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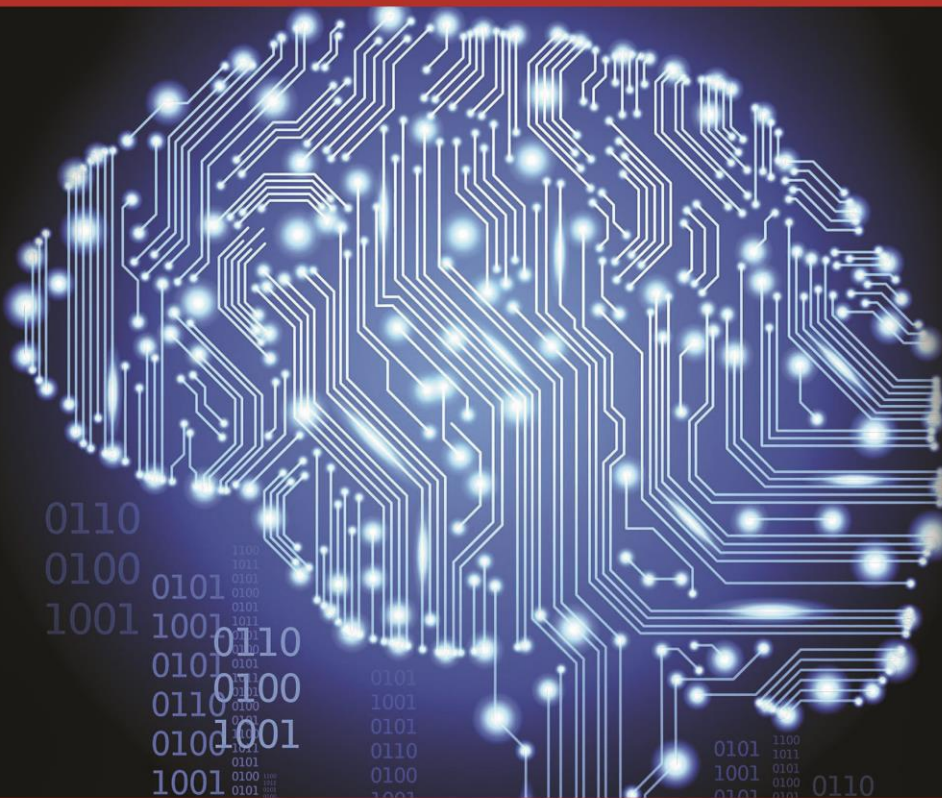
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# FOREWORD

I am pleased to put into the hands of readers Volume-3; Issue-12: Dec, 2017 of “**International Journal of Advanced Engineering, Management and Science (IJAEMS) (ISSN: 2354-1311)**”, an international journal which publishes peer reviewed quality research papers on a wide variety of topics related to Science, Technology, Management and Humanities. Looking to the keen interest shown by the authors and readers, the editorial board has decided to release print issue also, but this decision the journal issue will be available in various library also in print and online version. This will motivate authors for quick publication of their research papers. Even with these changes our objective remains the same, that is, to encourage young researchers and academicians to think innovatively and share their research findings with others for the betterment of mankind. This journal has DOI (Digital Object Identifier) also, this will improve citation of research papers.

I thank all the authors of the research papers for contributing their scholarly articles. Despite many challenges, the entire editorial board has worked tirelessly and helped me to bring out this issue of the journal well in time. They all deserve my heartfelt thanks.

Finally, I hope the readers will make good use of this valuable research material and continue to contribute their research finding for publication in this journal. Constructive comments and suggestions from our readers are welcome for further improvement of the quality and usefulness of the journal.

With warm regards.




