.

The reasons for inventory taking are:

i. Taking advantage of seasonal price fluctuations when the price is minimized by having inventories of raw materials.
ii. Taking advantage of price discounts when ordering in large quantities.
iii. Allow firms to meet orders on time despite fluctuations in the rate of output.

i) Inventory Valuation Method

Inventory valuation produces meaningful and accurate value for purchases of product cost and income determination.

i. *First-In-First-Out (FIFO)*

First-In-First-Out (FIFO) method is the act of issuing out the oldest materials first in the order in which they were received as a form of good and effective store keeping, which is a means of checking against obsolescence, deterioration, and depreciation of stock. This method of dealing with the materials that came in first, makes use of the actual cost, and avoids the use of unrealized profits or losses which may result from random issue of the materials. FIFO inventory fakes prices during periods of inflation as the actual cost of the goods in store are either understated or underestimated in valuation if the old prices are used.

ii. *Last-In-First-Out (FIFO)*

This method is opposite of the FIFO method because it implies that the latest materials received are issued out first thereby leaving oldest ones in stock, and this means that the items which are given out for production are charged on the current cost. In contrast, the stock on hand is valued at the oldest prices. The current production cost is simultaneous with the current sales revenue to obtain a real profit for the current period and this is because the most essential advantage of this method is that it can give the most current cost of a product, whereas the disadvantage of this technique is that the oldest merchandise in stock turns obsolescence, deteriorated, and depreciation sets in.

iii. *Base Stock Methods*

Osisioma (1990) stated that Bae Stock Method is a fixed minimum stock that credited all materials the original cost price. He went on to say that this method should not apply in an emergency, except for the minimum or buffer stock, and all other stocks should be valued as per the stock valuation method.

iv. *Standard Price Method*

Standard Price Method is the use of prevailing prices of the goods at the time of issuing them out, resulting in a profit if the actual materials price is low, and a loss if the actual price was higher. The main constraint is the inability of setting an acceptable standard price for all materials.

v. *Average Price Method*

This method is referred to as the weighted average, by dividing the total cost among the whole materials and obtains a unit cost for each item, which average price is allotted uniformly to all materials issued out, rather than using the actual cost.

j) Cost Associated With Inventory

All inventories incur cost either in ordering, storage, and issuance or checking, to have an optimal stock, and to determine the cost, we often use the cost function, which is in four components as follows:

i. *Purchase Cost*

The Purchase cost is the purchase price of an item procured from external sources and refers also to the production cost of the good that is manufactured within the organization that is to be used in further production. Generally, it is referred to as the nominal cost of inventory, which cost varies according to the quantity procured, discounts granted for bulk purchases and that of savings in production cost, as a result of longer batch run.

ii. *Ordering Cost*

This type of cost is incurred as inquiries and writing purchase order to procure goods from outside. Ordering cost accordingly to Okeke (1997), is the cost associated with replenishing an inventory. Adeniji (2008) stated that ordering cost is a cost incurred in placing the order up to the point of receiving the goods into the warehouse. Inventory ordering cost includes:

a. Cost of processing the papers.
b. Cost of communications such as expenses incurred in respect of e-mail, telephone calls and sending fax messages.
c. Carriage in costs.
d. Transport and travel.

iii. *Carrying or Holding Cost*

Carrying or Holding Costs refers to all costs relating to carrying inventories from place of purchase to buyers warehouse. Okeke (1997) stated that carrying cost refers to cost associated with maintaining the items in stock, while Adeniji (2008) opined that carrying cost is the cost incurred whenever a material is stored. Holding charges is earned because the firm has decided to maintain inventories. Carrying costs are costs associated with storing items in store, and they are proportional to the amount of the inventory and the time in which the catalogue is maintained. Carrying cost includes:

a. Cost of funds tied down
b. Insurance premium costs.
c. Inventory handling costs.
d. Heat or light or power and depreciation costs.
e. Cost of spoilage, keeping obsolescent machines, deterioration, and evaporation of volatile products.
f. General insurance and security costs.

Carrying cost is a variable cost that varies with quantity of stock. The cost of carrying an item is sometimes state as a percentage of the value of the merchandise, and it is usually invoiced in terms of the amount of money per unit of time.

iv. *Stock-Out Cost*

Stock-out cost is sustained when a customer's demand could not be met because of complete

exhaustion of stock. Okeke (1997) stated that stock-out cost is incurred535 as a result of an item that is needed, but its inventory level is totally depleted in a manufacturing system. A stock-out might cause production delays leading to idle labour, underutilization of equipment, and sometimes emergency supply order from the warehouse or retail production, and this may lead to loss of sales. This is the opportunity cost of not having a stock item when demanded. Stock-out causes loss of profit, loss of future sales and customers, wages being paid for idle time, loss of customers goodwill and customers cancelling their orders because of delay in delivery.

k) Purposes of Inventory Control

Inventory control is carried out for obvious reasons as enumerated below:

i. To minimize cost
ii. To maximize profit
iii. To maximize the return on investment
iv. To avoid running out of stock
v. To prevent unnecessary surplus stock
vi. To maintain average inventory within storage capacity availability.
vii. To control capital investment.
viii. To checkmate mismanagement and

l) Inventory Models

An inventory model represents an inventory problem that demands decision answer. Inventory model allows us to reasonably decide how much quantity of a good to buy, and when to buy. Right decisions are taken as an inventory model combines decision variables with situational constraints or considerations such as customers' demands, lead time; C1, C2, and C3, unit price; and any uncertainties associated with them. It may also include special features such as quantity discounts, inflationary factors, budget or space constraints, etc.

Naddor (1966) talks about inventory model as a mathematical relationship that involves three-related cost C1, C2, and C3, and that minimum of two of these three costs has to be placed in a state of being controlled. If C_1 and C_3 are relevant, ($C_2 = \infty$) then it is type (1, 3) inventory model. There are different approaches to inventory models as there are various authors namely Star & Miller (1975), Naddor (1966), Fabrycky & Banks (1967), Love (1979), and Hollier & Vrat (1978) depending upon the decision variables and situational parameters including inventory policies employed as operating doctrine in the management of inventories.

m) Inventory Policies

Inventory policy is a standard operating procedure (SOP) used in the implementation of an inventory model, which depends upon the choice of a particular inventory policy, that results in an inventory graph as a function of time. An inventory policy illustrates how the inventory position changes over time, and whenever procurement interpolation takes place.

There are three inventory policies that are generally engaged as follows:

i. *Economic Order Quantity (EOQ):* Which is the quantity ordered that minimizes total inventory holding and ordering costs. It is a production scheduling models used to determine the order quantity. It is also called Wilson EOQ Model or Wilson Formula, which was developed by Ford W. Harris in 1913, but was first applied by R. H. Wilson, a consultant to a firm, who was credit with the formula for his in-depth analysis according to Hax, AC, and Candea, D. (1984).

EOQ is applied when there is a demand for a particular product in the year, and delivery of a new order is supplied in full when inventory reaches zero. Every order placed has a fixed cost, irrespective of the number of units ordered. There is also a storage cost for each component stored known as holding expenses that is calculated as a percentage of the purchase cost. Inventory monitoring was continuous so that it will not fall below the minimal level called Reorder Point (ROP), having a replenishment order of fixed quantity called Economic Order Quantity (EOQ). Thus EOQ is represented by (Q), and ROP is represented by (R), both being the two decision variables involved in solving the problem of how much to buy. Figure 2.3 shows the graphical process of the Q, R policy. Such an inventory model must have (Q, R) as decision variables.

The policy requires that inventory levels be monitored unceasingly, calls for constant watch at stock levels, while in a computerized inventory control system, it is easy for an alarm will blow once the minimal is reached. Still in manual systems, its administrative cost of operation could be more. To ease this situation, a very ingenious method of manual monitoring of this policy has been evolved and is in practice for long and is called the two- bin' policy. Under the two bin policy, the total stock is kept in two bins. The second bin has the stock required during the lead time, and the first, box contains the Q minus the quantity of materials in the second bin. The consumption is met from the first bin until it gets consumed, and the reorder level is redeemed to have reached, and a replenishment order of size (Q) is placed. During the replenishment period, the demand is met, using the stock from the second bin.

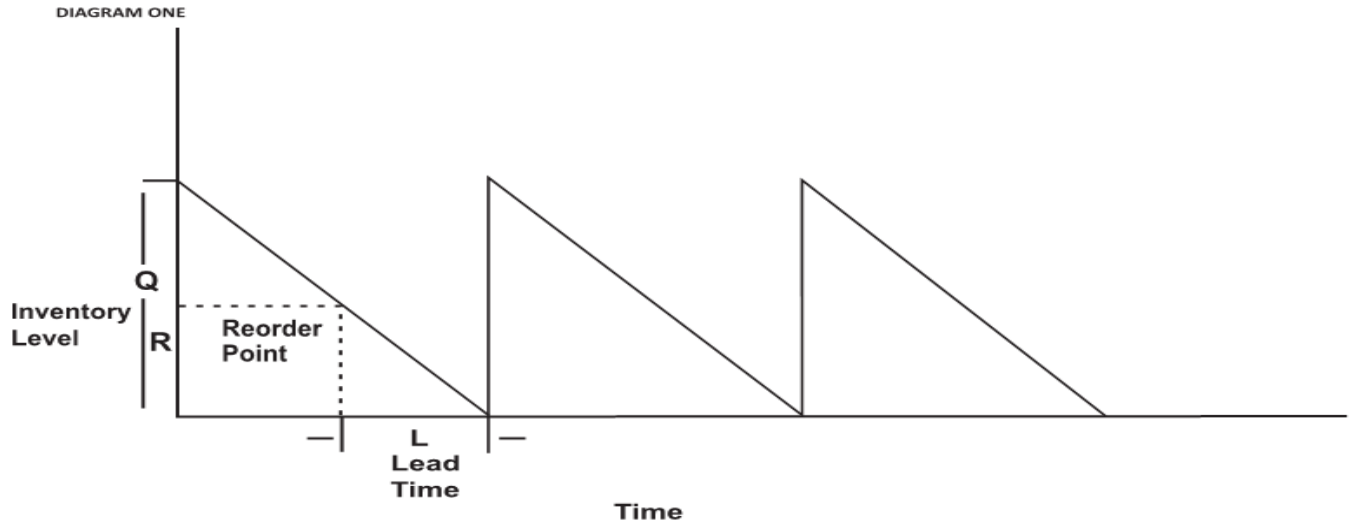

Figure 2.3: EOQ- ROP policies

In this age of computerization of inventory records, the stock status can be monitored continuously with ease without the use of two bin policy, which calls the keeping of two storage units for each item. Economic order quantity (EOQ) policy is the most widely used policy in inventory control literature, and it is the oldest scientific model of inventory control.

Assumptions of Economic Order Quantity (EOQ)

Horvgren (2007) postulated some assumptions as follows:

i. There must always be demand for materials on a continuous and constant over time.
ii. The same quantity of materials is being ordered at each re-order point.
iii. The lead time is known and fixed.
iv. The delivery time is instantaneous.
v. The purchase price of the item is constant; that is no discount is available for bulk purchases.
vi. The inventory replenished is immediate, as the stock level gets to zero.
vii. There should be no stock-out at any time.
viii. The per-unit holding and ordering cost are constant with same range of quantities ordered.

ii. *Periodic Inventory Review Policy*: The stock position is occasionally revised under this policy after a fixed time interlude (T), and when the review period is reached, the order is placed, which is determined by the following relationship:

Q= order quantity= (S-X)

Where S=maximum stock level

X= stock on hand at the time of review.

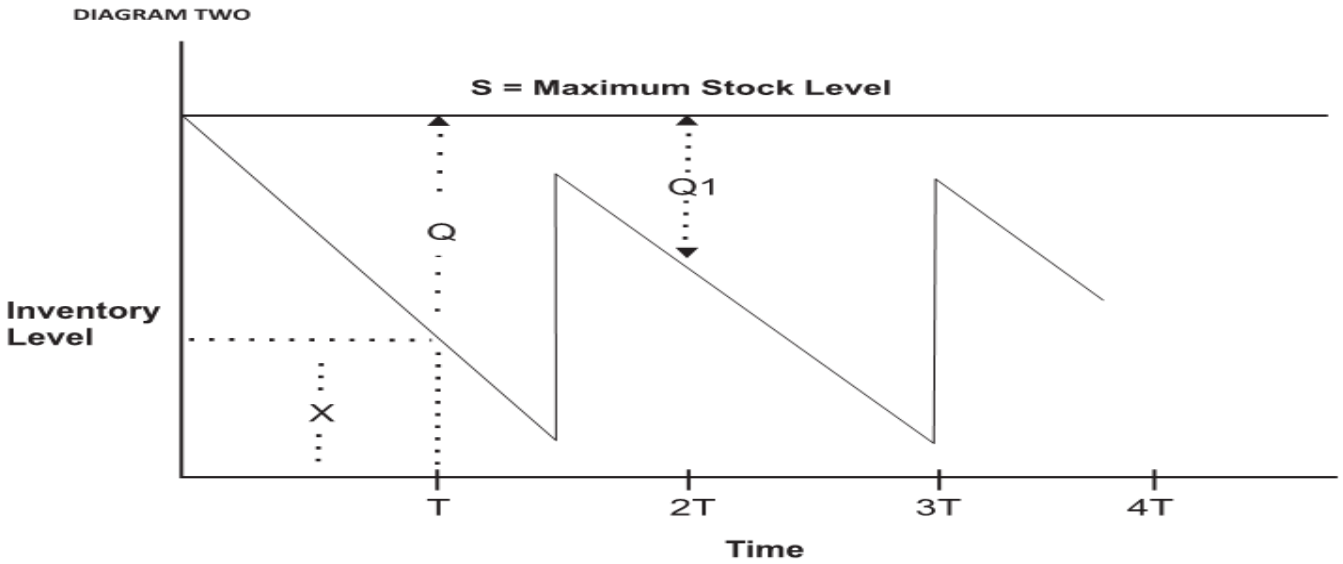

Figure 2.4: Illustrates the periodic review policy graphically.

Under the periodic inventory review policy, the maximum stock level (S), and time of interval between two reviews (T) are the two decision variables for optimization, called (S,T) policy. The operation of this policy is relatively easy as the status of inventory is taken only after a fixed time interval. However, this policy is quite sensitive to depletion during the review cycle. An order has to be compulsorily placed even if the stock levels are quite high at the review period even if the order size is a small quantity. To simplify the model, one may specify one of the decision variables, S or T so that S is defined, and T will be the only decision variable. On the other hand, if T prescribed, then it is called (S, T_P) policy with S as a decision variable.

iii. *Optional Replenishment Level:* This is a variant of periodic review inventory policy wherein there are two levels of inventory identified as S (the maximum level) and s (the minimum level) which needed to be examined periodically at fixed time interval T. If at the time of review, the stock level is more than the minimum level, then, replenishment decision is deferred to the subsequent review phase; and there shall be no order placed because the current stock is adequate for the time being. On the other hand, if at the time of review, the stock level (X) is less than or equal to (s), then the order quantity (Q) is determined, and a new order is placed so that the level of the stock shall be raised to S.

Thus we have,

$$Q = S - X$$

if $X = 0$

then:

$$X > s$$

Fig 2.5 depicts the operation of this policy graphically.

DIAGRAM THREE

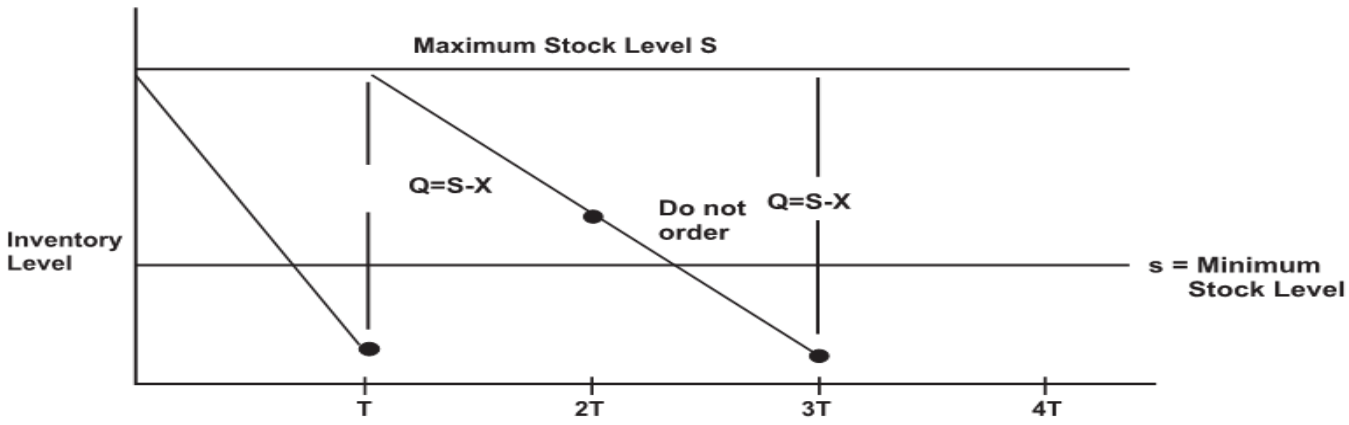

Figure 2.5: Optional (s, S) inventory policy

This policy is also known as minimum-maximum stock level policy or (s, S) or Optional Replenishment Policy (ORP) because there is an option of skipping the replenishment decision to the next review period if the current inventory on hand is more than the minimum level prescribed. Thus, this would appear to be better than (S, T) policy provided that, (s, S) and T are optimized.

For an inventory model to be developed to bring about optimum choice of the decision variables, a choice of policy has to be made. If (s, S, T) are optimized, then the optional replenishment policy is the best among the three policy options outlined above. The optimization of these three decisions simultaneously leads to a very complex model of inventory in case of probabilistic demands and lead times. For practical purposes, the EOQ- ROP policy is a better choice for efficient record keeping of high usage items. In contrast, the (S, T) policy is good for items of low demand.

We want to illustrate how to determine the optimal number of units to be to minimize the total cost associated with the purchase, delivery, and storage of the product. The required solution will depend on the yearly total demand for materials, the purchase price for each item, the fixed cost per order, and the yearly storage cost for each item. The number of times for an order needs to be known which will also affect the total cost.

The variables for the solution are:

= Purchase price of the item and unit production cost.

= The quantity to be ordered.

= The optimal order quantity.

= The quantity demanded annually.

= The fixed cost per order, setup cost (i.e. cost of ordering, shipping and handling). h= The annual holding cost per unit (i.e. carrying cost or storage cost, capital cost, warehouse space, refrigeration, insurance, etc. that are not related to the unit production cost)

n) The Total Cost function

The single-item EOQ formula is used to obtain the minimum point of the following cost function:

i. Total Cost made up of the purchase or production cost, the ordering cost and holding cost i.e. TC= PC + OC + HC.
ii. Purchase cost is the variable cost of goods that is made up of purchase unit price multiplied by the annual demand quantity i.e. PC = P × D.
iii. Ordering cost is the cost of placing orders, and each order has a fixed cost (K), and we need to order as many times a year, ie. K × D/Q times per year.
iv. Holding cost is the cost of holding in stock the average quantity, i.e. HC= h × Q/2.

The Total Cost Function is therefore stated as follows:

$$TC = PD + \frac{DK}{Q} + \frac{hQ}{2}$$

We determine the minimum point of the total cost curve by partially differentiating the total cost to Q and holding all other variables constant, and set all equal to 0. Hence,

$$0 = -\frac{DK}{Q^2} + \frac{h}{2}$$

We solve for Q to give us Q* which is the optimal order quantity.

$$= \quad Q^{*2} = \frac{2DK}{h}$$

Therefore:

Economic Order Quantity

$$Q^* = \sqrt{\frac{2DK}{h}}$$

Q* is independent of P; and it is a function of D, K, and h.