**Dr. Uma Choudhary**

Editor-in-Chief

Date: Dec, 2017

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# The Evolution of Enterprise Resource Planning Systems

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**Abstract** — *Management of organizations needs efficient information systems to improve competitiveness by cost reduction and better logistics. It is universally recognized by large and small to medium-size enterprises (SME) that the capability of providing the right information at the right time brings tremendous rewards to organizations in a global competitive world of complex business practices. ERP (Enterprise Resource Planning) can be defined as a framework for organizing, defining and standardizing the business processes necessary to effectively plan and control an organization so the organization can use its internal knowledge to seek external advantage. This paper presents the growth and success of ERP adoption and development through history. The evolution of ERP systems closely followed the spectacular developments in the field of computer hardware and software systems. There is still a never-ending process on the ERP market, of reengineering and development, bringing new products and solutions. The consolidations continue to occur and the key players continue to build out their products. The next phase of ERP systems will be the merged products.*

**Keywords** — *enterprise resource planning, evolution, history, management, organization.*

## I. INTRODUCTION

ERP (Enterprise Resource Planning) can be defined as a “framework for organizing, defining, and standardizing the business processes necessary to effectively plan and control an organization so the organization can use its internal knowledge to seek external advantage”. [1] Enterprise resource planning (ERP) is an integral component of today’s complex global marketplace. ERP software helps companies streamline business processes. Even though there are several definitions from the published literature which explain the concept of Enterprise Resource Planning, there is still a need for a historical perspective on the complete ERP evolution. In the first section we will focus on IBM implication in setting up the base of ERP (Enterprise Resource Planning) – firstly with the computers like IBM7094, 360 and 370 series, System 34 or System/38, then by introducing COPICS (Communications Oriented

Production Information and Control System), MMAS (Manufacturing Management and Account System), MAPICS (Manufacturing, Accounting and Production Information and Control System) and CIM (Computer Integrated Manufacturing).

The second section includes the beginnings of the term ERP (Enterprise Resource Planning). In the Moving to cloud section we show how the cloud technologies and programming languages affected the ERP systems. We also introduce the term ERP II (Extended ERP – EERP) in this section.

The last section assumes some conclusions on the subject represented by the evolution of the ERP system from historical perspective and some possibilities for future development.

## II. IBM – THE FIRST MAIN PLAYER ON THE MARKET

**MRP (Material Requirements Planning) – the predecessor to and base of MRP II and ERP – was born in the late 1960s** through a joint effort between J.I. Case, a manufacturer of construction machinery and IBM. At the time, the focus of manufacturing systems was on inventory control. Most of the software packages were designed to handle inventory based on traditional inventory concepts. This early MRP application software was the state-of-the-art method for planning and scheduling materials for complex manufactured products. [2]

Initial MRP solutions were big, clumsy and expensive. They required a large technical staff to support the mainframe computers — at first the IBM7094, for example, and later IBM’s 360s and 370s. The development of ever faster and higher capacity disk (random access) storage was a major enabling technology for the development of more integrated business information systems. [3]

**In the late 1970s MRP systems fit the adoption of target-market strategies with an emphasis on greater production integration and planning because of the integration between forecasting, master scheduling, procurement and shop floor control.** MRP systems

translated the master schedule build for the end items into time-phased net requirement for sub-assemblies, components, raw materials planning and procurement. MRP fairly quickly became established as the fundamental parts and materials planning concept used in production management and control. [4]

**The year 1972 saw the introduction of IBM's COPICS (Communications Oriented Production Information and Control System)**, an eight-volume series with the objective of providing "a series of concepts that outline an approach to an integrated computer-based manufacturing control system" [5]. The COPICS software was designed to run on the IBM model 360 mainframe computer. The movement towards what would be called MRP II (Manufacturing Resource Planning) was underway.

**In 1975 IBM offered its Manufacturing Management and Account System (MMAS)** which is considered to be a true precursor to ERP. It created general journal notes and job costing plus forecasting updates emanating from both inventory and production transactions and could generate manufacturing orders from customer orders using either a standard bill of material or a bill of material attached to the customer order. Accounts receivable transactions were generated by customer order activity, as well as accounts payable transactions against purchase order activities. At the time, IBM tended to synchronize new software applications with the release of new hardware systems. [3]

**In 1978 a new integrated suite of applications called Manufacturing, Accounting and Production Information and Control System (MAPICS) was released** as was the IBM System 34 – a mini-computer smaller and less expensive than earlier mainframes. This integrated application took MMAS to another level with general journal, accounts payable, order entry and invoicing, accounts receivable, sales analysis, payroll, data collection systems support, product and production definitions (the old bill of materials processor), inventory management, material requirements planning (with a scaled-down master scheduling capability), production monitoring and control capabilities. In a second release, IBM added forecasting, capacity requirements planning, purchasing, and full-scale master production schedule planning modules to the application [6].

**In 1978 SAP also released a more highly integrated version of its software, called the SAP R/2 system.** R/2 took full advantage of the mainframe computer technology at the time, allowing for interactivity between modules as well as additional capabilities such as order tracking. [7]

**J.D. Edwards began to focus on writing MRP II software for the IBM System/38 in the early 1980s.** This system was a much lower cost alternative to the mainframe computers: it offered flexible disk drives with

capacities useful for small and medium size businesses. Eventually the term manufacturing resource planning II (MRP-II) was conceived to identify the newer systems' capabilities. Manufacturing strategy emphasized greater process control, world class manufacturing and a focus on reducing overhead costs. The closed-loop scheduling, enhanced shop floor reporting, linkages to due date scheduling or procurement and detailed cost reporting features of the ever-developing MRP-II systems, were designed to support these new initiatives. These were character based system and had the capabilities to record transactions with low processing power computers. The heart of any MRP II system was still the fundamental MRP logic, now typically re-written in modern code. [8]

**At the end of the 1980s IBM came out with an update to their COPICS software that introduced the new acronym CIM for Computer Integrated Manufacturing.** This newer CIM framework offered a "comprehensive strategy to help integrate information in a consistent, effective manner across the enterprise". The framework had three levels of support: the top level supported the functional areas and included Marketing, Engineering and Research, Production Planning, Plant Operations, Physical Distribution and Business Management. Below this level, the CIM structure had a supporting layer, which included administrative support, application development and decision support. The bottom layer was a core series of applications including database, communications and presentation tools. [3]

### III. INTRODUCING THE TERM ERP (ENTERPRISE RESOURCE PLANNING)

**The term enterprise resource planning (ERP) was introduced in the early 1990s by the Gartner Group [9].** Their definition of ERP included criteria for evaluating the extent that software was actually integrated both across and within the various functional silos. **The year 1992 marked the release of SAP's R/3 product.** The main feature that distinguished R/3 from previous ERP systems was its use of client-server hardware architecture. This setup allowed the system to run on a variety of computer platforms such as UNIX and Windows NT. R/3 was also designed with an open architecture approach, allowing third-party companies to develop software that would integrate with SAP R/3. The ability to distribute the computer load to multiple small computers was particularly attractive due to the relatively low cost of the hardware employed. Client – server technology, with rapid growth of computers across organizations gained momentum allowing computers to communicate easily and that led to growth of ERP across the network.

**Corporations as well as small to medium-sized enterprises (SMEs) were quick to adopt the new ERP**



**offerings as one way of addressing needed fixes to legacy system software that was not compliant with year 2000.** In many respects, the technology advances hinted at the industry consolidation that was about to begin. Year 2000 has meant both the maturing of the ERP industry and the consolidation of large and small ERP vendors. By 2002, software companies were looking for ways to improve product offerings and increase market share. Between 2000 and 2002 software companies faced significant pressure to downsize following their amazing growth. With Internet flowing across the network, Cisco contributed to routers and switches that allowed people to connect across the world and gain access to ERP systems via remote connectivity such as Citrix and still use client-server technology or web based systems. The client-server had rich interfaces for users to use and mined data. However, the web based ERPs had browser restrictions due to components used and were limited to information that could be displayed to end-users and this space was evolving faster for vendors to keep up. [10]