Grubbström, Robert W. (1995) brought out the optimal value (Q*) by expanding these equations as follows:

$$TC = \frac{DK}{Q} + \frac{hQ}{2} + PD = \frac{h}{2Q}(Q - \sqrt{2DK/h})^2 + \sqrt{2hDK} + PD,$$

Expanding the equation removes the non-negative quadratic term to give $Q = \sqrt{2DK/h},$ and by bringing out the minimum cost, we have $TC_{min} = \sqrt{2hDK} + PD.$

o) Quantity Discounts

According to Abomaye-Nimenibo (2019), an essential extension to the EOQ model of Wilson is to accommodate quantity discounts, which is given by Hax (1990) as all-units, and incremental, and stated numerically as follows:

i. *Incremental unit discount:*

If you buy Units 1-100 cost ₦30 each; Units 101-199 cost ₦28 each; Units 200 and up cost ₦26 each. By ordering 150 units of the item will give a total cost of ₦4,400 (₦30*100 + ₦28*50 = ₦4, 400).

ii. *All units discount:*

If you order items between 1-1000 units the costs is ₦30 each; and if an order of 1001-5000 units is made, the costs is ₦45 each; while an order of more than 5000 units will costs ₦40 each. To enjoy all units discount, assuming you ordered 1,500 units, your total cost will be ₦67, 500 (₦45*1,500 = ₦67, 500).

p) Design of Optimal Quantity Discount Schedules

The availability or presence of a strategic customer, who responds optimally to the discount schedule, calls for the design of an optimal quantity discount scheme by the supplier is an intricate scheme

and has to be done carefully. An optimal quantity is granted when the demand of the customer is undefined. When a customer's demand is indeterminate and such demand reduces the order quantity, what is called "reverse bullwhip" policy will be applied to take care of the consumer's demand in case of unexpected increase or decrease (Altintas, N.; Erhun, F.; Tayur, S., 2008).

i. *Other Extensions of EOQ*

Numerous extensions the EOQ model has been developed to solve back-ordering costs and multiple items. The economic order interval problems has been worked out using the EOQ, and the monetary production quantity model has also been used to work out the optimal production quantity problem.

The Baumol-Tobin model has been applied in inventory just the same way it was applied to determine the money demand function for holding money balances as a parallel function in the firm's holding of inventory (Andrew Caplin and John Leahy:2010).

An Example of Using EOQ in Problems Solving:

Assuming an annual requirement quantity (D) of a firm = 20,000 units,

Cost per order (K) = ₦3

Cost per unit (P) = ₦10

Carrying cost percentage (h/P)(percentage of P) = 0.03

Annual carrying cost per unit (h) = ₦0.3

$$\text{Economic Order Quantity} = \sqrt{\frac{3D*K}{h}} = \sqrt{\frac{3*20{,}000*3}{10*0.03}} = 775 \text{ units}$$

$$\text{Number of orders per year using EOQ Figure} = \frac{20{,}000}{775} = 26 \text{ orders}$$

Total cost = $P * D + K\,(D/EOQ) + h\,(EOQ/3)$

Total cost = 10*20000 + 3(20000/775) + 0.3(775/3) = ₦200,154.92

= (200000+77.42+77.5 =₦200, 154.92).

If we decided to order 900 units per order, then our total cost will increase as follows: Total cost = 10*20000 + 3(20000/900) + 0.3(900/3) = ₦200,156.67

= (200000+66.67+90 = ₦200, 156.67).

From the above workings, it is cost effective to place order according to the Economic Order Quantity.

ii. *Multi-Criteria EOQ*

The Multi-Criteria EOQ is introduced by Malakooti (2013) to work out a system where the total cost, the inventory order quantity as well as shortages were reduced to the barest minimized; so that the Economic Production Quantity (EPQ) remains constant as production continues. There also exists the classical Newsvendor model for the random demand of the product. However, when demand varies over time, we apply the Dynamic lot size model.

III. Empirical Literature

A review of related literature is to establish the basis for the investigation of the effect of inventory management and organizational profitability of 7up Bottling Company. The assessment covered previous but similar empirical studies conducted in various places or countries on the same subject matter.

Raheman and Nasr (2007) studied the current ratio of the net operating profit of Pakistani firms, and observe the effects of inventory turnover in days. A total of 94 Pakistani firms that were listed on the Karachi Stock Exchange were chosen for the study for the period 1999-2004. They found a negative relationship between the inventory conversion period and profitability of the firms.

Falope and Ajilore (2009) also studied 50 Nigerian non-financial firms for the period 1996-2005, using panel data econometrics in a pooled regression where time-series and cross-sectional observations. They also found that profit making and inventory turnover have negative.

Abdulraheem, Yahaya, Isiaka, and Aliu (2011) used multiple regressions in their study of inventory management on the performance of small businesses in Nigeria, which result revealed that there is a strong positive relationship between inventory management and profitability among Nigerian small businesses.

Okwo and Ugwunta (2012) also studied the influence of input costs on the profitability of the breweries industry in Nigeria. They analyse their findings with Ordinary Least Squares and multiple regression

techniques, using ratios of selling, general administrative expenses, cost of goods sold (inventory), receivables, payables, and depreciation as independent variables; while profitability was the dependent variable. They found among others that the cost of goods sold (inventory) had a positive relationship with profitability.

Anichebe & Agu (2013) assessed the impact of proper inventory management on the performance of organizations in Nigeria, and used a sample of 248 respondents and collected data using a questionnaire and oral interviews. The findings of the study revealed that a significant relationship exists between inventory management and business effectiveness in an organization. The study also established that inventory management had a significant effect on the productivity of an organization, and there was a strong positive correlation between inventory management and profitability of an organization. The study concluded that decent inventories management was practised, which was key to the growth and success of these organizations.

Augustine and Agu (2013) studies was on effective inventory management vis-à-vis organizational effectiveness and profitability of manufacturing companies, and their findings revealed a positive relationship between inventory management and organizational efficiency and turnover.

Hassan, Imran, Amjad, and Hussain (2014) studied non-financial firms in Pakistan that were listed on the Karachi Stock Exchange for the period 2007 to 2010, over their effective working capital management and performance. They used Ordinary Least Square technique to analyse data collected. Among the independent variables used as a proxy for working capital management, the average age of inventory, their result find an insignificant positive relationship with gross profit margin and return on assets, with negative effect on return on equity.

Prempeh (2015) also carried out a study of manufacturing firms in Ghana over inventory management and profitability, using raw material inventory management and profit as variables. The result of their findings revealed the existence of a significant positive relationship between raw material inventory management and profitability.

a) Summary of Related Literature

In summary, we discuss the concept of inventory, which is central to materials management. Inventory is a "usable but idle" resource, and various types and classifications were outlined. The need to keep proper records and maintain corporate organizational structure is stressed. The two kinds of stock-taking methods of perpetual and periodic stock-taking were discussed, and the various costs associated with inventory, which include: purchase, ordering, carrying or holding, and stock out costs, etc.

The theoretical and empirical literatures states the varies theories and studies carried out with respect to inventory control system, the purpose of inventory control, and the various inventory levels, which include: re-order level, the maximum, minimum, and optimal stock levels. The different inventory valuation methods were also discussed, amongst which were the first-in-first-out, last-in-first-out, standard price method, and average price method. Three types of inventory policies were also emphasized with their relative strengths and weaknesses.

However, the right choice of the inventory model is crucial for the success of inventory management. Selective inventory management is necessary, whereas indiscriminate rigour in inventory control for all items could be counterproductive.

IV. Methods of Study

a) Research Design

Research design is the plan and structure of this investigation to obtain answers to research questions postulated. The research design also explains the method and nature of the research instrument used by the researchers to execute a particular research study. For this study, descriptive and expository research methods were adopted.

b) Population of the Study

The population refers to all elements (individuals, objects, and events) that meet the sample criteria for a study (Burns and Grove (2003). The population of this study consist of all the staffs both Management and other ranks that are directly involved in the inventory handling in Seven Up Bottling Company, Port Harcourt. We distributed seventy-five (75) questionnaires to the staff and employees in the production department of the company.

c) Sample and Sampling Techniques

Sampling is a crucial component of any investigation and involves several considerations. The researchers adopted the simple random sampling techniques because it gives every member of the population equal chances of being selected. In this study, the researchers randomly distributed the 75 questionnaires to each respondent according to their groupings in the people. The total survey questions returned depended on the timing and to those who were willing to give information as required. The distribution is classified into three categories of Management Staff, Supervisors, Senior Staff, Junior Staff, and the entire Inventory Department.

d) Method of Data Collection

This study relied on both primary and secondary data, which includes: internet search, articles, magazines, journals, and books from the library. These data collected from different secondary sources

were used, and the literature which guides us in finding the impact of inventory management on the financial condition of the organization. Data obtained through the use of questionnaires, an in-depth interview, and examination of Seven-up Company's annual report and accounts from 2012 - 2016, Central Bank of Nigeria, (CBN) bulletins on prudential guidelines, journals, and magazines, articles and research papers were of great help.

e) Estimation Techniques

Pearson coefficient for correlation technique was used to test the nature and strength of the relationship between inventory management and organization effectiveness concerning productivity, general operation, and profitability. In contrast, Spearman rank correlation was used to compare the relationship between inventory management and the other variables in 7up Bottling Company.

The Pearson correlation formula is;

$$r = \frac{N\sum Xy - (\sum X(\sum y)}{\sqrt{[N\sum X^2) - (\sum X)^2][N\sum (y^2) - (\sum y)^2]}}$$

Where:

r_{xy} = correlation coefficient n = number of sample size

$\sum xy$ = summation of xy

$\sum x$ = summation of x

$\sum y$ = summation of y

The spearman ranking order correlation coefficient (rs) is used in obtaining the degree of association between two variables measured in an ordinary scale.

$$rs = \frac{1 - {}^{6\Sigma}d^2}{N(N^2-1)}$$

Where

rs = spearman's ranked correlation.

$\sum d^2$= sum of squared differences in the ranking of subjects of two variables.

N = Number of subjects ranked for the test of the level of significance on the Spearman's Rank order correlation coefficient.

f) Reliability and Validity Test

The reliability test was estimated by examining the consistency of the responses between the three tests. Data from the primary sources are more reliable if the same results will be obtained accurately and consistently, meaning that the information should be very dependable.

The statistical tools used in this study are very reliable because overtime they are unswerving to prove the relationship over two variables.

V. Data presentation, Analysis, and Discussion of findings

a) Data Presentation

This section presents the research data, the analysis, and findings. The relevant data used in this research were assembled, as shown in various tables, using specified method of study, and the empirical results from the sample study were analysed.

The data collected for the research covered information concerning inventory management and the profitability of the organization under study, the sources of data collection as specified above through questionnaires and personal interviews, and applying descriptive statistics in the analysis.

i. *Response Rate*

The table below shows the number of questionnaires administered to staff of 7up bottling company in respect of the elements of inventory management and profitability of the organization.

The questionnaire has a 5 point scale in each of the questions that were administered to the three (3) categories of staff in the company. They were the Management Staff, Senior Staff, and the Junior Staff.

Table 4.1: Administration of Questionnaire

Category of staff	No. of questionnaire	Percentage (%)
Management staff	25	33.33%
Senior staff	25	33.33%
Junior staff	25	33.34%
Total	75	100.00

Source: Questionnaire of 2019 Survey.

From table 4.1, each category of staff ministered with 25 copies of questionnaires containing ten (10) sets of questions representing 100% of the total distributed.

Table 4.2: Analysis of Returned Questionnaires.

Category of staff	Number of the returned questionnaire	Number not returned	Percentage of returned
Management staff	16	9	21.3%
Senior staff	22	3	29.3%
Junior staff	24	1	32.1
Total	62	13	82.7%

Source: Questionnaire Survey, 2019

From Table 4.2, the analysis showed that the management staff returned 16 out of 25 questionnaires administered, which represent 21.3%, while the senior category filled and returned twenty (22) copies representing 29.3%. The junior staff returned twenty-four (24) copies representing 32.1%. In summary, a total number of 62 copies of the questionnaires were filled and returned, representing 82.7%, while thirteen (13) copies representing 17.3% were lost.

Table 4.3 is an analysis of responses to questionnaires from the length of service with the company in section.

Table 4.3: Length of Service

Yrs	Management Staff	Senior Staff	Junior Staff
1-5	-(0%)	- (0%)	10 (16.13%)
6-10	-(0%)	4 (6.45%)	7 (11.29%)
11-15	-0(%)	6 (9.68%)	5 (8.06%)
16-20	9 (14.52%)	9 (14.51%)	2(3.23%)
21& above	7 (11.29%)	3 (4.84%)	- (0%)
	16(25.81%)	22 (35.48%)	24(38.71%)

Source: Questionnaire Survey, 2019

From the table above, it was noticed that out of a total of 16copies of the questionnaires returned by the Management staff of which nine (9) copies representing 14.52 percent of the respondents were filled and retrieved by those who had served 7up bottling company from 16 to 20 years, and seven (7) copies of returned questionnaires were completed by Management staff that has served the Company from 21 years and above representing 11.29% of the whole respondents. On the part of Senior Staff category, the survey showed that four (4) copies (6.45%), six (6) copies (9.68%) and three (3) copies (4.84%) in the respective years of service of (6-10 years), (11- 15), (16 - 20), and (21 years & above) respectively. In the junior staff category, the respondents fall between 1 to 20 years of service, we found that ten (10) respondent had served the company between 1 – 5 years, i.e., 16.13 percent, seven (7) respondents representing 11.29 percent are of the 6 – 10 years of service, five (5) persons representing 8.06 percent have served the company for 11 – 15 years and two (2) respondents representing 3.23 percent have served for 16 – 20 years and there was no junior staff that has served in the category of 21 years and above.

b) Data Analysis

Table 4.4 is the analysis of responses to question 1 in section B of the questionnaire – whether inventory management exists in 7Up Bottling Company?

Table 4.4: X-ray the response on the inventory management system

Responses	STAFF CATEGORIES			Grade Point
Allocation of Point	Management staff	Senior staff	Junior staff	
Yes (3points)	8 (24 pts)	13(39 pts)	15(45 pts)	108
No (2 points)	7(14 pts)	8(16 pts)	7(14 pts)	44
No idea (0 points)	1(0 pts)	1(0 pts)	2(0 pt.)	0
Total	16	22	24	

Source: Questionnaire Survey 2019

The table 4.4 above x-ray the responses on inventory management system in the company, the management affirmed the existence of inventory system at (24 points), while those who thought there is no inventory management system scored (14 points) and one of the management staff had no idea 1(0 points) whether inventory management system ever existed in the company. The Senior Staff responses also follow the same direction. Those who affirmed the existence of inventory management system score (39 points), those who said 'No' scored (16 points), and a single person had no idea with (0 points). On the part of Junior Staff, 15 of them confirmed the existence of inventory management system in company with (45 points), 7 of the staff said 'No' with (14 points), and 2 of the junior category had no idea about inventory management system in the company with (0 points).

In summary, from the various categories of Respondents, the responses showed that there exist Inventory Management System (IMS) in the company. Those with "NO" answer may be due to their line of duties are not related to the inventory section, or they do accept in totality the mode and manner of handling inventory in the company. Those with no idea means they are ignorant of inventory management in the company.

From the analysis, it was deduced that there exist an inventory management system in the organization of 7up Bottling Company with 108 points as against 44 points from all categories.

Table 4.5: Analysis of question 2, section B of the questionnaire: To what extent was the application of inventory management procedures.

Staff categories	Great extent (5pts)	Considerable extent(4pts)	Moderation extent (3pts)	Slight extent 2pt	No idea (0pt)
Mgt. staff	6 (30)	4 (16)	3 (9)	2 (4)	1(0)
Senior staff	8 (40)	8 (32)	2 (6)	1 (2)	3 (0)
Junior staff	10 (50)	7 (28)	4 (12)	2 (4)	1 (0)
Total	24 (120)	19 (76)	9 (27)	5 (10)	5 (0)

Source: Questionnaire Survey 2019

From the table about, 24 (120) of the respondents agreed that the inventory management produce had been applied to a great extent in the company. In contrast, 19 (76 points) out 82 respondents said it is to a considerable extent, 9 with 27 points is said to a moderate, 5 (10 points) out of 63 said to be of slight extend while five (5) respondents out of the 62 had no idea of the inventory management procedure as is applicable to the company.

Table 4.6: Analysis of question 3 of section B, whether there are procedures put in place that will enhance inventory management in the company?

Staff categories	Storage procedure (1pt)	Carrying procedure (1pt)	Ordering procedure (1pt)	All of the above (2pts)	No of the above (0pt)
Mgt Staff	4 (4)	3 (3)	2 (2)	9 (18)	0 (0)
Senior staff	3 (3)	2 (2)	1 (1)	15 (30)	0 (0)
Junior staff	2 (2)	2 (2)	3 (3)	16 (32)	0 (0)
Total	9 (9)	7 (7)	6 (6)	40 (80)	0 (0)

Source: Questionnaire Survey 2019

From the analysis of table 4.6, it was made clear that inventory management is practiced following the procedures put in place in handling the inventory, which includes stored procedures, carrying procedures as well as ordering procedures.

The table showed that 40 respondents out of 62 agreed that all the procedures mention above enhanced proper handling showing a grade point of (80) meaning that those who prefer storage rules alone had (9 points), those with carrying methods had seven (7) points, and those with ordering systems which enhances inventory management had (6 points). None of the respondents stated that the techniques of handling inventory do not promote inventory management.

Table 4.7: Analysis of Q4 on Productivity and Q5 on Profitability, in Section B of the questionnaire, revealed the following.

Question	Staff categories	Great extent (5pts)	Considerable extent (4pts)	Moderate extent (3pts)	Slight extent (2pts)	No idea of the extent (0pts)
Q4	Mgt staff	8(40)	6(24)	2(6)	2(4)	0(0)
	Senior staff	8 (40)	8(32)	3(9)	2(4)	1(0)
	Junior staff	12 (60)	4(16)	3(9)	2(4)	1(0)
Total		28 (140)	18 (72)	8(24)	6(12)	2(0)

Source: Questionnaire Survey 2019

From the above table it was revealed that in answer to question 4, 28 respondents with a grade point of (140) confirmed that inventory control enhances effective productivity to a great extent. In contrast, a larger number of the respondents are 18 out of 62 with a grade point of (72) agreed that inventory control enhances inventory management to a considerable extent. In comparism 8 and 6 respondents with a grade point of (24) and (12) respectively agreed that inventory control enhances productivity to a moderate and slight extent respectively.

Table 4.8: Analysis of Q5 on Profitability in Section B of the questionnaire, revealed the following.

Question	Staff categories	Great extent (5pts)	Considerable extent (4pts)	Moderate extent (3pts)	Slight extent (2pts)	No idea of the extent (0pts)
Q5	Mgt staff	6(30)	7 (28)	3(9)	2(4)	0(0)
	Senior staff	9(45)	6 (24)	3(9)	3(6)	1(0)
	Junior staff	9(45)	8 (32)	2(6)	2(40	1(0)
Total		24(120)	21(76)	8(24)	7(14)	2(0)

Source: Questionnaire Survey 2019

In question 5 the analysis revealed that 24 respondents out of 62 with a grade point of 120 points believed that inventory management enhances the profitability of the company to a great extent, 21 responses with 76 points were of the view that it was to a considerable extent, eight (8) respondents with 24 points stated that inventory management causes profitability to a moderate level. In contrast, seven (7) respondent to a grade point of 14points said inventory management brings about profitability to a slight magnitude while two (2) respondents did not have any idea.

Table 4.9: Shows analysis of question 6, indicating the practice of best methods in Inventory Management.

Staff category	Traditional inventory Mgt. (2pts)	JIT inventory Mgt. (2pts)	None of the above (1pt)	No idea (0pt)
Mgt staff	10(20)	6(12)	0(0)	0(0)
Senior staff	14(28)	8(16)	0 (0)	0(0)
Junior staff	12(24)	7(14)	3(3)	2(0)
Total	36(72)	21(42)	3(3)	2(0)

Source: Questionnaire Survey 2019

From table 4.9 which analyses revealed that 36 respondents out of 62 with a grade point of 72 preferred traditional inventory management system as the best which they recommended for the company, while 21 responses indicating 42 points suggested Just-in- time (JIT) inventory management system, and three (3) respondents did not prefer any technique. In comparism, two (2) respondents had no idea about the system of inventory management in the company.

Table 4.10: Analysis of question 7 on inventory handling cost effect on the profit performance of the company.

Question	Staff categories	Great extent (5pts)	Considerable extent (4pts)	Moderate extent (3pts)	Slight extent (2pts)	No idea (opt)
Question 7	Mgt. staff	6 (20)	6 (24)	2 (6)	2 (4)	0 (0)
	Senior staff	6 (40)	8 (32)	2 (6)	3 (6)	1 (0)
	Junior staff	9 (45)	19 (44)	3 (9)	2 (2)	0 (0)
Total		23 (115)	25 (100)	7 (21)	6 (12)	1 (0)

Source: Questionnaire Survey, 2019

Table 4.10 analysed question 7 (To what extent does inventory handling cost affects the profitability performance of the company). The result showed that 23 respondents out of 62 with a grade point of (115 points) agreed that inventory handling cost affects the company profit to a great extent, 25 (100 points) expressed that it affects the turnover to a considerable extent, seven (7) respondents (21points) said that the inventory handling costs affects profitability to a moderate degree. Six (6) respondents with 12 points stated that inventory handling costs affect profitability to a slight magnitude, while one (1) respondent says he has no idea. Given their responses, all categories of staff in the company are aware that inventory handing cost is one of the overheads that leads to proper management of inventory that boosts the profit of the organization.

Table 4.11: Analysis of question 9 on the effect of constant inventory check for re-order brings about the profitability of the company.

Question	Staff categories	Great extent (5pts)	Considerable extent (4pts)	Moderate extent (3pts)	Slight extent (2pts)	No idea (opt)
Question Q9	Mgt staff	9 (45)	3 (12)	2 (6)	2 (4)	0 (0)
	Senior staff	10 (50)	9 (36)	2 (6)	1 (2)	0 (0)
	Junior staff	8 (40)	10 (40)	3 (9)	2 (2)	1 (0)
Total		27 (135)	22 (88)	7 (21)	5 (10)	1 (0)
Question	Staff categories	Great extent (5pts)	Considerable extent (4pts)	Moderate extent (3pts)	Slight extent (2pts)	No idea (opt)
Question Q10	Mgt. staff	5 (25)	8 (32)	3 (9)	1 (2)	0 (0)
	Senior staff	8 (40)	10 (40)	2 (6)	1 (2)	1 (0)
	Junior staff	9 (45)	10 (40)	3 (9)	1 (2)	1 (0)
Total		21 (110)	28 (112)	8 (24)	3 (6)	2 (0)

Source: Questionnaire Survey, 2019

Responses to question 10 as per Table 4.11revealed that, 21 out of 62 respondents with a grade point of (110) were of the view that reorders and replenishment of inventory enhances the profitability of the company to a great extent. In contrast, 28 out of 62 with a grade point of (112) agreed that catalogue reorders and replacement increases profit performance of the company to a considerable level, eight (8) respondents with 24 sockets considered reorder and refill of portfolio boost profit performance of the company to a moderate extent. In contrast, 3 (6 points) were of the view that its profitability was to a slight degree.

Table 4.12: Analysis of response to question 8 with respect to personal and interval inventory check in the company under study.

Staff categories	Weekly (1pt)	Monthly (1pt)	Quarterly (1pt)	Yearly (1pt)	No idea (0pt)
Management Staff	12 (12)	4 (4)	0 (0)	0 (0)	0 (0)
Senior Staff	10 (10)	8 (8)	2 (2)	2 (2)	0 (0)
Junior Staff	12 (12)	8 (8)	2 (2)	2 (2)	0 (0)
Total	34 (34)	20 (20)	4 (4)	4 (4)	0 (0)

Source: questionnaire survey, 2019

From Table 4.12, our analysis showed that 43 respondents out of 62 with a grade point of 43 stated that the organization does and should carry out inventory check weekly, 20 with a grade point of 20 says the organization do and should carry out personal and interval check monthly. Four (4) of the respondents stated that inventory check is practiced and carried out quarterly. In contrast, the last four (4) respondents who know little or nothing about inventory management considered yearly inventory. We are to note that 54 of all the respondents had an idea of the interval to which inventory management was practiced.

From the date of analysis, the researchers summarize that the grade point of all the questions in the questionnaire to work out the X and Y variables using the great extent as (X), and considerable extent as Y in a tabular form as follows:

Table 4.13: Summary of the grade point from respondents using Table 4.4 to 4.12 on the productivity of the company.

N	X	Y	XY	X^2	Y^2
1	108	44	4,752	11,664	1,936
2	120	76	9,120	14,400	5,776
3	9	7	63	81	49
4	140	72	10,080	19,600	5,184
5	120	76	9,120	14,400	5,776
6	72	42	3,024	5,184	1,764
7	115	100	11,500	13,225	10,000
8	135	88	11,880	18,225	7,744
9	110	112	12,320	12,100	12,544
10	34	20	680	1,156	400
∑	963	637	72,539	110,035	51,173

Source: Researcher Computation, 2019

Table 4.13 showed the computation for X and Y to calculate the sample correlation coefficient (rxy).

$$r = \frac{N\sum Xy - (\sum X)(\sum y)}{\sqrt{[N\sum X^2) - (\sum X)^2][N\sum (y^2) - (\sum y)^2]}}$$

$$r = \frac{10(72,539 - (963)(637)}{\sqrt{\{10(110035) - (963)^2\}\{10(51173) - (637)^2}}$$

$$r = \frac{725,390 - 613,431}{\sqrt{\{1,100,350 - 927,369\}\{(511,730 - 405,769)\}}}$$

$$= \frac{111,959}{\sqrt{(172,981)\,(105,961)}}$$

$$= \frac{111,959}{\sqrt{18,329,239,741}}$$

$$= \frac{111,959}{135,385.52}$$

$$= 0.8269 \text{ i.e. } 82.69\%$$

The result showed a correlation coefficient (rxy) of 82.69%. The findings indicated that the method used by 7up bottling company to manage her inventories in both raw materials and the finished product was efficient as the amount of naira saved in the course of purchase have more effect on the profitability of the company during production/ selling of the finished goods. The result further disclosed that the nature and strength of the relationship between inventory management and organization effectiveness concerning productivity, general operation, and profitability were all right, leading to the high profitability of the company.

Similarly, the researchers summarize that the grade point of all the questions in the questionnaire to work out the X and Y variables using the responses from Table 4.4 to 4.12 using moderate extent as (X), and slight degree as Y in a tabular form as follows:

Table 4.14: Summary of the grade point from respondents using Table 4.4 - 4.12 on the Profitability of the Company

N	X	Y	XY	X^2	Y^2
1	108	44	4,752	11,664	1,936
2	27	10	270	729	100
3	6	80	480	36	6,400
4	24	12	288	576	144
5	24	14	336	576	196
6	3	0	0	9	0
7	21	12	252	441	144
8	21	10	210	441	100
9	24	6	144	576	36
10	4	4	16	16	16
∑	262	210	6,748	15,064	9,072

Source: Researcher's Computation, 2019

The table above showed the computation for X and Y from a considerable and moderate extent to determine how inventory management affects the operational efficiency of the company.

$$r = \frac{N\sum Xy - (\sum X(\sum y)}{\sqrt{[N\sum X^2) - (\sum X)^2][N\sum (y^2) - (\sum y)^2]}}$$

$$r = \frac{10(6,748) - (262)\,(210)}{\sqrt{\{10(15,064) - (262)^2\}\{10(9,072) - (210)^2\}}}$$

$$= \frac{67,480 - 55,020}{\sqrt{\{150,640 - 68,644\}\{90,720 - 44,100\}}}$$

$$= \frac{12,460}{\sqrt{81,996 - 46,620}}$$

$$= \frac{12,460}{\sqrt{35,376}}$$

$$= \frac{12,460}{188.085}$$

$$= 66.25$$

The result showed that the company, through its effective and efficient application of timely inventory management, had a profit of over 66%.

Table 4.15: Summary of the grade points from the respondents' views from Table 4.4. to 4.12 using considerate extent and moderate extent for the profitability of the company.

N	X	Y	XY	X^2	Y^2
1	108	44	4,752	11,664	1,936
2	76	27	2,052	5,776	729
3	7	6	42	49	36
4	72	24	1,728	5,184	576
5	76	24	1,824	5,776	576
6	42	3	126	1,764	9
7	100	21	2,100	10,000	441
8	88	21	1,848	7,744	441
9	112	24	2,688	12,544	576
10	20	4	80	400	16
∑	701	198	17,240	60,901	5,336

Source: Researcher's computation, 2019

From the table, the researchers completed for x and y to determine the inventory contribution to the profitability of the company.

$$r = \frac{N\sum Xy - (\sum X(\sum y)}{\sqrt{[N\sum X^2) - (\sum X)^2][N\sum (y^2) - (\sum y)^2]}}$$

$$r = \frac{10(17240) - (701)(198)}{\sqrt{\{10(60,901) - (701)^2\}\{10(5336) - (198)^2}}$$

$$= \frac{172400 - 138,798}{\sqrt{(609,010 - 491401)(53,360 - 39,204)}}$$

$$= \frac{33,602}{\sqrt{117,609 - 14,156}}$$

$$= \frac{33,602}{\sqrt{103453}}$$

$$= \frac{33,602}{321.64}$$

$$= \underline{104.47}$$

$$= 104.47\%$$

The result shows that the relationship is more than a 100% correlation between productivity and profitability.

c) Re-Statement of Hypotheses

In line with section 1.5, we restate the following hypotheses:

Ho: 1 there is no significant relationship between inventory management and organizational productivity.

HO: 2 there is no significant relationship between poor inventory

Ho: 3 there is no significant relationship between inventory management and profit performance.

Testing the hypotheses

1. *HO: 1* for productivity where the researchers rank the result

$$Rxy = 1 - \frac{\sum D2}{n(n^2 - 1)}$$

$$= 0.9755 = 97.5\%$$

The general opinion showed that inventory management contributes 66.2% to productivity, while the specific assessment showed 97.5%.

$$O.975 \geq \text{Productivity} \geq 0.662$$

Therefore we accept null hypothesis HO: and reject Ha; that inventory management does not contribute significantly to productivity.

2. *HO: 2* for operation, the general view revealed that inventory management has contributed to the profit of the company by 97.5 %.

$$0.975 = \text{Operations} = 0.975$$

Therefore we reject null hypothesis Ho: and accept Ha: that inventory management contributed significantly to the operations of the company.

3. *HO: 3* for profitability, the general view displayed 64 % while the specific view rank is 97. 5%.

$$\therefore 0.975 \geq \text{profit} \geq 0.640$$

With 0.64 results, we reject the null hypothesis (Ho) and accept the alternative (Ha).

d) Discussion of Findings

From the analysis, we observed that 97 % of the staff of the company agreed that there is an inventory management system in the company, and those inventory management procedures are adhered to.

The study also revealed that the company operates traditional inventory management. The deduction was drawn based on the responses of the respondents. From the statistical analysis, it has been established that inventory management scores 97.5% which means, that there is a high level of the inventory management system that contributed about 66.2% to the organization's productivity, and other factors also contributed about 38.8%.

In terms of the general operations of the company, the result showed that operations are at par with the organizational inventory management system, which means that inventory management contributes significantly to the running of the company. For the profitability of the company, the result showed that the inventory management system contributed about 64% to the profit of the organization. Hence the company should continue to maintain a decent inventory management system since other activities and factors contributed about 36% of the total turnover of the company.

VI. Summary, Conclusion and Recommendation

a) Summary of Findings

Of a truth, profit and wealth maximization are variables that trigger the idea of business outfits. For manufacturing companies, the place of inventory management and the need to control it for increased profitability is a measure of effectiveness and efficiency. The continuous decrease in profitability and performance; and the resultant liquidation of manufacturing firms in Nigeria as a result of lack of proper inventory informed this study. After preliminary research, we found that accurate record of materials in stock constitutes a bigger percentage of the current asset growth and with other assets that form a worthy proportion of total assets in manufacturing firms. Some firms neglect its control, which amounts to endangering the long-run profitability and sustainability of these firms.

In terms of the general operation of the company, the result showed that the setup is at par with the organizational inventory management system, which means that inventory management contributes significantly to the well-being of the company. For the profitability of the company, the result showed that inventory management contributed about 64% to the profit of the organization. Hence the company should maintain a decent inventory system, as other activities and factors contributed about 36% of the total turnover of the company.

b) Conclusion

The understanding of inventory management at any given point is very significant, not only for controlling and managing the present situation but in predicting future trends. The notch of inventory management affects the profit of firms and invariably overall performance depending on methods adopted; which is an imperative aspect of profitability. It is imperative to know and use inventory management methods, and have perfect knowledge of experience and presentation skills in its control. Finally, there is a high prospect for improvement in the performance of 7up Bottling

Company if more attention is hinged on modern methods of inventory management.

c) Recommendations

Inventory management is a philosophy that has been of tremendous benefit in the western world, especially with the application of modern methods like Just-in-Time Method, which is still sprouting. Its positive return on investment is too glaring to flout. To ensure sufficient realization of the merits derived from inventory management and tackle the obstacle posed to the real inventory management program, the following recommendations are made based on the research findings:

i. Since companies' profitability is a function of the inventory management method, it is our candid recommendation that firms should adopt modern approaches in inventory management, which ensures high probability and success.
ii. Every business outfit in Nigeria should, as a matter of urgency, take on the contemporary techniques of inventory to have the dividend of reduction in storage cost, carrying cost, and ordering price, which also affects the level of performance.
iii. The old method of inventory keeping gives the sub-optimal result, and even if, in use, they should not be applied in isolation.
iv. Nigerian Companies that will like to enjoy a high and consistent success rate should apply a better inventory management method.
v. Companies should train their staff on Inventory Control Management to avoid overstocking or understocking.
vi. The application of modern inventory management be made a priority and be closely monitored and well-guarded and avoid liquidation.
vii. For companies to have immediate and lasting benefits in the uses of modern inventory management should employ professionals in inventory management to enable them to reap the full benefits of this method.
viii. An adoption and application of the Economic Order Quantity (EOQ) model to save cost and make the operations more efficient.
ix. EOQ model should adopt a fixed order for continuous productivity, which will lead to effective market operations and profitability.
x. Companies should shift from manual tasks to computerization to enhance profitability.
xi. Companies should continue to carry out workforce development, which will greatly enhance the performance of manufacturing firms.

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A Case Study of Walkability and Neighborhood Attachment

By Samaneh Khabiri, Mohammad Reza Pourjafar & Mohammad Saeid Izadi

Tarbiat Modares University

Abstract- The neighborhood attachment provides psychological benefits and has positive behavioral consequences for residents and communities. Much of the literature examines the impacts of individual and social indicators as predictors of place attachment. This research paper concentrates on the place dimension of this bond, examining influences of the built environment in the context of perceived walkability on neighborhood attachment and determining which variables of neighborhood walkability have the most significant impact on promoting neighborhood attachment. Moreover, the effects of neighborhood walkability variables on three main dimensions of neighborhood attachment, namely emotional, functional, and behavioral, are compared.

In this study, we draw a random sample of 348 Ekbatan residents aged 15 and above by using the stratified sampling method, and a multidimensional scale is adopted to measure neighborhood attachment and walkability. The findings confirm that respondents assign high or very high ranks to both variables.

Keywords: urban planning, neighborhood attachment, walkability, correlation, and regression analyses.

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A Case Study of Walkability and Neighborhood Attachment

Samaneh Khabiri [α], Mohammad Reza Pourjafar [σ] & Mohammad Saeid Izadi [ρ]

Abstract- The neighborhood attachment provides psychological benefits and has positive behavioral consequences for residents and communities. Much of the literature examines the impacts of individual and social indicators as predictors of place attachment. This research paper concentrates on the place dimension of this bond, examining influences of the built environment in the context of perceived walkability on neighborhood attachment and determining which variables of neighborhood walkability have the most significant impact on promoting neighborhood attachment. Moreover, the effects of neighborhood walkability variables on three main dimensions of neighborhood attachment, namely emotional, functional, and behavioral, are compared.

In this study, we draw a random sample of 348 Ekbatan residents aged 15 and above by using the stratified sampling method, and a multidimensional scale is adopted to measure neighborhood attachment and walkability. The findings confirm that respondents assign high or very high ranks to both variables. The correlations show a significant comovement between variables of perceived walkability and neighborhood attachment. The regression analyses point out that perceived walkability accounts for 39 percent of variations in neighborhood attachment. Besides, among all indicators for perceived walkability, the results show that proximity, environmental desirability, and then security are respectively the most significant driving forces of neighborhood attachment.

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I. Introduction

The neighborhood attachment is a psychological bond between people and the neighborhood in which they live. It encompasses emotional, cognitive, and behavioral dimensions. Numerous studies indicate that attachment to the place of residence is a psychological bond that carries beneficial effects for people and their communities (Lewicka, 2008). It also entails positive emotions such as love, joy, and pride. As put forward by Manzo and Perkins (2006), emotional connections to residential places relate to community social cohesion, organized participation, and community development. Besides, research conducted by Mesch and Manor (1998) shows that high neighborhood attachment among residents leads to protective behavior that safeguards the place and environment in which they dwell.

The individual and social benefits of place attachment, globalization, and destruction of ties between people and neighborhoods caused by factors such as growing mobility, development of new technologies, and their inevitable outcomes in life patterns have brought place attachment to the attention of policymakers and scholars across the world. Moreover, the rapid urbanization and dominance of modernist planning discourse in Iran's urban development programs in the past decades have caused a major spatial transformation in neighborhood structures, which once featured continuity of residence. Nowadays, the neighbors' alienation and ignorance undermine those neighborhoods that, in the past, enjoyed social capital as a result of close relationships and social ties among residents (Fallahpasand, 2011). Overlooking local communities and people's emotional connection with their places of residence has led to a decline of local communities' role in building social trust and cohesion. Such circumstances call for more attention to the physiological dimensions of cities in urban development plans.

The previous research on place attachment often concentrates on economic, political, or social dynamics (Manzo and Perkins, 2006) and underestimate the effects of physical dimensions of places on such ties (Scannell and Gifford, 2010). Today, walkability is a major topic in sustainable city and neighborhood planning and design (Southworth, 2005). The concept of walkability is concerned with the extent to which the built environment makes walking experience safe, secure, and pleasant. Gehl (2010) emphasizes that "in lively, safe, sustainable and healthy cities, the prerequisite for city life is good walking opportunities"(p.19). Various benefits of walkability for cities and communities, namely economic, social, and environmental, transport, and public health have resulted in a shift in the urban policymaking approach from auto-centric planning to more sustainable urban transport modes, especially walking and cycling. This trend has made walkability a

Author α: Ph.D Candidate in Urban planning, Urban Planning Department, School of Arts and Architecture, Tarbiat Modares University, Tehran, Iran. e-mail: s.khabiri@modares.ac.ir
Corresponding Author σ: Professor, Urban Planning Department, School of Arts and Architecture, Tarbiat Modares University, Tehran, Iran. e-mail: pourja_m@modares.ac.ir
Author ρ: Associate Professor, Urban Design Department, School of Arts and Architecture, Bu-Ali Sina University, Hamedan, Iran. e-mail: ms.izadi@basu.ac.ir

priority for urban planning and design aimed at creating walkable cities and neighborhoods through developing policy frameworks and planning guidelines (Dong, 2017; Rafiemanzelat, Zebardast, and Latifi, 2017) for the built environment.

This study aims at identifying the relationships between perceived walkability and residents' place attachment in Ekbatan neighborhood in Tehran by means of survey research methods and quantitative analytical tools. The rest of this article is organized as follows. Section 2 briefly reviews relevant theoretical framework, Section 3 lays out research methods, hypotheses, and models, and Section 4 presents results and interpretations. Finally, Section 5 sums up all discussions and concludes.

II. Theoretical Framework

a) *Neighborhood attachment*

Lewicka (2010a) states "neighborhood is considered as the most popular spatial scale in place attachment literature". As a complicated, multilateral, and multidisciplinary concept, place attachment implies a positive psychological bond between people and places by which groups and individuals assign symbolic meaning to those places. Of course, some positive sentiments such as love, joy, and pride, unpleasant emotions like grief, distress, or desolation caused by being distant from the place or losing it, could accompany the formation of such a tie (Scannell and Gifford, 2013). The bond is also reflected in a series of specific behavior such as a tendency to maintain proximity to places (Hidalgo and Hernandez, 2001), social support, pro-environmental demeanor, and a tendency to participate in local affairs (Lewicka, 2005).

Initially introduced by Proshansky in 1978, the concept of place identity is also referred to as emotional place attachment in the respective literature and it is known as a notion related to place attachment. The place identity is part of a person's identity and is the result of his cognition of the physical world where they live. The cognition itself consists of memories, ideas, emotions, viewpoints, values, preferences, concepts, and experiential and behavioral ideals in interaction with varied and complex surroundings that shape every person's experimental space, including cognition and behavior. Twigger-Ross and Uzzell (1996) set the formation of place identity in connection with senses of self-efficacy, continuity, self-esteem, and distinction (Lewicka, 2008). Therefore, if a particular place raises a sense of distinction, self-efficacy, self-esteem, and compliance with beliefs, it is deemed more likely to have a highlighted role in the person's identity structure.