#### **IV. MOVING TO CLOUD**

**In 2010 the evolution of Internet technologies and programming languages has finally reached the cloud,** where business can operate efficiently and have entire infrastructure taken care. Cloud ERP software are written in powerful web based languages. Cloud ERP makes it easier to access from anywhere, on any devices local or remote without trouble. [11]  
ERP systems have reached a level of maturity where both software vendors and users understand the technical, human resource or financial resources required for implementation and ongoing use. Generic ERP software packages are already increasingly tailored to specific

market segments like refinery, hospital, automotive assembly and law office such that niche markets create niche products and vendors. Preconfigured software modules incorporating best practices and standard business processes are simplifying future implementations. Systems are much more intelligent. Data mining and intelligence tools including expert systems and advanced planning systems (with optimization) are used to make/suggest business decisions. Simulation is an important element of an integrated extended enterprise planning and execution system. Examples of major areas to receive the benefits of simulation include cost accounting, forecasting, capacity planning, order rate, lead time and supply network planning. Company cultures have obviously been affected by ERP consolidations. Current ERP technology provides an information rich environment that is ripe for very intelligent planning and execution logic. The current systems are now just executing the logic associated with such applications as forecasting, reorder point logic, MRP and production scheduling much faster than the ones in the late 1970s and in real-time. [12]

Now, the concept of ERP II (Extended ERP – EERP) is fast evolving, covering all the internal as well as external business functions such as SCM (Supply Chain Management) and CRM (Customer Relationship Management). ERP II is built on object technology or component architecture. These ERPs are cross-functional and enterprise wide. All functional departments that are involved in operations or production are integrated in one system. ERP II means open ERP architecture of components. The older, monolithic ERP systems became component oriented. [13]