Moreover, the functional attachment is another dimension of the place attachment (Scannell and Gifford, 2013), defined by Stokols and Shumaker (1981) as the potential of a particular place in satisfying a person's needs and goals (Williams, Patterson, and Roggenbuck, 1992). In their viewpoint, two factors affect the way people perceive place dependency; First, quality of current place to meet their needs, and second, the relative quality of comparable alternatives in addressing those needs. Korpela (1989) puts forward that there exists a close relationship between place attachment and place identity through the concept of self-efficacy (Livingston, Bailey and Kearns, 2008). Twigger-Ross and Uzzell (1996) state "feelings of self-efficacy are maintained if the environment facilitates or at least does not hinder a person's everyday lifestyle".

A review of the research background in conceptualizing the psychological link between people and places shows that it involves three main dimensions of behavioral, emotional-cognitive, and functional. Scannell and Gifford (2010) have introduced a tripartite organizing framework for the concept of place attachment. According to their model, the place attachment is a bond that includes three main components of people (collective of individuals), process (emotional, cognitive, and behavioral aspects), and the place. Among them, the place is the most significant one that is less studied than the other two. Also, thanks to the heavy heritage of community studies on community attachment (Lewicka, 2010a), the social dimension of the place has been examined more compared to the physical aspect and the built environment.

A review of the studies that have subjectively assessed the impact of physical and environmental factors on perceived attachment to neighborhoods shows that neighborhood attachment is significantly greater with quiet and buildings' aesthetic pleasantness (Bonaiuto, Perugini, Bonnes, and Ercolani, 1999), lack of pollution and disorder (Harlan et al., 2005), access to the nature, housing and neighborhood quality, sense of safety, municipal services (Fried, 1982), presence of greenery (lewicka, 2010b; Bonaiuto et al., 1999). In contrast, neighborhood attachment is significantly lower with lack of opportunities, the inadequacy of cultural activities and meeting places (Bonaiuto et al., 1999), and size of buildings (Lewicka, 2010b; Gifford, 2007). Also, a study on a retirement community shows physical features that influence place attachment indirectly are close walking distance to the central activity building, small functional distance to neighbors, and access to a shared, enclosed outdoor garden (Sugihara and Evans, 2000). This study draws upon the physical dimension of place in order to probe into the relationship between the built environment from the virwpoint of walkability and the people's psychological connection with the neighborhood.

b) *Walkable neighborhoods*

Walking is the most accessible and the most affordable form of mobility (Southworth, 2005), the

primary, the oldest, and the most natural form of moving around for the people (Pakzad, 2005). The walkability of cities and neighborhoods came to the spotlight in the late 1960s, concurrent with growing criticisms and urban problems caused by car-oriented policies. Promotion of walking and walkable communities emerged in activities of pioneering theorists like Jacobs (1961), Cullen (1971), Ghel (1971), Alexander (1977), White (1980), and Appleyard (1980), and developed into movements such as Smart Growth, New Urbanism, Transit-Oriented Development (TOD), activities of international organizations, and manifestos issued like "Towards an Urban Renaissance, Final Report of the urban task force" (2005), "Planning and Design for Sustainable Urban Mobility" (2013), "Streets as Public Spaces and Drivers of Urban Prosperity" (2013), "The Future We Want, The City We Need" (2014), and global movements such as Walk21. Likewise, a large number of research studies on walkability are carried out in several disciplines and various fields of knowledge, including urban planning and design, transport planning, and public health.

As demonstrated in Table 1, the definition of walkability does not draw merely upon increasing residents' walking in the urban environment. It is also described as a form of sustainable mobility and capabilities of the built environment which provide high-quality walking experience. Thus, the quality of walking experience as being safe, easy, and enjoyable is emphasized in the definition of walkability. To Forsyth and Southworth (2008), walkability encompasses certain features such as short distance to a destination, barrier-free and traversable routes for all, safety, provision of sufficient pedestrian facilities and infrastructures, and upscale environment.

Table 1: Definition of Walkability

Reference	Year	Definition
Seilo	2004	A measure of the urban form and the quality and availability of pedestrian infrastructure within a defined area.
Southworth	2005	The ability of the place to connect people with varied destinations within a reasonable amount of time and effort, and to offer visual interest in journeys throughout the network.
Abley	2005	The extent to which the built environment is walking friendly.
Steve	2005	The extent to which walking is readily available as safe, connected, accessible, and pleasant mode of transport.
Leslie et al.	2007	The extent to which characteristics of the built environment and land use may or may not be conductive to residents in the area walking for either leisure, exercise or recreation, to access services, or to travel to work.
Nosal	2009	The extent to which the built environment is friendly to the presence of people living, shopping, visiting, enjoying or spending time in an area.
American Planning Association	2010	A place in which residents of all ages and abilities feel that it is safe, comfortable, convenient, efficient, and welcoming to walk, not only for recreation but also for utility and transportation.
Litman	2011	The quality of walking conditions in an urban space which is inclusive of comfort, safety, connectedness and permeability (inclusiveness of neighborhood design).
Un-Habitat	2015	The extent to which the built environment is friendly to people moving on foot in an area.

Walkability facilitates and encourages pedestrian mobility (Lee and Talen, 2014). Moudon et al. (2006) hold the belief that walkability is not merely a motion pattern but is a type of sociability among neighbors that would eventually affect the physical, mental, and spiritual health of members of the community. Designing and planning such neighborhoods has received a considerable amount of attention. According to the study carried out by the World Health Organization (2008), walking may improve the life quality and mental health of people and prevent obesity, ailment, and disability by increasing their daily physical activity. It also lowers the stress level, and thus, helps lift people's spirits and strengthens the sense of social community, which brings about increased satisfaction among residents. In fact, walkable neighborhoods promote a certain lifestyle, which not only improves the physical and mental health of people but also entails the development of local communities. Hence, walking is both a physical and social activity (Gemzøe, Kirknæs, and Søndergaard, 2006). As found by various researches, neighborhood walkability increases physical activity (Frank et al., 2010) that in turn has health benefits for residents, ease social, economic, and environmental tensions (Giles-Corti and Donvan, 2002; Handy, Boarnet, Ewing, and Killingsworth, 2002; Pucher and Dijkstra, 2003; Vojnovic, Jackson-Elmoore, Holtrop, and Bruch, 2006), make neighbors meet and know each other, build trust among neighbors, and increase their social involvement (Dong, 2017).

On the one hand, a walkable neighborhood provides a safe environment for its inhabitants. The safety of walking increases the number of pedestrians, promotes the culture of walking, reduces the speed of motor vehicles, and puts pedestrians at the top of the transportation hierarchy. Also, a decrease in the number of injuries resulted from the lower speed of motor vehicles creates a safe environment for everyone and particularly for children. On the other hand, the absence of pedestrians in neighborhood spaces and decreased walkability would reduce safety, security, and social ties, and would give rise to environmental problems such as air and noise pollution, deteriorated public health, lack of identity and sense of belonging, and boredom. The undesirable effect of impaired neighborhood walkability on the sense of community is considered to be one of the gravest problems in every country (Rezazadeh, 2011).

i. *Principles and criteria of neighborhood walkability*

The degree of neighborhood walkability depends on several factors. A strand of literetaure attempts to identify the criteria and principles for the built environment that facilitate walking. As inferred from past research, the walkability has three main criteria, namely proximity (Gori, Nigro, and Petrelli, 2014; Schlossberg, 2006), connectivity (Schlossberg, 2006; Frank et al., 2006; Lee and Moudon, 2008; Mouden et al., 2006; Gori et al., 2014), and quality of spaces (Gori et al., 2014; Litman and Blair, 2011; Schlossberg, 2006).

Proximity is the ability of street networks to facilitate pedestrian access to local destinations (Gori et al., 2014; Brookield, 2017). Access to daily needs within an acceptable amount of time and effort (Southworth, 2005) is the main issue in the proximity criterion. Versatile, small, and fine-grain blocks may shorten the distance between the residents and local services. A convenient walking distance is set to be between 365 to 610 meters long or may last between 5 to 10 minutes.

Owen et al. (2007) define connectivity as accessibility, choice of mobility methods, and continuity of the path to various local destinations. As specified by the American Planning Association (2010), multiple route connections do not make pedestrians take lengthy detours to reach their destinations. Connectivity and continuity of paths also require carefully-designed midblock crossings with curb extensions, median refuges, and other features to ensure pedestrian safety. Connectivity of routes is of high significance as it affects both time and distance of walking, and as a result, people's tendency to walk.

However, Ghel (2010) believes that the quality of the path people walk through may change the sense of desirable distance for users of the space. He goes on to explain that attractive and comfortable routes that offer rich experiences make users forget the remoteness and enjoy experiences as they happen. Scholars list various components such as safety, security, and delightfulness as indicators of quality for paths and spaces. Southworth (2005) names the width of pathways, paving, landscaping, signing, and lighting as the main principles to assess the excellence of paths. Sufficient lighting has a highly significant effect on the safety of pedestrians in public spaces (Litman and Blair, 2011). Additionally, paths and spaces need to be safe for everyone, including those physically challenged, the elderly, and children. Shortening distance between junctions and designing well-marked pedestrian crossings help traffic calming and enhance pedestrian safety.

III. Methodology and Model Specification

a) *Introduction to Ekbatan*

With 33 blocks and 15,675 residential units, Ekbatan town in Tehran is the largest residential complex in Iran that was designed and built with foreign investment in the 1960s. Its main goals were to control population growth, redistribute, and accommodate civil servants and the middle-class. Since then, this neighborhood has managed to preserve its original design and form. In terms of municipal administrative divisions, the town has an organization called City Council Assistant (or Shorayari in the local language).

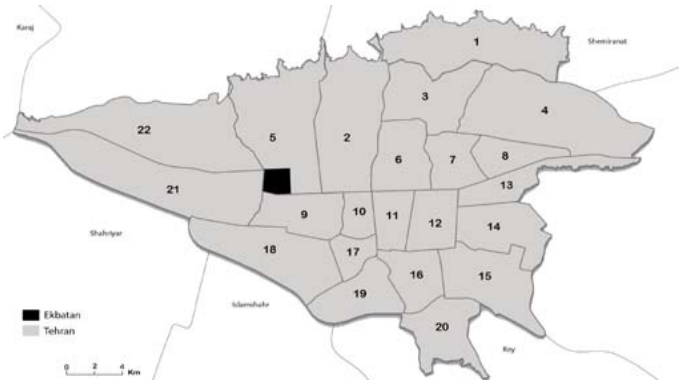

Figure 1: Ekbatan's location in Tehran

Ekbatan has three separate sets of buildings, each called a phase, and they currently accommodate a population of 44,981 people (Marbaghi et al., 2018). In the total constructed area of the town, the five-to-thirteen-floor buildings and the service usage occupy about 58 percent and 5 percent, respectively. The U-shaped blocks have formed semi-public spaces with diverse green spaces. These open and green spaces make up one of the prominent Ekbatan physical and landscape features. In addition to improving air quality and creating a proper landscape, green spaces are also crucial for a vibrant social life leading to a continued presence of residents in these public spaces. Although the design of these spaces differs in each of the neighborhood's three phases, the green space has high per-capita square meters in all of them. Also, separating pedestrians and vehicle movements in the main public spaces and the semipublic spaces of each block has created a safe and secure feeling for the residents (see Figure 2).

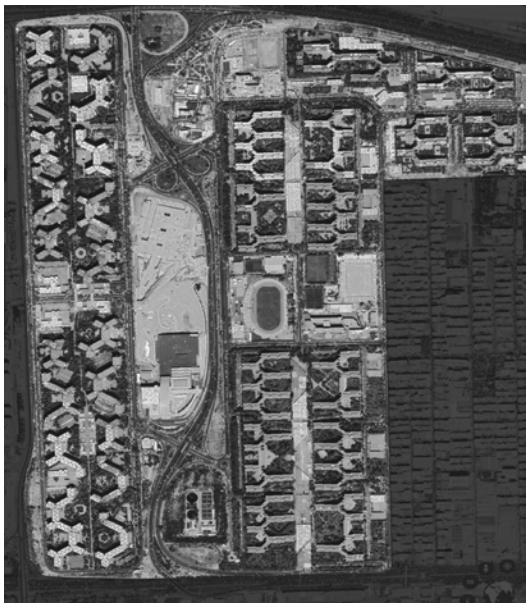

Figure 2: Ekbatan's aerial map

The neighborhood's Phase 1 consists of 10 residential blocks (6,511 residential units), two sports stadiums, one mosque, and 11 local markets or bazaars (see Figure 3). Markets are located in the center of Phase 1 along the north-south axis, and the local services and cultural-recreational spaces are concentrated on this axis (see Figure 4). These markets that are built in three floors integrate modern commercial complexes with traditional bazaars. They also form corridor-like walkways consisting of outdoor and indoor spaces, and at some points, have views to the green spaces of the blocks. This interconnected network of green and open spaces that links the markets of Phase 1 is known as the neighborhood's most active public space. Residents come to this place not only for shopping but also for meeting and greeting neighbors, social interaction, and leisure activities.

Figure 3: Blocks A_5 & B_4 and central market in Phase 1

Figure 4: Phase 1's market as the Ekbatan's prominent public space

Phase 2 is located in the eastern part of the neighborhood, covering 19 blocks and 7,978 residential units, and comprising three markets, one public library, one mosque, and six schools (see Figure 5). The pecular layout of blocks in this phase creates a green pedestrian corridor in the middle, which is called the Health Road by the residents (see Figure 6). Due to its open spaces, Golha Commercial Complex is also used as another public space in the neighborhood. MegaMall Commercial Complex with a city-wide function, which includes facilities such as a cinema campus, hypermarket, reputable retailers, and brands, is located in Phase 2.

Figure 5: Phase 2's aerial map

Figure 6: Phase 2's walking path called Health Road

Phase 3, consisting of 4 blocks and covering 2,086 residential units, is located in the northern part of the neighborhood and has been in operation since 1991 after the construction of Phases 1 and 2 (see Figure 7). Offering its services to beyond the Ekbatan residents, Sarem Hospital, which is a well-known center for infertility treatment, is located in this phase. There is also a local market with 40 shops, one mosque, one local park, and two schools in Phase 3. Further, the Ekbatan neighborhood community center, which is called Saraye Mahallah, and city council assistant of the neighborhood are both located in this phase.

Figure 7: Phase 3's aerial map

Ekbatan is bounded by the Tehran-Karaj highway on the north, Shahid Lashgari highway on the south, Sattari highway on the west that provide vehicle access to the neighborhood. Ekbatan is located close to Line 4 of Tehran underground, and an underground station serves its residents. Moreover, the proximity of the neighborhood to Azadi Square, a prominent Tehran landmark, and its numerous public transport terminals and several taxi stations in all phases of the neighborhood facilitate people's accessibility to public transport. Each block of Ekbatan has an independent board of directors elected by the block's residents. The members of board of directors that are also members of the town's board, based on internal regulations, have the responsibility to monitor local business activities, accessibility, and availability of services and infrastructures.

b) Sample data

This paper uses the survey method and questionnaires to collect data. Assuming a population proportion of 0.5 and a confidence level of 95 percent, Krejcie and Morgan (1970) suggest that the sample should comprise 384 respondents. We distributed close-ended questionnaires among three phases in

Ekbatan using the stratified random sampling. Our sample data consists of questionnaires that are filled in by 384 Ekbatan residents.

c) *Research variables and their quantitative measurements*

The two major research variables are neighborhood attachment and neighborhood walkability, the former as the dependent variable and the latter as the explanatory variable. The quantification and measurement of these theoretical concepts are based on methods reviewed in the literature. As explained in the previous section, neighborhood attachment is a psychological bond between people and the neighborhood and comprises three aspects, namely emotional-cognitive, functional, and behavioral. Place identity is emotional and cognitive side, place dependency is functional aspect, and residential stability and social support are behavioral criteria.

Measurement of the place attachment in quantitative studies utilizes survey methods and self-report scales. In this paper, a one-to-five scale of 20 different items is used to measure how Ekbatan residents perceive cognitive-emotional, functional, and behavioral dimensions of attachment in their town (see Table 2). These items that we apply to prepare questionnaires are extracted from some previous studies such as Williams and Roggenbuck (1989), Hidalgo and Hernandez (2001), Williams and Vaske (2003), and Lewicka (2005).

Table 2: Measuring Neighborhood Attachment

Components		Items
Emotional and cognitive bonds	Place identity	10 items including the following: Memories come to my mind when I am in various spaces in Ekbatan./ I have knowledge of Ekbatan history./ Ekbatan is a unique and special place to me./ I am proud of living in Ekbatan./ I like Ekbatan and feel attached to it./ Living in Ekbatan brings me peace of mind./ I define part of my identity by being an Ekbatan resident./ Ekbatan has become part of me. Ekbatan complies with my lifestyle which is based on my beliefs, tastes, tendencies, values, and orientations./ Residents of Ekbatan are homogeneous as for lifestyle, culture, and religious beliefs.
	Place depencency	2 items including the following: Ekbatan is a neighborhood that caters well to the needs of its residents./ Ekbatan caters to the needs of its residents better than other neighborhoods in Tehran.
Behavioral consequences	Residential stability	3 items including the following: Even if I can afford to live in other neighborhoods, I would continue residing in Ekbatan./ I would feel very sad and desolated if I am forced to leave Ekbatan./ How long have you lived in Ekbatan?
	Social support	5 items including the following: So far, whenever there was a form of objection to undesired alterations in Ekbatan, I have collaborated with other residents to prevent or stop it (e.g. Writing and signing petitions, protests, etc)./ I take part in management of the block in which I am living./ I wish to take part in decision-making procedures and other issues pertaining to Ekbatan./ In case I spot someone vandalizing the public spaces and facilities of Ekbatan, I would warn them or try to stop them.
Reference: Authors		

The literature review points out two general approaches in measuring the walkability of neighborhoods. The first approach employs application software to quantify objectively the influence of the built environment on walking behavior (Leslie, Butterworth, and Edwards, 2006; frank et al., 2006; Cole, Leslie, Bauman, Donald, and Owen, 2006; Rutt and Coleman, 2005). In contrast, the second approach measures neighborhood walkability subjectively by identifying opinion and perception of users with reference to aforesaid three principles of walkability (Burton, Turrell, Oldenburg, and Sallis, 2005; De Bourdeaudhuji, Teixeira, Cardon, and Deforche, 2005; Hooker, Wilson, Griffin, and Ainsworth, 2005; Plaut, 2005; Spence et al., 2006; Van Lenthe, Brug, and Mackenbush, 2005; Suminski, Poston, Petosa, Stevens, and Katzenmoyer, 2005).

Table 3: Measuring Neighborhood Walkability

Components		Items
Proximity		9 items including the following: I normally walk to reach markets and other services in Ekbatan./ I spend most of my leisure time inside Ekbatan and enjoy leisure facilities provided./ How satisfied are you with accessibility of leisure and entertainment facilities in Ekbatan?/ How satisfied are you with accessibility of playgrounds for children?/ How satisfied are you with accessibility of schools and educational institutions in Ekbatan?/ How satisfied are you with accessibility of local markets and green grocers?/ How satisfied are you with accessibility of sports facilities and fields in Ekbatan?/ How satisfied are you with accessibility and number of extent parks and green spaces?
Continuity		2 items including the following: How satisfied are you with pedestrian accessibility of public transport inside Ekbatan?/ How satisfied are you with fast and easy access to streets and highways outside Ekbatan?
Spatial quality	Security	2 items including the following: I feel secure while walking around open and green spaces in Ekbatan./ How satisfied are you with lighting of passageways and public spaces in Ekbatan?
	Environmental desirability	3 items including the following: Open and green spaces in Ekbatan are delightful and I enjoy being around them or walking in them./ How satisfied are you with hygiene and cleanliness of open and public spaces in Ekbatan?/ How satisfied are you with visual beauty and landscaping of green spaces in Ekbatan?
	Safety	3 items including the following: Open and public spaces in Ekbatan are safe and proper for walking./ Open and public spaces in Ekbatan are safe and proper for children's walking./ Open and public spaces in Ekbatan are safe and proper for senior citizens' walking.
Reference: Authors		

The present article adopts the latter to indirectly measure walkability in Ekbatan by surveying the perception of residents about the walkability of their neighborhood using the inquiry method and questionnaire. The theoretical definition of neighborhood walkability also has three criteria including proximity, connectivity of the local road network, and spatial quality that itself has three sub-criteria of safety, security, and desirability. It might be noted that accessibility and reaching local services on foot are measured under proximity aspect. Connectivity measures the ease of access to other means of transportation both inside and outside the Ekbatan, including city transport networks. Spatial quality is measured by three sub-categories of safety, security, and environmental desirability. The safety of walkways and the security of spaces for movement of various age groups are rated by pedestrians' sense of safety and proper lighting of pathways. Also, desirability is evaluated according to pathways' beauty, cleanliness, and delightfulness. Similarly, walkability is measured using close-ended questions with answers according to a Likert scale. Respondents assessed each criterion by answering questions designed for specific items using a five-point scale (see Table 3).

According to validity and reliability tests implemented for neighborhood attachment, Cronbach's alpha is 0.921, composite reliability is 0.857, and the AVE value is 0.611. These statistics for neighborhood walkability are 0.925, 0.874, and 0.703, respectively. Given that acceptable values for Cronbach's alpha and composite reliability are bigger than 0.7 and for the AVE are larger than 0.5, the reliability and validity of the structure for these two research variables are confirmed. Also, when the coefficients of Cronbach's alpha are calculated upon the elimination of any items in these two variables, there are no significant changes in Cronbach's alpha. Thus, it is not deemed necessary to exclude any of them.

d) Correlation and regression analyses

We examine the relationships between neighborhood attachment and neighborhood walkability using correlation and regression analyses. The summary statistics of research variables, correlation coefficients, regression models, results, and their interpretations are reported in the next section.

IV. Empirical Analyses

a) Demographic characteristics of respondents

Demographic characteristics of 384 survey participants are as follows. 49 percent are female, and 51 percent are male. 90 percent were born outside Ekbatan, and 72 percent spent their childhood in places

other than Ekbatan. The average age is 41. About 20 percent are aged below 30. About 40 percent are aged below 50, and the remainder are more than 50 years old. The most frequent age group is 50-60. 30 percent are single, 11 percent are married with no children, and 59 percent are married with children. Furthermore, 76 percent are homeowners, and the remainder are tenants. 25 percent have postgraduate degrees, 35 percent hold bachelor's degrees, and the remainder have lower educational levels.

b) Summary statistics

As reported in Table 4, the average rates respondents have given to both neighborhood attachment and neighborhood walkability are significantly larger than 3 on a one-to-five scale. It means that, on average, survey participants have high or very high attachment to their town and assess Ekbatan's walkability as desirable or very desirable. Among indicators of neighborhood attachment, residential stability has the highest score, and social support is the only exception that is not rated high or very high in the neighborhood. Also, among walkability indicators, residents rated the spatial quality of the town higher than others. Among the three sub-indicators, it is quality safety that has received the highest score from residents.

Table 4: Summary Statistics

Variables			Average rate	Standard deviation	Skewness	Kurtosis
Neighborhood attachment			3.584	0.841	-0.526	2.880
Indicators	Place identity		3.379	1.013	-0.484	2.394
	Place dependency		3.882	1.035	-0.889	3.429
	Residential stability		4.063	1.258	-0.420	2.356
	Social support		3.011	1.060	-0.317	2.806
Neighborhood walkability			3.780	0.792	-0.925	4.144
Indicators	Proximity		3.606	0.878	-0.695	3.675
	Continuity		3.832	1.024	-1.050	4.271
	Spatial quality		3.902	0.912	-1.164	4.398
	Sub-indicators	Security	3.728	1.022	-0.732	2.963
		Environmental desirability	3.893	0.893	-0.934	4.138
		Safety	4.085	1.190	-1.934	6.787
** and ** denote statistically significant at 5 percent and 1 percent, respectively.*						

c) Correlation analysis

Then, the correlation analysis is applied to measure the co-movement between two variables of walkability and neighborhood attachment in Ekbatan. We use Kendall's tau-b to estimate the direction and strength of the concordance between each pair of variables. As reported in Table 5, Kendall's correlation coefficients among all components of walkability and neighborhood attachment are positive and significant. These findings indicate that perceptions of walkability and neighborhood attachment change in tandem among Ekbatan residents.

Table 5: Kendall's Tau-b Correlation Coefficients

Variables		Neighborhood attachment	Place identity	Place dependency	Residential stability	Social support
Neighborhood walkability		0.37**	0.36**	0.41**	0.24**	0.20**
Proximity		0.42**	0.41**	0.43**	0.29**	0.22**
Continuity		0.26**	0.25**	0.30**	0.17**	0.16**
Spatial quality		0.35**	0.34**	0.39**	0.21**	0.18**
Sub-indicators	Security	0.32**	0.30**	0.34**	0.18**	0.20**
	Environmental desirability	0.39**	0.38**	0.45**	0.25**	0.18**
	Safety	0.28**	0.26**	0.32**	0.18**	0.15**
** and ** denote statistically significant at 5 percent and 1 percent, respectively.*						

d) Regression analysis

As shown in Table 6, there exists a significant positive relationship between walkability and neighborhood attachment in Ekbatan. It means that higher walkablity leads to stronger neighborhood attachment and vice versa. The slope coefficients for walkability are positive and statistically significant. The coefficient of determination, R^2, estimates that walkability accounts for 32 percent of variations in neighborhood attachment. Significant F statistics mean that both intercept and slope coefficients of regression models are jointly significant. Also, significant ADF statistics imply that regression residuals have no unit roots, and hence, they are stationary.

Table 6: Impact of Walkability on Neighborhood Attachment

The regression model $Y_i = \alpha + \beta X_i + \varepsilon_i$ is estimated five times. In all five regression models reported, the explanatory variable is neighborhood walkability. The dependent variable in each of five regression models is mentioned below.

Regression parameters	Dependent variable				
	Neighborhood attachment	Place identity	Place attachment	Residential stability	Social Support
α	1.307** (0.234)	0.910** (0.282)	1.237** (0.283)	2.045** (0.350)	1.035** (0.300)
β	0.602** (0.057)	0.653** (0.070)	0.700** (0.069)	0.534** (0.085)	0.523** (0.080)
F	180.97**	134.67**	153.11**	48.56**	68.69**
R^2	0.32	0.26	0.29	0.11	0.15
ADF	-16.60**	-18.48**	-18.70**	-16.14**	-16.25**

Figures in parantheses are heteroskedasticity-and-autocorrelation consistent (HAC) standard errors;
ADF stands for Augmented Dickey-Fuller test statistic calculated for regression residuals;
** and ** denote statistically significant at 5 percent and 1 percent, respectively.*

Having detected a positive relationship between walkability and neighborhood attachment in Ekbatan, we then move to investigate this causal relationship in more detail. To this end, we extended our regression model into a multivariate equation in which the neighborhood attachment and its four indicators are individually regressed on five main components of walkability, namely proximity, continuity, security, environmental desirability, and safety. The results from these linear regression models enable us to see which component of walkability has stronger influence on neighborhood attachment and its four indicators.

Table 7: Impact of Walkability on Neighborhood Attachment

The regression model $Y_i = \alpha + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_4 X_{4i} + \beta_5 X_{5i} + \varepsilon_i$ is estimated five times. In all five regression models reported, explanatory variables are indicators of walkability. Hence, X_{1i} is proximity, X_{2i} is continuity, X_{3i} is security, X_{4i} is environmental desirability and X_{5i} is safety. The dependent variable in each of five regression models is mentioned below.

Regression parameters	Dependent variable				
	Neighborhood attachment	Place identity	Place dependency	Residential stability	Social support
α	1.284** (0.193)	0.891** (0.223)	1.190** (0.271)	2.081** (0.312)	0.972** (0.272)
β_1	0.471** (0.072)	0.574** (0.082)	0.390** (0.089)	0.654** (0.146)	0.266* (0.125)
β_2	-0.015 (0.058)	-0.078 (0.067)	0.036 (0.072)	-0.085 (0.076)	0.067 (0.071)
β_3	0.146* (0.059)	0.205** (0.071)	0.094 (0.078)	0.295** (0.104)	0.012 (0.088)
β_4	0.290** (0.074)	0.432** (0.078)	0.432** (0.128)	0.323** (0.113)	-0.029 (0.106)
β_5	0.018 (0.034)	-0.050 (0.046)	-0.045 (0.047)	-0.051 (0.069)	0.218** (0.057)
F	48.59**	41.84**	38.31**	16.33**	16.68**
R^2	0.39	0.36	0.34	0.18	0.18
ADF	-14.98**	-17.40**	-17.97**	-15.06**	-10.74**

Figures in parantheses are heteroskedasticity-and-autocorrelation consistent (HAC) standard errors;
ADF stands for Augmented Dickey-Fuller test statistic calculated for regression residuals;
** denotes statistically significant at 5 percent; and*
*** denotes statistically significant at 1 percent.*

The results are reported in Table 7. Among the theoretical components of walkability, only two of them, namely proximity and environmental desirability, are the significant drivers of neighborhood attachment in Ekbatan. Therefore, it might be concluded that a close distance to leisure facilities, parks, markets, and other local amenities improves attachment among Ekbatan residents. Similarly, green spaces, hygiene, and cleanness enhance people-place bond in the town. Security is the third significant factor that strengthens the sense of neighborhood attachment. However, it has a smaller effect on neighborhood attachment compared to proximity and environmental desirability.

Since all regression variables are quantified using the 1-5 Likert scale, the absolute value of slope coefficients allows us to determine which variable has the biggest impact on neighborhood attachment. Among the three significant variables of proximity, environmental desirability, and security, the first one has the largest significant impact, and the third one has the smallest significant effect on neighborhood attachment among Ekbatan residents. These three variables may account for 39 percent of variations in neighborhood attachment. Other components of walkability do not seem to have a significant effect on neighborhood attachment. The findings are similar for every four components of neighborhood attachment. In the cases of place identity, place dependency, and residential stability, the results show that proximity, environmental desirability, and security are still the main drivers. The social support is the only exception among components of neighborhood attachment. The proximity and safety are the driving factors for the self-reported perception of social support among Ekbatan residents.

V. Concluding Remarks

The neighborhood attachment is a positive psychological bond that has emotional, cognitive, and behavioral aspects with benefits for the individual and the community. These benefits include the social capital, residence stability, and social unity. Impairment of emotional bonds between people and the neighborhood and residence instability may lead to a decline in the social capital and wealth and has negative impacts on the social participation of residents, turning them into passive citizens.

Studying the influence of social and physical features of the neighborhood on residents' attachment may guide urban planners and designers to manage psychological bonds between people and the neighborhood through appropriate urban development plans. In line with prior place attachment studies in neighborhood scale, this paper examines the relationships between walkability as the capacity of the built environment and the spatial features of the town in encouraging and supporting enjoyable pedestrian mobility in a safe and secure space in Ekbatan. People's perception of walkability is assessed by three physical aspects of a neighborhood, i.e., proximity, connectivity, and spatial quality.

The survey results point out that Ekbatan residents have a positive assessment of walkability in their neighborhood and have high or very high attachment to their residence. Evidence also confirms high correlations between walkability and neighborhood attachment in Ekbatan. Thus, increased walkability may enhance neighborhood attachment. Besides, results from multiple linear regression models show that walkability indicators are significant factors to explain changes in neighborhood attachment. The estimated coefficient of determination implies that walkability accounts for 39 percent of changes in neighborhood attachment in our sample data. It is also evident that among the defined indicators for walkability, three of them, namely proximity, safety, and environmental desirability, are the significant predictors of neighborhood attachment. Among these three factors, proximity has the largest impact on neighborhood attachment.

The results of this study are similar to those of Sugihara and Evans (2000). They find proximity and short walking distance to community service centers are the major factors which affect the elderly's attachment to the local community. Our findings generalize these facts to all age groups above 18. Further, the results are in line with Sugihara and Evans (2000) that show social support as having a positive relationship with smaller functional distances and proximity to central buildings. Similarly, other studies such as Harlan et al. (2005), Fried (1982), Lewicka (2010b), and Bonaiuto et al., (1999) show that environmental desirability in terms of green spaces and low pollution have a positive effect on neighborhood attachment.

Therefore, it could be inferred that a proper design for local services and amenities and locating them within walkable distances and building pedestrian spaces of high quality with proper lighting, which bring about a sense of safety among the users, have improved the sense of place attachment among Ekbatan residents. Likewise, providing an enjoyable experience of walking in these pathways by building green spaces, increasing visual delightfulness, and regular cleaning has raised neighborhood attachment in the neighborhood. These are practical implications that could be used in preparing urban planning and design guidelines and checklists.

The results also give some insights into further research avenues. Future studies may examine the impact of walkability and each of its indicators on place attachment at a different spatial scale, for example, in the city range. Also, this study could be conducted in neighborhoods with lower levels of attachment to allow comparisons of findings in different levels of neighborhood attachment. Also, some researchers,

such as Félonneau (2004), counter-argue that people who are more attached to their neighborhood tend to perceive its physical characteristics as more pleasant. Accordingly, by designing and measuring objective indicators to evaluate neighborhood walkability, we obtain some evidence that could be contrasted with those of perception-based assessments.

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Ecological Knowledge on Medicinal Plant: A Study among the Vhogobania Community in Rural Bangladesh

By Sk Mashudur Rahman

Abstract- Basically the followers of Kortavaza religion, the Bhogobania community originated in the middle of the 18th century. This community is guided by core six principles and if the people follow these principles, need not visit the doctor. In any cases, if they go to doctor then the preceptor of this community imposes some fines. For this reason they have a lot of medicinal plant knowledge among them which they use these herbs for head to toe treatment. Basically following the participant observation method this article has been prepared. The study focuses a single community covered forty households highlighting their demographic profile, socio economic condition and medicinal plant knowledge. This article points out thirty eight types of diseases, symptoms and remedies suggested by various types of herbs. The World Health Organization (WHO) has declared that it is possible to turn traditional healing practices into modern scientific medicine. And to materialize this possibility, vast research is needed to be done in medically pluralistic society like Bangladesh. In this regard, the Bhogobanian's individuality concerning indigenous medicinal plant knowledge for curing disease can act as a great instance.

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Sk Mashudur Rahman

Abstract- Basically the followers of Kortavaza religion, the Bhogobania community originated in the middle of the 18th century. This community is guided by core six principles and if the people follow these principles, need not visit the doctor. In any cases, if they go to doctor then the preceptor of this community imposes some fines. For this reason they have a lot of medicinal plant knowledge among them which they use these herbs for head to toe treatment. Basically following the participant observation method this article has been prepared. The study focuses a single community covered forty households highlighting their demographic profile, socio economic condition and medicinal plant knowledge. This article points out thirty eight types of diseases, symptoms and remedies suggested by various types of herbs. The World Health Organization (WHO) has declared that it is possible to turn traditional healing practices into modern scientific medicine. And to materialize this possibility, vast research is needed to be done in medically pluralistic society like Bangladesh. In this regard, the Bhogobanian's individuality concerning indigenous medicinal plant knowledge for curing disease can act as a great instance.

I. Introduction

Among the ethnic minorities in Bangladesh, Bhogobania is a community known to few. If we trace the evolution of this community, we will see that it is a recently developed religion. Basically followers of *Kortavaza* religion, the *Bhogobanians* originated in the middle of the 18th century in a remote small village of Ghosh Para in Nadia district in India. Aul Chand, preached this religion. *Ramsarown Pal* was the first *Gurudev* (first preceptor) and his wife *Satima* was the first Guruma of this religion (Debendranath De, 1990). *Sibram Mohanto* was the first follower of *Kortavaza* religion in the village of *Zagolandkati* under *Jhikargacha* sub-district of Jessore district in Bangladesh. He spreads this religion to many districts in Bangladesh (Source: Orally Collected). The main dissimilarity between the *Kortavaza* and other religions is that the former believes in something, which possesses a structure or form and the preceptors are considered to the forms and so they are honored and respected by them and as a religious leader and the *Guru* is the most powerful person in this community. The people of this cult think that obeying the words of the *Guru* means, obeying and respecting God. *Guru*'s son usually becomes the next *Guru*, but the preceptor has the authority to select any person. Their house for worship is usually known as the *Kachari Ghar*.

A noticeable aspect of this community is that traditionally the *Vhogobanians* do not want to use any modern medicine. They feel proud of the fact that if they follow the basic principles of their community, they do not need any medicine to fit their body. They try their utmost to follow these principles. Six basic prohibitions prevail in this community false negotiation, abduction of another's wife, stealing, drug addiction and leaving immediately after a meal. In the past, taking medicine was totally prohibited. Still they use a very efficient folk medicine system. The preceptor for various diseases and problems usually gives folk medicinal plant. Many people from all nooks and corners of the vast society are using the folk treatment for many years and are getting cured. Particularly mentionable is their knowledge about the medicine used to cure smallpox, rabies, jaundice, encephalitis and rubella. For these reasons, the aim of the study is to focus their medicinal plant knowledge for curing the diseases. The purpose of the study is to know the ecological knowledge on medicinal plants as well as demographic and socio economic information among the *Vhogobania* community.

II. Materials and Method

a) Location

The research unfolds itself in *Chargram* in 2019. This village is situated in *Magura* union of Tala Thana under Satkhira district of Bangladesh. The river *Kopotakko (*almost death) flows by the Western Side of Tala Police Station. Crossing the river, the Bhogobania community is only two kilometers away on the Southwest of Tala Police Station. The Para is surrounded by three Muslim & Hindu Predominated villages namely Chargram, Baruipara & Dhulandagram. Cycle, Van etc. from the bridge between Chargram and Tala Police Station. It is a small community with an area of 24 acres. There are a few narrow muddy roads in this Para.

Author: Joint Director, BARD (Bangladesh Academy for Rural Development), Kotbari, Comilla.
e-mail: mashudur.rahmanbard@gmail.com

b) Data collection

Research methodology is an important factor in any kind of social research. There are several techniques of research. The study is designed by following the more recognized and more valued method-namely participant-observation. Participant-observation means "to grasp the native point of view, his relation to life, to realize his vision of his world (Malinowski, 1978: 25). Besides, this study has collected information by using questionnaires, and key informant interviewing. For conducting research this study spends more than three month among the Bhogobania community.

c) Data analysis

This descriptive research entails some quantitative data regarding their demographic and socio economic information. Data have been presented in various tables. Data have been analyzed and tabulated using Microsoft Excel. Depending on close and open ended question the descriptive part has been prepared.

III. Result and Discussion

a) Demographic Aspect

Chargram particularly the Bhogoania Para consist of 40 households with a total population of 213. This Para is again divided in to four Sub-Para namely KhaPara, BiswasPara, SheikhPara and Das Para. A Para is composed of a number of *Baris* (Households). Within a bari, the dwelling houses are further sub-divided into household. There are forty households in my experimental area. The basis of the subdivision of the bari into household is joint messing i,e, common kitchen.

Table 1: Distribution of households according to para

Para	Number of Households	Percentage
Kha Para	12	30.00
Biswas Para	8	20.00
Sheikh Para	18	45.00
Das Para	2	5.00
	40	100.00

Source: Field work in Bhogobania Community.

At the time of my study, the total households of vhogobania para were 40. And they live in four areas based on the decent groups and these are Kha para, Biswaspara, Sheikhpara and Daspara. In the past the first three paras belonged to the Muslim community and last one belongs to the Hindu community.

Table 2: Population according to sex

Category	Number	Percentage
Male	113	48.92
Female	118	51.08
Total	231	100.00

Source: Field work in Vhogobania Community.

During the study the total population of vhogobania in Chargram is 231 and out of them 48.92% are male and 51.08% are female. The age group distribution of the population is also shown below:

Table 3: Population according to age

Age group	Number	Percentage
0-10	56	24.24
11-20	48	20.78
21-30	49	21.21
31-40	40	17.31
41-50	16	6.94
51-60	7	3.03
61-70	10	4.32
71-80	3	1.29
81-90	2	0.88
	231	100.00

Source: Field work in Vhogobania Community.