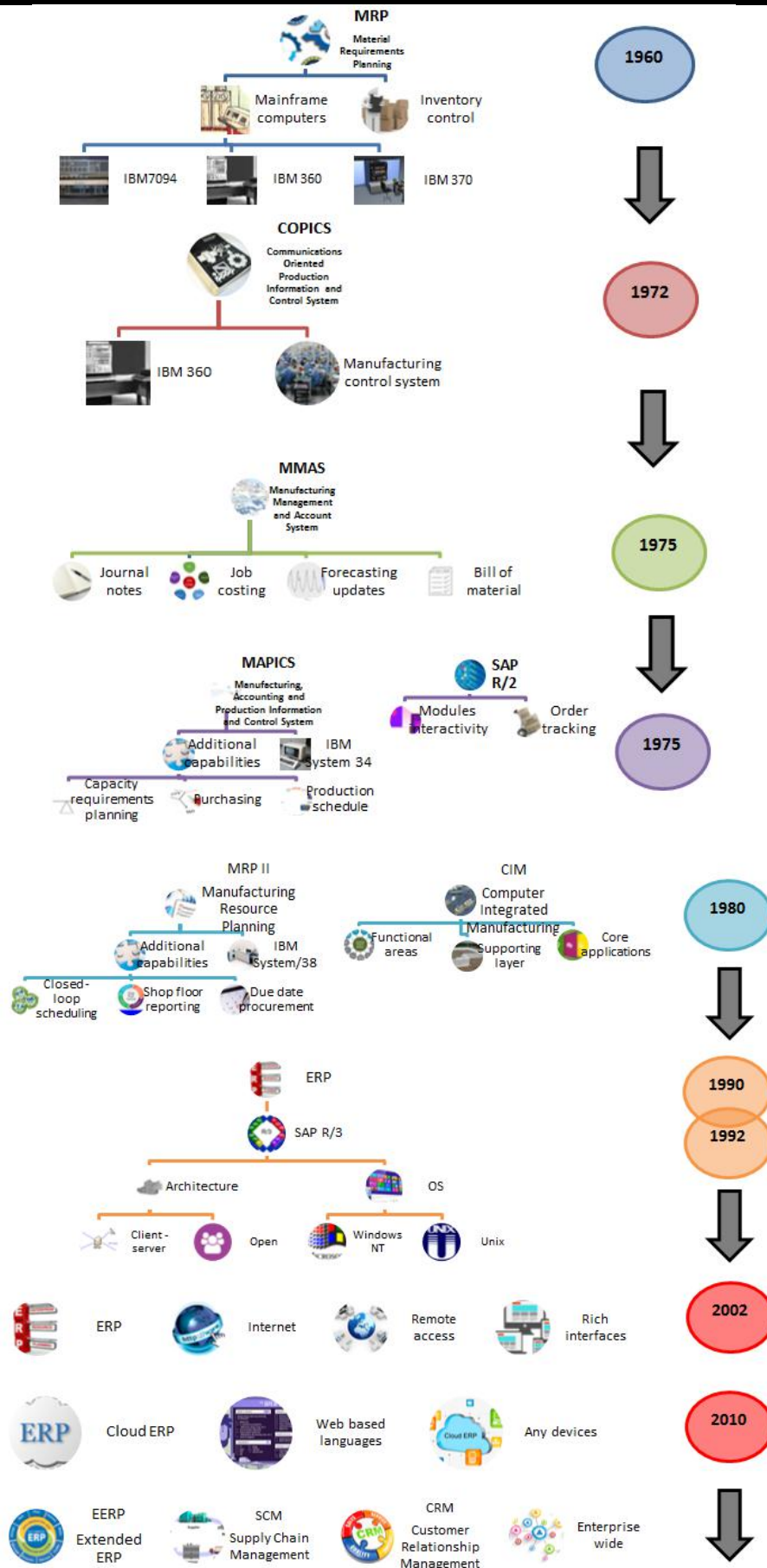


Fig. 1: Evolution of ERP systems from historical perspective

## V. CONCLUSION

Even though there were several definitions from the published literature which explained the concept of Enterprise Resource Planning, there was still a need for a historical perspective on the complete ERP evolution (see Fig. 1) and we think that this need is now covered by this paper.

ERP systems are now ubiquitous in large businesses and the current move by vendors is to repackage them. This migration has many consequences that have to be addressed through understanding the history and evolution of ERP systems.

These days, ERP has expanded to encompass business intelligence (BI) while also handling “front-office” functions. With the product advancements and the success stories coming out of these systems, companies of all sizes and from every industry – from wholesale distribution to ecommerce – can implement and benefit from ERP systems. That’s why there are still opportunities for new ERP vendors to emerge from industries that so far have not contributed to the ERP phenomenon.

As ERP has evolved, its business case has also changed. Consequently, it has become even more important that companies get the right solution to suit their needs.

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# Compliance Analysis of the Best Practices of Corporate Governance in Morocco: Case of the Large Market Capitalization Companies

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**Abstract**— Amid the leading position of Morocco in terms of Corporate Governance compared to peer countries from the Middle East and Africa (MEA) region, a number of legislative and operational limitations still as of today impede the process of implementation of these practices [1].

This leads us to question the extent to which the large market capitalization firms have implemented these practices. Therefore, the present article aims to present the findings of a semi-directive qualitative research conducted on the 20 largest capitalizations of Casablanca Stock Exchange.

We will attempt to contextualize the most widely used Corporate Governance scoring system (Institute of Shareholders Services) to the Moroccan context.

We will, then, analyze the state of progress of the selected equity listed companies in terms best practices of corporate governance by comparing our findings dated as of 2017 with the last report of the Moroccan Institute of Directors (IMA) of 2012.

**Keywords**—Corporate Governance, RM/ISS, Semi-directive qualitative research, and Moroccan equity Listed Companies.

## I. INTRODUCTION

Morocco, the 3rd largest financial market and the 2nd most promising emerging economy in Africa, has underway from early 1990's a series of economic and regulatory reforms which has fostered, in 2008, to the establishment of the national code of corporate governance [2].

According to the ROSC report [3], the national code of corporate governance in Morocco complies with the Organization for Economic Co-operation and Development (OECD) principles in terms of shareholder rights, disclosure and the role of board of directors. This report acknowledges the initiatives of policy makers to update and modernize the legal and regulatory frameworks as well as to strengthen the enforcement structures such as the Moroccan Capital Markets Authority (AMMC) and the central bank (Bank AlMaghrib- - BAM).

In 2012, the Autorité Marocaine des Marchés de Capitaux (AMMC), the Moroccan Securities Exchange Commission, has mandated the Moroccan Institute of Administrators (IMA) to conduct a survey regarding the application of best practices of corporate governance within publicly traded companies. This market survey is intended to be re-conducted every three years. However, the last report issued by this organization was as of 2012 [4]. Thus, it seems interesting to investigate the state of play of best practices of corporate governance in the publically traded companies since the last report of IMA in 2012[4].