The population of Bhogobania Para is relatively young. More than half of the population is below 20 and roughly one sixth are above 40 years. The rate of education in this Para is very satisfactory. About 140 persons are literate and 26 are illiterate. Total working population in the Para is about 163. Most of them are housewives, farmers and day labourer. There are only two persons who depend solely upon by folk healing for

livelihood. Among forty households, 38 are Muslims and only 2 are Hindu Bhogobanias under my research. The number of Hindu & Muslim religious followers in this community may be presented in the following table:

Table 4: Religion Category among the Vhogobania

Types	Number
Muslim Vhogobanians	180
Hindu Vhogobanians	11
	191

Source: Field work in Vhogobania Community.

b) Socio-economic condition

The Bhogobania community under my observation is situated just in a corner of Chargram. The dwellers, generally live in-groups. Like any other part of Bangladesh, the main resource of this Para is land. The land is mainly loamy and mixed with silt, which is very suitable for cultivating paddy, jute, bamboo and betel. Basing on the ownership of land the people of this Para can be classified into three kinds small, middle and rich farmers. Small farmers are those who possess from one decimal to 160 decimal of land.

Those who have from 6 to 15 *bighas* (1 *bighas*= 33 decimal) of land, belong to the middle, and those who own more than 15 *bighas* of land are recognized to be rich farmers. Of the forty families living in the Para under my experiment, 29 families belong to the small, 9 to the middle and 2 to the rich group.

Table 5: Category of Peasant

Classification	Land holding	No. of Household
Small	1 decimal to 150 decimal	29
Middle	151 decimal to 500 decimal	9
Rich	501 decimal to above	2
		40

Source: Field work in Vhogobania Community.

Professionally they depend on agriculture. Besides, sharecropper and working for others as laborers, the small farmers go afar for the work related to bamboo and *shola* (cutting the bamboo in to pieces). The middle farmers never work in others' land, and their condition is somehow, well off. And, the rich farmers get their work done, by day-labourers. Their condition is very good. Almost every family possesses a cow. They think that rearing cows is a very profitable job.

c) Vhogobanian's Knowledge of Common Diseases

A general belief among the Bhogobanians concerning diseases is that all the diseases may be the results of either the weather or the violation of any of the basic six codes. If the disease is a horrible one, the patient must see the preceptor immediately and if the disease is trivial one, the patient is permitted to take attempt to cure himself. Though these people are unable to give any scientific explanation of a disease, their local explanation is very interesting and they give the explanation very systematically. Their local knowledge related to various diseases is very intricately mixed with their religious beliefs. Though they have no education of the symptoms and causes of disease, ordinarily they know various bodily symptoms and they have given the symptoms various local names. More or less to the majority of people in Bangladesh also knows these names. However, the prescription, given by general public after recognizing the symptoms is really very wonderful. Among the forty families there is not a single one, which is unable to recognize a common disease and to give any effective treatments for curing the disease immediately. All must every medicine is collected from various ethno botanical plants. They claim that these medicines have no side effect and these may be used for curing any disease. In this contest, the quotation of S. K. Jain is remarkable. He mentions that, "some of the medical herbs are believed to cure practically every human disease from head to toe" *(S. K. Jain, 1994: 2).* The preceptor declares very forcefully that we are not supposed to face various common diseases so frequently: but now a day whatever we are eating is poisonous. He says that no crop is going to be product unless pesticides and chemical fertilizers are used and we are supposed to live on such crops. He also thinks that we are still alive only because we eat everything boiled. Many of this community try to grow different kinds of crops and vegetables by using bio-fertilizer (compost). They believe that they can be saved from various diseases if they eat foods produced in this way. So, now-a days many of this community think that, apart from the transgression of religious rules and regulations eating various crops, produced by using modern technology, is one of fundamental causes of various common diseases. In the past the nature of different diseases was not so complex and the number of common diseases was not so large. At present, the number of

common diseases has multiplied in a huge quantity. With the increase of the number of common diseases, they also have been taught many new methods of curing diseases by their male and female preceptors. So that before going to see the preceptor, they recognizing the disease themselves are able to take necessary steps against the disease. But if the disease is not healed in this way, it is taken for granted that it is consequence namely all the religious codes have not been acted upon properly.

Vhogobanian common perception is every thing comes as an outcome of either weather or negligence of religious order or prohibition. One should observe the religious rituals, rules and regulations correctly and orderly. A man is attacked by a disease if he avoids religious prohibitions. If affected one should stand before the preceptor with clothes round the neck and confess his sin. But when someone is attacked by a simple or common disease, he should as the preceptor permits, try to cure himself and if he fails, it is understood that the disease is the result of some great misdeeds.

Mentionable that there is an intimate relationship between the local ways of curing disease and ecology. In other words, for healing various diseases there have been created different local way of healing depending on certain specific herbs and plants growing respectively in respective areas. According to S. K. jain "the local names are some times very misleading causes of same local name being used for more than one herb are riot infrequent" (Ibid: 2). So, the name of those herbs and plants can differ according to time and space. However, the local concepts of various diseases as well as the processes for healing them are given below:

Table

Disease (Local name)	Symptoms			Remedies suggested by local people
1) Matha Kamrano (Headache) 2) Matha Batha (Headache)	1) Continuous pain in the head as if some insect is biting in the head. The pain may occur in a part of the body. 2) Sudden ache in the head which causes uneasiness.			1) The juice from the leaves of *Talakuchu is* to be drunk. If the pain is in a part, the Juice from the leaves of *Burlpan is* to be used over the head before sun rising. 2) An ordinary problem will be solved if the mixture of pure mustard oil and water is used on the head. But when the problem is a complex one- the patient has started meaning less talk- the knead, made of the leaves of *Ghorakhur, Bai-Dolon* and *Potka,* is used and kept on the head for some time. They even believe that these
3) Matha Zantrona (Headache)	3) Agony in the head which does not let the head to go up.			3) If juice, taken from Joba-flowers, is anointed over the patient's forehead, the agony in the head will vanish off within five minutes.
4) Paglami (Madness)	4) The patient talks wildly and can not sleep.			4) If the juice collected by crushing the roots of Dhudro-tree, is drunk, the feeling of madness will disappear. For sleeplessness the juice of potka-leaves is suggested to be drunk.
5) Soron sokti haras (Low emorizing power)	5) Memory is not able to remember something in the past. The patient becomes unmindful			5) In this case, to eat young stems of Kumurki *lota* with empty stomach regularly for some days, the brain will begin to be very cultured.
6) Chokotha (Trachoma)	6) Filth in the eyes which become reddish, unable to look at light at night.			6) Red husk of chandon-wood is applied to the eyes or sticky juice of *Akundo* tree to give the big toe. Or The patient should wipe his eyes with some soft clothes, which have to be soaked in the hot water with turmeric. Sometimes the cloth is kept on the eyes. As it is a contiguous disease, children
7) Chokpora and Jantrona kora (Burning and agonizing sensation in the eyes.)	7) The eyes don't see clearly. water comes frequently and a pain is felt.			7) Juice made of coriander-leaves, if used in the eyes, will make the eyes as cold as ice. Besides it will help to remain awake through out the whole night without the least discomfort.
8) Rat Kana (Night blind ness)	8) Can not see any thing at night.			8) If a glow-worm is pushed into a banana called Jeen Kola and then eaten, one will see at night, besides, this disease will vanish off, if oil make of a kind of fish called muilli, is boiled soundly and then drink one to three times.
9) Kankamrano (Ear-itch)	9) Itching in the ear with irritable uneasiness.			9) This sensation will vanish of if the ear is stretched with a young stem of Bonmoichsi-tree.

10) Kanpaka (Infection in the ear)	10) Ulcer in the ear: Sometimes there flows the yellowish-liquid (pug) from the ulcer.			10) Oil should be warmed by placing it in the "Ato of Ghatkol" and then used in the ear hole to cure it.
11) Nak dia-rokto para (Nose-bleeding)	11) It occurs suddenly or a blow may result in profuse bleeding.			11) If three bugs are crushed with fingers smelt, blood-flow through the nose-holes will stop. Besides, the problem will be solved if the patient smells that cow-dung which has just been discharged.
12) Sordi (Catarrh)	12) All the holes of nose and moth seem to be blocked, dizziness is in the head; the sound of voice may change; continuous sound is in the breast, mucus like water comes out of the nose and the mucus may be condensed.			12) For the children, a hand, warmed being placed over a lamp should massage pure mustard oil on the chest and throat of the child for an early cure. For the aged, a mixture of the through the nose, the juice from the Tulsi leaves should be mixed with salt and then drunk it.
13) Gola phola (Mumps)	13) The throat swells and pain and anguish are felt.			13) Fluid, derived from sytin tree, mixed with salt is used. Besides the pain in the throat will disappear if the organ is first massaged with the fluid from sara tree and then is sprinkled over with the mixture of water and salt.
14) Tonsil (Tonsilities)	14) Cough remains for one or two days. At the time of swallowing, pain is felt. There is feeling of hindrance in the throat.			14) Tonsil will be cured, if the black pepper (golemoris) is eaten.
15) Jar-Vat (Throat's disease)	15) There are two thin bones in the two sides of the throat, they are called 'Golfash'. When this organ swells there remains no chance for the patient to live. Any man may be attacked by this disease suddenly.			15) There is a tree called Jor-vat if the fruit or the flower or the trunk or the bark of this tree grinned with two and a half black pepper (Golemoris) is pushed into the mouth, the victim will be ok instantly. Sometimes the patient is unable to eat as he is senseless. In this case, the medicine will be place in cap of banana-lea and pushed as far as possible in to the mouth and to drive it farther to the stomach water will be used slowly. As soon as the juice reaches the bowel, the patient becomes all correct.
16) Sorir-a-batha (Pain in the body)	16) Pain in the whole body. The patient feels terribly when stands up, or sits down, or walks.			16) This sensation will vanish off if the man stands for sometime in sun light with body massage with oil. Or A leaf of Dhodru tree sunned warmed, and anointed with oil. Then the leaf will be placed on the pain producing part of the body and moved to and fro slowly in order to get rid of the pain.
17) Angul Phola (Swell finger)	17) The swell-finger causes terrible agony. It becomes difficult for the patient to survive.			17) The infected finger will come its normal stage if it is pushed and kept in the hole made in the root of arum (kochri tree)
18) Kata-sara (cut and scratch)	18) A cut may cause an ulcer and pain which may ultimately result in permanent spot.			18) If the bruise is a small one, generally the grinned leaves of Lanka berry or marigold flower is enough to stop the blood flow. But when the cut is a big or long one, they claim that if the separated two skins are pressed to each other and crushed leaves of Buch tree is placed on the bruise for a while it would be hard to distinguish the bruise. Besides to guard the possibility of tetanus resulted by the bruise, they eat raw turmeric with granular-plum-molasses. Some times only the juice of raw turmeric is drunk. If it is not available, a fixed quantity of the juice derived from the Durba-grass will be enough to protect tetanus.
19) Fora or Sar (Abscess)	19) Swollen part of the body in which a thick yellowish liquid has collected.			19) Rubbing crushed leaves or fruit form Ata tree can prevent the rising of an abscess. But if the abscess has, already appeared, the kneaded mixture of burned soil and unboiled milk rubbed over the spot will help, it to ripe and finally to come to an end.
20) Angul Sani (Finger ulcer)	20) An ulcer on a side of a finger which slowly become wider and wider and goes up to the bone.			20) Coal made by burning wild hog plum and mixed with pure-oil should be used two to three times to make the patient cured.
21) Kunock (Toe's disease)	21) It is found at the corner of a finger both of hands and legs. It cause pain.			21) A creeper called pui-shak should be dried and then burnt to collect its ash. If this ash is mixed

				with 2 to 3 drops of oil and used, the problem will be solved.
22) Bagi (On kind of swelling)	22) It causes terrible agony and the existence itself is threatened.			22) The bagi will tanned if leaves of shimul tree and lentil are first drenched with the water of hookah and then used on the Bagi. If it fails to create a mouth of the Bagi, the excrement of pigeon should be used.
23) Creime-a-r-fit (Fit of crime)	23) The infected child throws its legs and arms so wildly, it seems the child will die at any moment.			23) The problem will be solved instantly, if some date molasses used with a finger in the child's mouth And to protect the child from future attack, the wood of silk-cotton tree (shimul gus) should be cut into pieces and binded round the neck or arms of the child.
24) Jhor (fever)	24) Temperature rises and the patient may become delirious.			24) The mixed juice of pith within the stem of pine-apple and the branch of bamboo tree should be drunk.
25) Patla phikhana (Diarrhea)	25) Waste mattes is emptied from the bowels again and again and the patient becomes very weak.			25) The juice of the roots from the eastern part of a Tulshi-tree is to be drunk. or Complex grinned mixture of leaves and bark from black berry and wild hog-plum, of bark from sweet mango and margosa tree, of leaves from .... tree, of a kind of banana (thota kola) of sunned rice and of coriander seed, if eaten will cure diarrhea instantly. or Diarrhea will be controlled if the juice of crushed leaves of wild hog. Plum is mixed with a little salt and eaten in perfect quantity. If evacuation is stopped for four or five days the patient is suggested to drink the juice of pumpkin-leaves.
26) Amasa and Rokto Amasa (Dysentery and Blood-Dysentery)	26) Great urging for toilet with little success, mucus comes out with blood and terrible pain in the belly after using latrine.			26) If attacked by blood dysentery the victim should eat the mixture of salt and the leaves of the pomegranate tree roasted in ghee. Or Juice Collected from the aerial roots of a, banyan tree is very useful for blood dysentery. Or It is said that if one can eat seven or eight round snail (gole shamuk) by cooking one will get rid of chronic dysentery forever. And for blood dysentery the patient is prescribed to drink the juice made of leaves of silk cotton tree (Shimul gus)
27) Pat batha (pain in the belly/stomach)	27) Terrible pain is felt in the belly.			27) If some mustard seed mixed with sunned rice and salt is crushed with teeth and swallowed with water, the pain will gradually decrease.
28) Pat phapha (Flatulence)	28) The belly conceives the size of a football bladders and there produces a sound tok, tok (murmuring sound) when the belly is truck by the finger.			28) If the stomach swells, the juice pathor kuchi leaves should be eaten.
29) Gas (belly related disease)	29) Swelling belly, Occurrence of belches problems with the digestion, a burning sensation in the throat and the breast.			29) The patient will get rid of it, some days, if he eats pills made of leaves from such the jujube tree (kul gud) which is yet to bear any fruit and flowers form Shajna (one kind of tree) regularly. Besides a mixture of half tola juice of roots and leaves from Buch tree and half tola mustard oil will cure the patient.
30) Pat-pira (Diseases of the stomach)	30) Stomach-pain, indigestion and flatulence.			30) Every kind of stomach disease will disappear, if juice make of leaves from wild hog-apple (bunoamra gus) is drunk in suggested quantity.
31) Rokta Salpota (Anemia)	31) Redishness disappears from the lower part of the eye. The whole body becomes pate.			31) If soup of small-fish and the dish of the leaves of tamarind and Thankuri with kai or shingh fish are eaten, the disease will be cured.
32) Drubolota (Weakness)	32) The body becomes weak for semen-destruction. Dizziness in the head is felt. Besides going latrine not in time and lack of sufficient sleep may cause weakness.			32) Hortoki, Amloki, Bohera, Chirota and indrojal should mixed and crushed and kept in a glass-jar, with water. Then the patient is suggested to mix some juice form the jar with sugar and eat with empty stomach in the morning for seven days. The health will be sound, the feeling of

				weakness will disappear, he will have sound sleep and there will be no problem with evacuation.
33) Pakostholi-go ram howea (Heated stomach)	33) When the bille is heated there come out jill (small stone) and saliva in the mouth.			33) Very green coconut is to be cut and its young case preserved in a water pot. Then the case will be eaten with the water in which it was kept. It this way eating two or three cases will make the stomach cool and there will be no problem.
34) Dhatusto rogh (Seminal disease)	34) Always the feeling of tiredness, giddiness in the head, fever, afternoon burning in the eyes as the result of rising temperature.			34) If two out of the eight fibers collected from a Nara-Saja Tree's branch, are mixed with sugar and eaten, the disease will be cured.
35) 35) Bhouo Mutro (Diabetes)	35) Frequently urination! It seems that the body has no power.			35) One can get rid of this disease, if one eats three or four young stems of a kind of creeper called Kumruki lata with sugar.
36) Bassader nari barhowea (Children's tubular organ comes out)	36) Sometimes, at the time of evacuation, some tubular organ comes out of the children's bowls.			36) A round snail (gole shamuk) should be broken and bundled with a cloth. Then the bundle should be warned by placing it over burning husk so as to sear. After the searing being started the child's tubular organ will slowly begin to push back.
37) Pox	37) Feeling fever, blisters on the skin which, if destroyed cause permanent black marks and the body becomes seriously weak.			37) The juice of the Aut-Shuti leaves should be drunk.
38) Jokka(Tuberculosis or TB)	38) A lot of cough, blood with cough, expels plenty of phlegm.			38) It is a contiguous (soyachi) disease. The patient should lie on the leaves of Nim. None but the specific one should go near the patient. And the specific one must take steps of prevention.

Source: Field work in Vhogobania Community.

IV. Conclusion

Health is the root of all happiness. In order to preserve sound health, there exists, from ancient time different traditional systems in different communities in all the countries of this world. But this indigenous health Knowledge, because of modern medical systems and its success, has reached the threshold of extinction. While analyzing the different sides of medicinal plants and its uses prevailing in one of the Paras of the Vhogobania community, I began to the belief that all the ccncepts of various diseases are constructed by society, because these concepts differ according to time and space. To the Vhogobanians, health means mainly spiritual health for they believe in an ever-existing link between supernatural power and various diseases and their prevention. Besides, in order to maintain physical health they possess vast knowledge of the usefulness of folk herbs as well as different religion-based health related rules. If as John Locke states, a sound mind in a sound body, the practices which exist in the Bhogobanians to protect both body and mind sound, are worthy of praise. But it is observed that it will be hard for their own identity concerning health to last long because of the influence of larger society, and it is probable that in near future the Bhogobanians will stand in the same line with other communities and it may be said also that the process has already been started well. Recently World Health Organization (WHO) has declared that it is possible to turn traditional healing practices into modern scientific medicine. And to materialize this possibility, vast research is needed to be done in medically pluralistic society like Bangladesh. In this regard, the Bhogobanian's individuality concerning indigenous health management systems can act as a great instance.

Anthropology or an anthropologist believes that it is necessary to study every culture separately. In spite of my extreme devotion and real sincerity, perhaps I failed to maintain all, the time of my work, the priority of scientific mentality and impartial point of view, which was expected for such research. But I am sure that there was no lacking in maintaining the fundamental rules. I am very hopeful that by providing very essential primary data and Information, my little work will be able to help any further research work

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Self-Concept and Post Retirement Adjustment of Public Servants in Akwa Ibom State

By Dr. Nenty J. Nenty & Okopideh, Nsisong Edikan
Obong University

Abstract- This study of self-concept of retired public servants in Akwa Ibom State on their post-retirement adjustment used 299 subjects. A 34 item Retired Public Servants Opinion Questionnaire (REPSOQ) was used to elicit information on retirees' feelings on self-concept and their post-retirement satisfaction of health, social, emotional, and economic indices. A null hypothesis of no significant influence of self-concept on post-retirement adjustment of public servants was put to test using analysis of variance (ANOVA) at 0.05 significance level, 2 and, 296 df. The result showed no significant influence of self-concept on post-retirement health, emotional, and economical but momentous influence on social adjustment of public servants. Retirees without resources live unsatisfactory lives and are traumatized as the unemployed. Low self-concept promotes a sense of worthlessness; which impacts the retirees' mental state causing depression. The suggestion was made for informal social activities with others to provide role support to promote positive self-concept and retirees' satisfaction.

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Self-Concept and Post Retirement Adjustment of Public Servants in Akwa Ibom State

Dr. Nenty J. Nenty [α] & Okopideh, Nsisong Edikan [σ]

Abstract- This study of self-concept of retired public servants in Akwa Ibom State on their post-retirement adjustment used 299 subjects. A 34 item Retired Public Servants Opinion Questionnaire (REPSOQ) was used to elicit information on retirees' feelings on self-concept and their post-retirement satisfaction of health, social, emotional, and economic indices. A null hypothesis of no significant influence of self-concept on post-retirement adjustment of public servants was put to test using analysis of variance (ANOVA) at 0.05 significance level, 2 and, 296 df. The result showed no significant influence of self-concept on post-retirement health, emotional, and economical but momentous influence on social adjustment of public servants. Retirees without resources live unsatisfactory lives and are traumatized as the unemployed. Low self-concept promotes a sense of worthlessness; which impacts the retirees' mental state causing depression. The suggestion was made for informal social activities with others to provide role support to promote positive self-concept and retirees' satisfaction.

I. Introduction

All over the world, people work to earn a living, either for themselves in private capacities or for established organizations. The unemployed housewives work from morning till bedtime and until they are too old to continue but were not paid for their services. At a certain age, people have to retire, sometimes with retirement benefits.

The way people related to their jobs, how they expect retirement, how they feel about leaving their jobs, and how they prepared for such exit are all a function of the relationship between people and their occupations. Sociologists maintain that since work is central in the lives of people, the loss of employment in retirement means leaving one's means and sense of being. Some jobs do not pay enough to feed the holder and his family while others pay a sufficient amount for holders to live on, take leisure trips, and engage in business investment. Some jobs are pensionable and stable, while others are temporary and non-pensionable. How one feels about his occupation influences his prospect in retirement. Jobs that allow for more autonomy, self-directedness, intellectual flexibility, and sociability, prepare people better for retirement, (Kohn and Schooler (1993). Emphasis on the effect of from work and severing of relationship from the job and working colleagues. Though humanly threatening because it seems an imposition on labour freedom, retirement is a deserved phase for workers. It is a vital step when declining health, age-related infirmities, compulsory retirement regulations, or all of these combined to place an embargo on a worker's relevance in labour set up. Satisfaction and adjustment to retirement depend on several factors, although several of these are predictors of contentment for everybody. These are health, finance, and purpose in life, having a robust interest in education and social class, voluntary and planned retirement, and marital status of retired persons.

The stark reality is that, in a third world country like Nigeria, where the economy is grossly mismanaged for more than three decades, the general salary structure is meagre; and the period of retirement is welcome by a feeling of economic deprivation and frustration.

These have effects on the families of the retired people and their communities. Despite palliative steps taken in 1998 and 1999 by Generals Abubakar and Obasanjo administrations to review pensions of the retired, the training and orientation of staff due for retirement by the army, police, and related parastatals, there still exists an atmosphere of uncertainty and loss around those who retire.

Even then, those who retire strong and healthy were highly paid and had accumulated resources, are busy with activities in social organizations still find it difficult to adjust. Based on this observation, our attention was focused on the personality trait of self–concept, to determine its influence on the degree of retired person's adjustment satisfaction.

a) Explanation of Terms

i. *Self-concept*

One's evaluation of himself, his image, as distinct from what others think of him, is self-concept. It could be positive or negative, depending on the individual. The human self develops through self-actualization, self-maintenance, self-enhancement, and experience based on his environment. The influence of the culture of the environment plays an key role in one's personality. The concept of self fits together with the experiences of the organism. One's first mode of adjustment in the interpersonal ground is the superannuation tends to be positioned on separation

Author α: Ph.D Edu. Psy., M.Ed, Guidance & Counselling, B.Sc. Geography, Faculty of Management and Social Sciences, Obong University, Obong Ntak, Akwa Ibom State.
e-mail: nejonenty@gmail.com
Author σ: M.Ed., B.Sc. Nursing Science.

reorganization of the field minus the ego. Pursuing projects for successes but avoiding failures in daily endeavours is to push for attainment of positive self-concept (image). By removing the concept, the individual has of self, reorganization results, and psychological adjustment takes place. Taking initiative steps in one's own affairs gives the person a sense of worth.

ii. *Adjustment*

Adjustment is the process or ability to move flexibly from one level or condition or situation to another level without significant manifestation of positive/negative stress effect.

In the literature of gerontology, an adjustment has a lot to do with health, social, emotional, and economic conditions. Any retired public servant that is capable of fine-tuning on these indices can live an optimistic life at retirement. However, modification on the above four (4) indices cannot manifest on the same level at some fixed time; fluctuation between high, moderate, and low is incessant.

iii. *Retirement*

Retirement is used herein as disengagement from active service by public servants. One is due for retirement at the age of 60 years (in the civil service), or due to declining health (deterioration of psychomotor performance) or at meeting obligatory regulatory conditions or all of the above combined.

In fluid and well-managed economies, the labour market is mobile and dynamic, making it easy for people to retire at any time from one job to join another without loss of benefit. In Nigeria, even at 60-70 years, retirement remains disturbing to workers.

iv. *Public servants*

In the context used here, public servants would include all retired civil servants in and from state and federal ministries, government and public parastatals and companies, federal and state universities, corporations, Nigeria Airways, Sea Ports, etc. those from other parts of the federation, who worked in Akwa Ibom State, retired here but found the place peaceful to settle in were all included in the study.

v. *Akwa Ibom State*

Akwa Ibom State was created in 1987, September 23. It has a total area of 7.08 square kilometres in landmass, and is located between latitudes $4^{o}23^{1}$ and $5^{o}33^{1}$ north of the Equator and longitudes $7^{o}25^{1}$ and $8^{o}25^{1}$ east of the Greenwich meridian. It has Abia, Cross River, and Rivers States as boundaries in the North and West, East and South-West respectively, and the Atlantic Ocean by the South. Its major ethnic groups are Ibibio, Annang, and Oron, which make up a population of 5,450, 758 million. The state has nineteen ministries, two non-ministerial departments, seventeen tertiary institutions. The state capital is Uyo, and the governor is Don Udom Gabriel Emmanuel.

b) Statement of Problem

When public servants retire, they face grave challenges in adjusting to life in retirement. The challenges they face include, transition into a new and harsh environment that has no sympathy for their plight, declining finances, a threatening new lifestyle, boredom, and delay in the payment of their severance packages. These give life to accompanying problems like children dropping out from school because of fees, piled up house rent and threat of ejection by landlords; health challenges, and demands for drugs. Frustration often results in a sharp change in behaviour (reliance on drug-alcohol), quarrels, and seclusion (withdrawal).

Despite spirited efforts by few (not all) state governments to pay gratuity and pension to retirees, long delays in payment, of one to four years, have resulted in many deaths among them. In Akwa Ibom State, of recent, the fate of the retired is conservatively speaking pathetic. The exploitation they suffer in the hands of the pension office staff is another case. The new Police Pension Fund scandal involving the diversion of N32.8billions meant for pensioners is a tip of the iceberg of what confronts them (Oluokun and Utomnwen (2012). However, some workers from affluent oil companies and senior federal civil servants with accumulated resources at retirement still find it hard to adjust well at retirement. It, therefore, means to retire and regulate satisfactorily entails more than just resources (money). This observation prompted the study if self-concept has any influence on the retired person's degree of positive adjustment.

c) Purpose of the Study

This study was carried out to determine the influence of self-concept as an aspect of personality trait on post-retirement adjustment of workers in Akwa Ibom State.

II. Review of Related Literature

Self-concept, as a trait, is used in this study to mean how one evaluates himself. It was posited by Mead (2004) to be a product of evaluation of the self through one's perception of social experiences, which is key to human development. The process of socialization involves interaction, the significance of support, and the individual's interpretation of the message received from others. The impression is that people develop self-concept and become able to anticipate, evaluate, and consciously experience their behaviour. In relation to others, the understanding of their expectations, knowing their desires, and feelings is important. Cooley's (1989) concept of the looking glass self systematically explains the origin and nature of self-concept in three elements: our imagination or image of how we appear to others, and reflection of others' judgment of such appearance and some self-feeling about that judgment, such as pride or shame that others see us in that way. It is

through this that we accumulate a set of beliefs and evaluations about ourselves and about whom and what we are and what that means in our society. An essential quality of self-concept is that it is subjective, as it makes possible a forecast that creates the condition for their fulfilment, the first kind we bring on ourselves and the second others impose on us. The society is internalized in the self-concept through culture, hence, people's instincts can be marginally, or modified by the society's influence. The personality and society are reflective rather than one determining the other though there are selves devoid of the social order and no people is devoid of identities.

Rogers (1952) had theorized that the self develops through self-actualization, self-maintenance, self-enhancement, and experience based on phenomenological field and congruence. Behaviour of a person is determined by these immediate perceptual changes. To Rogers, the behaviour is not directly influenced or determined by organic or cultural factors but primarily by the perception of these elements; meaning that the most significant element in determining behaviour is in the perceptual field of the individual. When the composite ways through which the individual perceives qualities, abilities, impulse, the attitude of the person, and all perceptions of the person about others are accepted into the society's organized conscious concept of the self, there is a feeling of comfort and freedom from tension which is experienced as psycho adjustment. McCandless and Trotter (1997) reported in their study of 300 subjects on self-concept and level of anxiety that people with high general self-concept are less anxious, very useful in group interaction, and more confident in them than those with low self-concept. They also found a relationship between low self-concept and an increased level of anxiety. They concluded that nervousness has a lot of impact on one's self-concept. An increased state of anxiety produces negative self-concept. Generally, they posited that a negative self-concept denotes a lack of confidence in facing and mastering the environment, which would be related to the individual's performances in life. Ekpe (1988) in his study used 278 employed men and women and 150 unemployed men and women to find out the effect of unemployment on the aspirations, motivations, self-concept, locus of control, and anomie among job seekers in Cross River State, Nigeria. His finding on self-concept was no significant difference between the employed and the unemployed. There was no significant relation between unemployed and self-concept. However, Umana's (1989) study on self-concept and unemployed people found that those gainfully employed tended to have a higher social self-concept than the unemployed. By implication, those who have retired, especially without resources to enable them to live suitable lives, are as traumatized as the unemployed, if not more, since they now cannot meet their societal obligation as before. They feel inadequate and empty. Their self-concept diminishes, which promotes a sense of worthlessness that impinges on the mental health of the retired persons.

The adjustment between retirement and leisure, according to Stone (2006), is often a negative process as others look at themselves as unproductive. They feel bored and unhappy. This attitude can be detrimental to life satisfaction and perception of well-being. The belief is that adult participation in continuing education can really improve quality of life (Perlmutter and Hall, 1992). Self-perception is an imperative determinant of life satisfaction and is assumed to have four dimensions – wellbeing, activity, individuality, and sociability).

Wellbeing and life satisfaction among the retired has been studied as it relates to Abraham Maslow's model of the hierarchy of human needs. Wyne and Groves (1995) believe that as a result of the changes in responsibilities and increased available time, the retirement years can either be very fulfilling and enriching or painful and unsatisfying.

III. Method of Study

The population of the study was retired public servants in the Akwa Ibom State of Nigeria, made up of three senatorial districts and thirty-one local government councils. The language of public servants used in the study entails all civil servants proper and those who worked in government parastatals and companies. The accidental sampling technique was applied by giving the questionnaires to those found on the spot during the payment of monthly pension, and others who volunteered to participate in the study. A total of 299 retired public servants made up of 214 males, and 85 females were interviewed. Items from an earlier Self Scoring Personality Inventory Schedule by Serebriakoff (1999) were adopted, patterned to taste in addition to new ones and used. A 34 item questionnaire was structured in line with the Retired Public Servant Opinion Questionnaire (REPSOQ) that extracted information on the retired person's feelings on self-concept (social, physical, family, moral) and their post-retirement satisfaction of the health, social, emotional and economic indices. The questionnaire was pilot tested on 100 retired persons in two local government councils from 2 senatorial districts of the three used. The split-half reliability estimate ranged from 0.79 to 0.92. Those Local Government Areas and respondents involved in the pilot study were no longer interviewed in this study.

IV. Data Analysis and Results

The data collected for the study were subjected to statistical analysis using the analysis of variance (ANOVA). As presented in table 1, the result showed that the calculated F-ratio of 2.073, 82, and 1,105 for the influence of self-concept on retired public servants

health, emotional and economic adjustments are respectively lower than the critical F-ratio of 3.00 at 0.05 level of significance with 2 and 296 degrees of freedom. But the calculated F-ratio of 14,862 for social adjustment is larger than the critical F-ratio of 3.00 needed for significance with 2 and 296 degrees of freedom, meaning that there is no significant influence of self-concept on post-retirement health, emotional, and economic adjustments of retired public servants. However, there is a substantial influence of self-concept on post-retirement social amendment of retired civil servants. The null hypothesis that there is no significant influence of self-concept of (high, moderate, low) on their post-retirement health, emotional and economic adjustment is upheld at 0.05 level of significance with 2 and 296 degrees of freedom but was rejected for social change.

A Post ad-hoc Test using the Fishers' Least Significance Difference (LSD) was conducted to find out how the retired public servants faired in terms of social modification. The result presented in Table 2 shows that retired public servants with moderate self-concept have significantly lower social adjustment than their counterparts with low and high self-concept. However, retired government workers with low and high self-concept do not ominously differ in their social modification.

Table 1: Analysis of variance (ANOVA) showing the influence of self-concept on post-retirement adjustment

Health	Low	92	17.32	3.19
	Moderate	153	17.20	2.58
	High	54	18.09	2.79
	Total	.299	17.39	2.83
Social	Low	92	20.36	3.43
	Moderate	153	18.51	2.38
	High	54	20.20	2.96
	Total	.299	19.38	2.97
Emotional	Low	92	20.61	2.69
	Moderate	153	20.77	3.03
	High	54	20.19	2.83
	Total	.299	20.62	2.89
Economic	Low	92	20.28	2.60
	Moderate	153	19.75	2.69
	High	54	19.87	3.06
	Total	.299	19.94	2.73

Adjustment	Source of variance	Ss	df	ms	F
Health	between group	32.918	2	16.450	2.073
Within-group	2350.513 296 8.533				
	Total	2383.431	296		
Social	between group	240.612	2	20.306	
	Within group	2396.153	296	8.095	14.862*
	Total	2636.769	296		
Emotional	between group	13.715	2	6.857	82
Within-group	2475.055 296 8.362				
	Total	2488.769	296		
Economic	between group	16.486	2	8.243	
	Within group	2207.307	296	7.457	1.105
	Total	223.793	296		

Significant at 0.05 level, df = 2.296, F=3.00

Table 2: Fishers LSD test of the influence of self-concept on post-retirement social adjustment of the public servant

Self Concept	Low	Moderate	High
Low	20.36*	1.849*	55
Moderate	4.93*	18.51	1.694
High	0.32	4.28*	

a. Group means is along the diagonal
b. Differences between the mean are above the diagonal
c. Fishers' LSD t value is below the diagonal
d. Significant at 0.05 level, df = 296; t = 1.96

a) Discussion of finding

The study found no significant influence of self-concept on post-retirement (health, emotional and economic) adjustment of public servants but a substantial influence of self-concept on post-retirement social adjustment of civil servants, and those of them with high and low self-concept, there was no influence of self-concept on their adjustment satisfaction on three indices of health, emotional and economic. Those who manifested moderate self-concept, the study revealed, had a significantly lower social adjustment compared to those who had high and low self-concept. They did not also differ in their level of social regulation. Self-concept affecting post-retirement seems usual though in this case, it is those with a moderate self-concept that manifested this satisfaction. It is predictable that those with high self-concept should display a high level of adjustment on the four indices used; those with moderate self-concept would have followed, while those with low self-concept would exhibit little level of alteration. The finding is peculiar, Umana's study (1988) where unemployed people have lower social self-concept than those who are employed, seems to state the obvious. Ekpe (1988) found no significant difference in self-concept between the employed and the unemployed. Tennessee's (1985) findings equally differ from this finding in that an individual with high self-concept responded positively to treatment compared to those with low self-concept, and those with great self-concept are elders in the study group, who depict signs of positive perception of their state than the low self-concept ones. There is a positive relationship here. McCandless and Trotter (1997) concluded that people with low self-concept related to behaviour manifested in many areas of self-endeavours which include self-discipline.

One is tempted to attribute moderate self-concept to the low level of adjustment because of the way our retired persons are treated at or after retirement. They are abandoned properties that are no more useful in the scheme of things even in their family circles when they retired. This type of impression can make retired people feel socially unwanted and manifest poor adjustment. Umana (1988) averred that those who are out of job, and without resources to keep them alive to live a sustainable live, are traumatized as the unemployed. Their self-concept falls to the lowest level, thus promoting a sense of worthlessness, which impinges on their mental state; leading to a state of depression. As a way out, Longino and Kart (1992) suggested that informal social activity with intimate ones could provide the role support that reaffirms self-concept and contribute to late-life satisfaction, than either formal or solitary activity. Formal or informal activity is what should be encouraged among our retired people.

V. Conclusion

The no significant influence of self-concept (high, moderate, low) of retired public servants (RPS) on their post-retirement (PR) health, emotional and economic adjustment is surprising and revealing. The expectation was that self-concept (SC) would affect the RPS satisfaction (health and emotion) in that RPS with high and moderate (positive) self-concept (SC) should adjust well in health and emotion-wise. Still then other variables (resources) do promote positive adjustment. If money is robust in the promotion of positive adjustment satisfaction, it means one's level of self-concept has a little significant effect on modification, because one's view of self is too abstract to impact a cure of illness at old age. The same applies to one's state of emotion. Thinking influences health, but one's uncertain condition at retirement demands survival before any other need is satisfied. The retiree concept of himself and that of others would not change his/her circumstance. Faith may not work miracles here. Resigning to fate equally will not. Reality will, so is the impression that SC has no significant influence on RPS in terms of health, emotion, and economic indices.

SC influences achievement. Proper adjustment of the individual promotes mental health. Education and personality theorists attest that high SC is associated with high performance and positive disposition while low or negative SC is related to misbehaviour and acquired indiscipline or deviance. Relations and counsellors should be ready to help retirees who have developed low self-concept, through the introduction of positive life experiences and models to enable them to adjust.

a) Recommendation

i. In the course of collecting data from retired persons, we gathered retirees suffer a lot of abuses from various people in the course of collecting their gratuity. The government should arrange for retirees to receive their retirement benefits promptly, and devoid of exploitation, and molestations.

ii. There is a need for the government to establish the elderly counselling194 unit in all council headquarters where the retired would receive free counselling services on health, emotional and socio-cultural challenges.

iii. Most challenges the retired people face are government generated. Pension officers should acquit themselves as humane and honest in handling retiree cases. Defaulters that exploit or ask for bribe should be sanctioned.

iv. Nigerian government and public office holders should not treat retirees as second class citizens whether in offices, banks, health posts, etc., which demeans their self-concept and impacts on their health. Retired peoples deserve respect, preferential treatment, and mercy wherever they are found.

v. By labour laws, and in-keeping with the economic downturn ravaging the world, the pensions of retirees should be periodically reviewed upwards, and at other times when there is minimum wage review in the country. With the introduction of the current thirty thousand naira minimum wage in Nigeria, pensioner's stipend should equally be reviewed upward.

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We accept the manuscript submissions in any standard (generic) format.

We typeset manuscripts using advanced typesetting tools like Adobe In Design, CorelDraw, TeXnicCenter, and TeXStudio. We usually recommend authors submit their research using any standard format they are comfortable with, and let Global Journals do the rest.

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7. Manuscript submitted *must not have been submitted or published elsewhere* and all authors must be aware of the submission.

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Acknowledgments

Contributors to the research other than authors credited should be mentioned in Acknowledgments. The source of funding for the research can be included. Suppliers of resources may be mentioned along with their addresses.

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Authors can submit papers and articles in an acceptable file format: MS Word (doc, docx), LaTeX (.tex, .zip or .rar including all of your files), Adobe PDF (.pdf), rich text format (.rtf), simple text document (.txt), Open Document Text (.odt), and Apple Pages (.pages). Our professional layout editors will format the entire paper according to our official guidelines. This is one of the highlights of publishing with Global Journals—authors should not be concerned about the formatting of their paper. Global Journals accepts articles and manuscripts in every major language, be it Spanish, Chinese, Japanese, Portuguese, Russian, French, German, Dutch, Italian, Greek, or any other national language, but the title, subtitle, and abstract should be in English. This will facilitate indexing and the pre-peer review process.

The following is the official style and template developed for publication of a research paper. Authors are not required to follow this style during the submission of the paper. It is just for reference purposes.

Manuscript Style Instruction (Optional)

- Microsoft Word Document Setting Instructions.
- Font type of all text should be Swis721 Lt BT.
- Page size: 8.27" x 11'", left margin: 0.65, right margin: 0.65, bottom margin: 0.75.
- Paper title should be in one column of font size 24.
- Author name in font size of 11 in one column.
- Abstract: font size 9 with the word "Abstract" in bold italics.
- Main text: font size 10 with two justified columns.
- Two columns with equal column width of 3.38 and spacing of 0.2.
- First character must be three lines drop-capped.
- The paragraph before spacing of 1 pt and after of 0 pt.
- Line spacing of 1 pt.
- Large images must be in one column.
- The names of first main headings (Heading 1) must be in Roman font, capital letters, and font size of 10.
- The names of second main headings (Heading 2) must not include numbers and must be in italics with a font size of 10.