Consequently, our work attempts to answer the following questions:

1. To which extent the international norms and more specifically the recommendations of Institutional Shareholders' Services (ISS) are applicable to the Moroccan large market capitalizations? and,
2. Did these companies improve their best practices since the last report of IMA in 2012?

To this purpose, our article will be organized in three parts. The first part will tackle the literature on the best practices of corporate governance. The second part will present our exploratory qualitative study in terms methodology. The last part will gauge the compliance to the international norms (ISS) as well as the state of progress of corporate governance within the large equity listed companies.

## II. LITERATURE REVIEW

The main objective of corporate governance is to 'govern' the behavior of managers and align their decisions to the best interests of shareholders. Thus, the act of 'governance' underpins two functions: a "constraining" function which is represented by the disciplinary paradigm of corporate governance and an "enabling" educational function covered by the cognitive approach of governance[5].

According to VO and Phan[6], the literature review from relevant academic studies has indicated several common characteristics relative to corporate governance such as: 1-board effectiveness; 2-the independence of audit

committee; 3-board compensation; and 4-shareholder's protection.

#### **A. Board effectiveness**

Emerging from the contractual theories of corporate governance, the board effectiveness depends on how well this latter performs its monitoring and strategic advisory roles [7] and [8]. These authors state that firms with audit committees and remuneration committees are related to higher performance.

Chen et al. [9] argued that board characteristics such as composition and internal functioning are crucial to conceptualizing and determining board effectiveness based on the shareholder perspective.

#### **B. Audit committee**

A number of studies have found that companies with an audit committee, particularly when the committee is active and independent, have less chance for the occurrence of fraud and other irregularities in reporting [8]. The recommendations of these researchers consent on the importance of the independence and competence of the audit committee members.

Moreover, Love [10] states that the audit committee should be permanent, independent, reporting directly to the board and having an advisory function with at least one member been independent and having expertise in accounting and/or auditing.

#### **C. Shareholders' protection provisions**

Since shareholders exercise their power by voting for directors and on major corporate issues, experts focus on voting procedures in evaluating shareholder rights [11].

These rights, which refer to anti-director rights, measure how strongly the legal system favors minority shareholders against managers or dominant shareholders in the corporate decision making process, including the voting process namely: voting by correspondence, cumulative voting, right to challenge director's decisions in courts, preemptive right to buy new issues of stock, and the share capital needed to call an extraordinary shareholders' meeting [11].

#### **D. Compensation of executives**

According to Affes [12], the fundamental dilemma of corporate governance is the imperfect alignment of incentives between shareholders and managers, which can lead to behaviors and decisions by managers that are not in the interests of the firm's shareholders. This author refers to the pioneer work of Jensen and Meckling in 1976 and states that when managers act in their own personal interest at the expense of shareholders, it results in agency costs for the firm's owners, which reduces value of shareholders. Several authors [11] [12] [13] explain that

shareholders can use managerial incentives to help align the manager's interests with those of shareholders.

### **III. METHODOLOGY**

#### **A. Data collection**

Our study was carried out over a five months period (from October 2016 to February 2017) in which we used as a primary method of data collection the interviewing techniques.

Along with it, and to a limited extent, we also used official market reports as a complementary source of information. An interview guide was elaborated to facilitate the process of data collection. The choice and development of semi-structured questions were justified and been based upon the literature review and the main recommendations of the ISS scoring metric.

Most of interviews were mediated by telephone (12 out of 20) while the remaining were conducted face to face.

Due to the sensitivity of the subject, no verbatim audios were allowed and all the data were collected from transcripts taken during the telephone/ face to face interviews.

Our points of contact were the chief financial officers (CFO), control directors and the senior management of the selected companies.

The selection of our sample of companies was purposive and criteria based. We selected 20 equity listed companies. Our selection was based on two criteria: large-cap companies incorporating the FTSE CSE Morocco 15 index, and / or belonging to major international groups.