Structure and Format of Manuscript

The recommended size of an original research paper is under 15,000 words and review papers under 7,000 words. Research articles should be less than 10,000 words. Research papers are usually longer than review papers. Review papers are reports of significant research (typically less than 7,000 words, including tables, figures, and references)

A research paper must include:

a) A title which should be relevant to the theme of the paper.
b) A summary, known as an abstract (less than 150 words), containing the major results and conclusions.
c) Up to 10 keywords that precisely identify the paper's subject, purpose, and focus.
d) An introduction, giving fundamental background objectives.
e) Resources and techniques with sufficient complete experimental details (wherever possible by reference) to permit repetition, sources of information must be given, and numerical methods must be specified by reference.
f) Results which should be presented concisely by well-designed tables and figures.
g) Suitable statistical data should also be given.
h) All data must have been gathered with attention to numerical detail in the planning stage.

Design has been recognized to be essential to experiments for a considerable time, and the editor has decided that any paper that appears not to have adequate numerical treatments of the data will be returned unrefereed.

i) Discussion should cover implications and consequences and not just recapitulate the results; conclusions should also be summarized.
j) There should be brief acknowledgments.
k) There ought to be references in the conventional format. Global Journals recommends APA format.

Authors should carefully consider the preparation of papers to ensure that they communicate effectively. Papers are much more likely to be accepted if they are carefully designed and laid out, contain few or no errors, are summarizing, and follow instructions. They will also be published with much fewer delays than those that require much technical and editorial correction.

The Editorial Board reserves the right to make literary corrections and suggestions to improve brevity.

Format Structure

It is necessary that authors take care in submitting a manuscript that is written in simple language and adheres to published guidelines.

All manuscripts submitted to Global Journals should include:

Title

The title page must carry an informative title that reflects the content, a running title (less than 45 characters together with spaces), names of the authors and co-authors, and the place(s) where the work was carried out.

Author details

The full postal address of any related author(s) must be specified.

Abstract

The abstract is the foundation of the research paper. It should be clear and concise and must contain the objective of the paper and inferences drawn. It is advised to not include big mathematical equations or complicated jargon.

Many researchers searching for information online will use search engines such as Google, Yahoo or others. By optimizing your paper for search engines, you will amplify the chance of someone finding it. In turn, this will make it more likely to be viewed and cited in further works. Global Journals has compiled these guidelines to facilitate you to maximize the web-friendliness of the most public part of your paper.

Keywords

A major lynchpin of research work for the writing of research papers is the keyword search, which one will employ to find both library and internet resources. Up to eleven keywords or very brief phrases have to be given to help data retrieval, mining, and indexing.

One must be persistent and creative in using keywords. An effective keyword search requires a strategy: planning of a list of possible keywords and phrases to try.

Choice of the main keywords is the first tool of writing a research paper. Research paper writing is an art. Keyword search should be as strategic as possible.

One should start brainstorming lists of potential keywords before even beginning searching. Think about the most important concepts related to research work. Ask, “What words would a source have to include to be truly valuable in a research paper?” Then consider synonyms for the important words.

It may take the discovery of only one important paper to steer in the right keyword direction because, in most databases, the keywords under which a research paper is abstracted are listed with the paper.

Numerical Methods

Numerical methods used should be transparent and, where appropriate, supported by references.

Abbreviations

Authors must list all the abbreviations used in the paper at the end of the paper or in a separate table before using them.

Formulas and equations

Authors are advised to submit any mathematical equation using either MathJax, KaTeX, or LaTeX, or in a very high-quality image.

Tables, Figures, and Figure Legends

Tables: Tables should be cautiously designed, uncrowned, and include only essential data. Each must have an Arabic number, e.g., Table 4, a self-explanatory caption, and be on a separate sheet. Authors must submit tables in an editable format and not as images. References to these tables (if any) must be mentioned accurately.

Figures

Figures are supposed to be submitted as separate files. Always include a citation in the text for each figure using Arabic numbers, e.g., Fig. 4. Artwork must be submitted online in vector electronic form or by emailing it.

Preparation of Eletronic Figures for Publication

Although low-quality images are sufficient for review purposes, print publication requires high-quality images to prevent the final product being blurred or fuzzy. Submit (possibly by e-mail) EPS (line art) or TIFF (halftone/ photographs) files only. MS PowerPoint and Word Graphics are unsuitable for printed pictures. Avoid using pixel-oriented software. Scans (TIFF only) should have a resolution of at least 350 dpi (halftone) or 700 to 1100 dpi (line drawings). Please give the data for figures in black and white or submit a Color Work Agreement form. EPS files must be saved with fonts embedded (and with a TIFF preview, if possible).

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Tips for writing a good quality Social Science Research Paper

Techniques for writing a good quality homan social science research paper:

1. Choosing the topic: In most cases, the topic is selected by the interests of the author, but it can also be suggested by the guides. You can have several topics, and then judge which you are most comfortable with. This may be done by asking several questions of yourself, like "Will I be able to carry out a search in this area? Will I find all necessary resources to accomplish the search? Will I be able to find all information in this field area?" If the answer to this type of question is "yes," then you ought to choose that topic. In most cases, you may have to conduct surveys and visit several places. Also, you might have to do a lot of work to find all the rises and falls of the various data on that subject. Sometimes, detailed information plays a vital role, instead of short information. Evaluators are human: The first thing to remember is that evaluators are also human beings. They are not only meant for rejecting a paper. They are here to evaluate your paper. So present your best aspect.

2. Think like evaluators: If you are in confusion or getting demotivated because your paper may not be accepted by the evaluators, then think, and try to evaluate your paper like an evaluator. Try to understand what an evaluator wants in your research paper, and you will automatically have your answer. Make blueprints of paper: The outline is the plan or framework that will help you to arrange your thoughts. It will make your paper logical. But remember that all points of your outline must be related to the topic you have chosen.

3. Ask your guides: If you are having any difficulty with your research, then do not hesitate to share your difficulty with your guide (if you have one). They will surely help you out and resolve your doubts. If you can't clarify what exactly you require for your work, then ask your supervisor to help you with an alternative. He or she might also provide you with a list of essential readings.

4. Use of computer is recommended: As you are doing research in the field of homan social science then this point is quite obvious. Use right software: Always use good quality software packages. If you are not capable of judging good software, then you can lose the quality of your paper unknowingly. There are various programs available to help you which you can get through the internet.

5. Use the internet for help: An excellent start for your paper is using Google. It is a wondrous search engine, where you can have your doubts resolved. You may also read some answers for the frequent question of how to write your research paper or find a model research paper. You can download books from the internet. If you have all the required books, place importance on reading, selecting, and analyzing the specified information. Then sketch out your research paper. Use big pictures: You may use encyclopedias like Wikipedia to get pictures with the best resolution. At Global Journals, you should strictly follow here.

6. Bookmarks are useful: When you read any book or magazine, you generally use bookmarks, right? It is a good habit which helps to not lose your continuity. You should always use bookmarks while searching on the internet also, which will make your search easier.

7. Revise what you wrote: When you write anything, always read it, summarize it, and then finalize it.

8. Make every effort: Make every effort to mention what you are going to write in your paper. That means always have a good start. Try to mention everything in the introduction—what is the need for a particular research paper. Polish your work with good writing skills and always give an evaluator what he wants. Make backups: When you are going to do any important thing like making a research paper, you should always have backup copies of it either on your computer or on paper. This protects you from losing any portion of your important data.

9. Produce good diagrams of your own: Always try to include good charts or diagrams in your paper to improve quality. Using several unnecessary diagrams will degrade the quality of your paper by creating a hodgepodge. So always try to include diagrams which were made by you to improve the readability of your paper. Use of direct quotes: When you do research relevant to literature, history, or current affairs, then use of quotes becomes essential, but if the study is relevant to science, use of quotes is not preferable.

10. Use proper verb tense: Use proper verb tenses in your paper. Use past tense to present those events that have happened. Use present tense to indicate events that are going on. Use future tense to indicate events that will happen in the future. Use of wrong tenses will confuse the evaluator. Avoid sentences that are incomplete.

11. Pick a good study spot: Always try to pick a spot for your research which is quiet. Not every spot is good for studying.

12. Know what you know: Always try to know what you know by making objectives, otherwise you will be confused and unable to achieve your target.

13. Use good grammar: Always use good grammar and words that will have a positive impact on the evaluator; use of good vocabulary does not mean using tough words which the evaluator has to find in a dictionary. Do not fragment sentences. Eliminate one-word sentences. Do not ever use a big word when a smaller one would suffice.

Verbs have to be in agreement with their subjects. In a research paper, do not start sentences with conjunctions or finish them with prepositions. When writing formally, it is advisable to never split an infinitive because someone will (wrongly) complain. Avoid clichés like a disease. Always shun irritating alliteration. Use language which is simple and straightforward. Put together a neat summary.

14. Arrangement of information: Each section of the main body should start with an opening sentence, and there should be a changeover at the end of the section. Give only valid and powerful arguments for your topic. You may also maintain your arguments with records.

15. Never start at the last minute: Always allow enough time for research work. Leaving everything to the last minute will degrade your paper and spoil your work.

16. Multitasking in research is not good: Doing several things at the same time is a bad habit in the case of research activity. Research is an area where everything has a particular time slot. Divide your research work into parts, and do a particular part in a particular time slot.

17. Never copy others' work: Never copy others' work and give it your name because if the evaluator has seen it anywhere, you will be in trouble. Take proper rest and food: No matter how many hours you spend on your research activity, if you are not taking care of your health, then all your efforts will have been in vain. For quality research, take proper rest and food.

18. Go to seminars: Attend seminars if the topic is relevant to your research area. Utilize all your resources.
Refresh your mind after intervals: Try to give your mind a rest by listening to soft music or sleeping in intervals. This will also improve your memory. Acquire colleagues: Always try to acquire colleagues. No matter how sharp you are, if you acquire colleagues, they can give you ideas which will be helpful to your research.

19. Think technically: Always think technically. If anything happens, search for its reasons, benefits, and demerits. Think and then print: When you go to print your paper, check that tables are not split, headings are not detached from their descriptions, and page sequence is maintained.

20. Adding unnecessary information: Do not add unnecessary information like "I have used MS Excel to draw graphs." Irrelevant and inappropriate material is superfluous. Foreign terminology and phrases are not apropos. One should never take a broad view. Analogy is like feathers on a snake. Use words properly, regardless of how others use them. Remove quotations. Puns are for kids, not grunt readers. Never oversimplify: When adding material to your research paper, never go for oversimplification; this will definitely irritate the evaluator. Be specific. Never use rhythmic redundancies. Contractions shouldn't be used in a research paper. Comparisons are as terrible as clichés. Give up ampersands, abbreviations, and so on. Remove commas that are not necessary. Parenthetical words should be between brackets or commas. Understatement is always the best way to put forward earth-shaking thoughts. Give a detailed literary review.

21. Report concluded results: Use concluded results. From raw data, filter the results, and then conclude your studies based on measurements and observations taken. An appropriate number of decimal places should be used. Parenthetical remarks are prohibited here. Proofread carefully at the final stage. At the end, give an outline to your arguments. Spot perspectives of further study of the subject. Justify your conclusion at the bottom sufficiently, which will probably include examples.

22. Upon conclusion: Once you have concluded your research, the next most important step is to present your findings. Presentation is extremely important as it is the definite medium though which your research is going to be in print for the rest of the crowd. Care should be taken to categorize your thoughts well and present them in a logical and neat manner. A good quality research paper format is essential because it serves to highlight your research paper and bring to light all necessary aspects of your research.

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Informal Guidelines of Research Paper Writing

Key points to remember:

- Submit all work in its final form.
- Write your paper in the form which is presented in the guidelines using the template.
- Please note the criteria peer reviewers will use for grading the final paper.

Final points:

One purpose of organizing a research paper is to let people interpret your efforts selectively. The journal requires the following sections, submitted in the order listed, with each section starting on a new page:

The introduction: This will be compiled from reference matter and reflect the design processes or outline of basis that directed you to make a study. As you carry out the process of study, the method and process section will be constructed like that. The results segment will show related statistics in nearly sequential order and direct reviewers to similar intellectual paths throughout the data that you gathered to carry out your study.

The discussion section:

This will provide understanding of the data and projections as to the implications of the results. The use of good quality references throughout the paper will give the effort trustworthiness by representing an alertness to prior workings.

Writing a research paper is not an easy job, no matter how trouble-free the actual research or concept. Practice, excellent preparation, and controlled record-keeping are the only means to make straightforward progression.

General style:

Specific editorial column necessities for compliance of a manuscript will always take over from directions in these general guidelines.

To make a paper clear: Adhere to recommended page limits.

Mistakes to avoid:

- Insertion of a title at the foot of a page with subsequent text on the next page.
- Separating a table, chart, or figure—confine each to a single page.
- Submitting a manuscript with pages out of sequence.
- In every section of your document, use standard writing style, including articles ("a" and "the").
- Keep paying attention to the topic of the paper.
- Use paragraphs to split each significant point (excluding the abstract).
- Align the primary line of each section.
- Present your points in sound order.
- Use present tense to report well-accepted matters.
- Use past tense to describe specific results.
- Do not use familiar wording; don't address the reviewer directly. Don't use slang or superlatives.
- Avoid use of extra pictures—include only those figures essential to presenting results.

Title page:

Choose a revealing title. It should be short and include the name(s) and address(es) of all authors. It should not have acronyms or abbreviations or exceed two printed lines.

Abstract: This summary should be two hundred words or less. It should clearly and briefly explain the key findings reported in the manuscript and must have precise statistics. It should not have acronyms or abbreviations. It should be logical in itself. Do not cite references at this point.

An abstract is a brief, distinct paragraph summary of finished work or work in development. In a minute or less, a reviewer can be taught the foundation behind the study, common approaches to the problem, relevant results, and significant conclusions or new questions.

Write your summary when your paper is completed because how can you write the summary of anything which is not yet written? Wealth of terminology is very essential in abstract. Use comprehensive sentences, and do not sacrifice readability for brevity; you can maintain it succinctly by phrasing sentences so that they provide more than a lone rationale. The author can at this moment go straight to shortening the outcome. Sum up the study with the subsequent elements in any summary. Try to limit the initial two items to no more than one line each.

Reason for writing the article—theory, overall issue, purpose.

- Fundamental goal.
- To-the-point depiction of the research.
- Consequences, including definite statistics—if the consequences are quantitative in nature, account for this; results of any numerical analysis should be reported. Significant conclusions or questions that emerge from the research.

Approach:

- Single section and succinct.
- An outline of the job done is always written in past tense.
- Concentrate on shortening results—limit background information to a verdict or two.
- Exact spelling, clarity of sentences and phrases, and appropriate reporting of quantities (proper units, important statistics) are just as significant in an abstract as they are anywhere else.

Introduction:

The introduction should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable of comprehending and calculating the purpose of your study without having to refer to other works. The basis for the study should be offered. Give the most important references, but avoid making a comprehensive appraisal of the topic. Describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will give no attention to your results. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here.

The following approach can create a valuable beginning:

- Explain the value (significance) of the study.
- Defend the model—why did you employ this particular system or method? What is its compensation? Remark upon its appropriateness from an abstract point of view as well as pointing out sensible reasons for using it.
- Present a justification. State your particular theory(-ies) or aim(s), and describe the logic that led you to choose them.
- Briefly explain the study's tentative purpose and how it meets the declared objectives.

Approach:

Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done. Sort out your thoughts; manufacture one key point for every section. If you make the four points listed above, you will need at least four paragraphs. Present surrounding information only when it is necessary to support a situation. The reviewer does not desire to read everything you know about a topic. Shape the theory specifically—do not take a broad view.

As always, give awareness to spelling, simplicity, and correctness of sentences and phrases.

Procedures (methods and materials):

This part is supposed to be the easiest to carve if you have good skills. A soundly written procedures segment allows a capable scientist to replicate your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order, but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt to give the least amount of information that would permit another capable scientist to replicate your outcome, but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section.

When a technique is used that has been well-described in another section, mention the specific item describing the way, but draw the basic principle while stating the situation. The purpose is to show all particular resources and broad procedures so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step-by-step report of the whole thing you did, nor is a methods section a set of orders.

Materials:

Materials may be reported in part of a section or else they may be recognized along with your measures.

Methods:

- Report the method and not the particulars of each process that engaged the same methodology.
- Describe the method entirely.
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures.
- Simplify—detail how procedures were completed, not how they were performed on a particular day.
- If well-known procedures were used, account for the procedure by name, possibly with a reference, and that's all.

Approach:

It is embarrassing to use vigorous voice when documenting methods without using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result, when writing up the methods, most authors use third person passive voice.

Use standard style in this and every other part of the paper—avoid familiar lists, and use full sentences.

What to keep away from:

- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings—save it for the argument.
- Leave out information that is immaterial to a third party.

Results:

The principle of a results segment is to present and demonstrate your conclusion. Create this part as entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Use statistics and tables, if suitable, to present consequences most efficiently.

You must clearly differentiate material which would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matters should not be submitted at all except if requested by the instructor.

Content:

- Sum up your conclusions in text and demonstrate them, if suitable, with figures and tables.
- In the manuscript, explain each of your consequences, and point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation of an exacting study.
- Explain results of control experiments and give remarks that are not accessible in a prescribed figure or table, if appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or manuscript.

What to stay away from:

- Do not discuss or infer your outcome, report surrounding information, or try to explain anything.
- Do not include raw data or intermediate calculations in a research manuscript.
- Do not present similar data more than once.
- A manuscript should complement any figures or tables, not duplicate information.
- Never confuse figures with tables—there is a difference.

Approach:

As always, use past tense when you submit your results, and put the whole thing in a reasonable order.

Put figures and tables, appropriately numbered, in order at the end of the report.

If you desire, you may place your figures and tables properly within the text of your results section.

Figures and tables:

If you put figures and tables at the end of some details, make certain that they are visibly distinguished from any attached appendix materials, such as raw facts. Whatever the position, each table must be titled, numbered one after the other, and include a heading. All figures and tables must be divided from the text.

Discussion:

The discussion is expected to be the trickiest segment to write. A lot of papers submitted to the journal are discarded based on problems with the discussion. There is no rule for how long an argument should be.

Position your understanding of the outcome visibly to lead the reviewer through your conclusions, and then finish the paper with a summing up of the implications of the study. The purpose here is to offer an understanding of your results and support all of your conclusions, using facts from your research and generally accepted information, if suitable. The implication of results should be fully described.

Infer your data in the conversation in suitable depth. This means that when you clarify an observable fact, you must explain mechanisms that may account for the observation. If your results vary from your prospect, make clear why that may have happened. If your results agree, then explain the theory that the proof supported. It is never suitable to just state that the data approved the prospect, and let it drop at that. Make a decision as to whether each premise is supported or discarded or if you cannot make a conclusion with assurance. Do not just dismiss a study or part of a study as "uncertain."

Research papers are not acknowledged if the work is imperfect. Draw what conclusions you can based upon the results that you have, and take care of the study as a finished work.

- You may propose future guidelines, such as how an experiment might be personalized to accomplish a new idea.
- Give details of all of your remarks as much as possible, focusing on mechanisms.
- Make a decision as to whether the tentative design sufficiently addressed the theory and whether or not it was correctly restricted. Try to present substitute explanations if they are sensible alternatives.
- One piece of research will not counter an overall question, so maintain the large picture in mind. Where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

Approach:

When you refer to information, differentiate data generated by your own studies from other available information. Present work done by specific persons (including you) in past tense.

Describe generally acknowledged facts and main beliefs in present tense.

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Topics	Grades		
	A-B	**C-D**	**E-F**
Abstract	Clear and concise with appropriate content, Correct format. 200 words or below	Unclear summary and no specific data, Incorrect form Above 200 words	No specific data with ambiguous information Above 250 words
Introduction	Containing all background details with clear goal and appropriate details, flow specification, no grammar and spelling mistake, well organized sentence and paragraph, reference cited	Unclear and confusing data, appropriate format, grammar and spelling errors with unorganized matter	Out of place depth and content, hazy format
Methods and Procedures	Clear and to the point with well arranged paragraph, precision and accuracy of facts and figures, well organized subheads	Difficult to comprehend with embarrassed text, too much explanation but completed	Incorrect and unorganized structure with hazy meaning
Result	Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake	Complete and embarrassed text, difficult to comprehend	Irregular format with wrong facts and figures
Discussion	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
References	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring

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