Five sectors were represented in this study namely: financial sector (8 enterprises), real estate and construction (4 enterprises), energy and mining (2 enterprises), telecommunication and new technologies (2 enterprises) and retail and consumer products (4 enterprises).

The choice of equity listed companies was justified by the lenience of these latter to adopt and comply with the best practices of corporate governance, more stringent market regulations, and the availability of financial and corporate information.

#### **B. Data analysis**

Data analysis was based on a thematic conceptual framework developed as a part of our doctoral project.

Data were analyzed using an iterative approach whereby transcripts were coded according to a thematic framework, allowing mechanisms and practices of corporate governance to emerge in our analysis in line with our literature review.

Transcripts were analyzed using NVIVO software. Content analysis was predominantly used and in a lesser extent textual analysis was applied.

We also used a comparative analysis when assessing the degree of progress of the best practices of corporate governance in Moroccan large capitalizations between the periods of 2012 (report of IMA) and 2017 (findings of our study).

#### **IV. FINDINGS**

As reported earlier, we will undergo two analyses. For the compliance analysis, we have chosen as an international reference the Corporate Governance Quotient (CGQ) which is the rating metric under the flagship of the Institute of Shareholder Services (ISS). As per the evolution analysis, we have chosen the ten criterions highlighted in the IMA report [4].

##### **A. Compliance to the international norms (ISS standards)**

The CGQ scoring system classified the best practices of corporate governance in seven requirements namely: 1- board composition, 2- specialized committees, 3- shareholders' protection provisions, 4- mandates policy, 5- progressive practices, 6- audit committee and 7- compensation of directors.

###### **1. Board composition**

The independence and size of board of directors for Moroccan large capitalizations are merely in line with the recommendations of the ISS scoring metric.

Interestingly, though the Article 39 of Law 17-95 on the joint stock companies along with the national code of corporate governance require the independence criteria but they do not impose the majority quota. Understandably, the independence requirements are not fully met due to the overriding requirements of the acting national code of corporate governance in Morocco.

###### **2. Specialized committees**

Only one third of our targeted companies have a specialized committee (e.g. the governance and nomination committee.) The remainder confirms that this function is carried out by the board of directors.

The independence requirement as it is stated by the ISS metric is not met by any of the panel interviewed. More importantly, the joint stock act and the national code of corporate governance do not require independence of such committee.

###### **3. Shareholders' protection provisions**

The results of our study have shown that our entire sample of companies complies with these provisions except the postal voting which is not a market practice in Morocco.

According to our respondents, the provisions of ISS converge with the Law 17-95 on the joint stock companies and the AMMC act related to the legal provisions of publically listed companies [15].

###### **4. Mandates policy**

Half of our panel confirms that their CEOs sit on other boards while no former CEO serves as a board member. On average, the CEO and senior management serve one to two other mandates on behalf of their respective companies which are in line with the ISS standards (CEOs must not sit in more than 5 other boards.)

Interestingly, our respondents confirm to not control if their CEOs exercise other external/third party mandates. It is to mention also that the acting code as well as the joint stock act do not provision for the limit number of mandates of CEOs and senior management.

###### **5. Progressive practices**

The findings of our study point out a substantial divergence between the market practices and the ISS recommendations. The quasi majority of our panel does not comply with all of these norms.

###### **6. Audit committee**

As per the independence requirement, more than half of our panel (14 enterprises out of 20) confirms having a distinct audit committee. Furthermore, the audit committee accounts on average half of its members as independent while the remaining members are the chief financial officers and the control directors.

The lack of compliance in terms the independence criteria is justified by the provisions of Law 17-95 on the joint stock companies which require that the chief financial officer as well as the control director to be part of the audit committee [14].

The transparency of auditor policy is not met by any of our sample of enterprises. According to our respondents, this discrepancy is attributed to the fact that the acting regulatory framework does not require such practice [15].

###### **7. Compensation of directors**

Though our panel is not fully compliant, more than half of our sample (13 enterprises out of 20) has already put in place a stock option plan for their executives. According to our respondents, the stock option provision is optional and only applied in the financial sector companies affiliated to international groups.

The approval of executive compensation by shareholders is been met by all our panel of interviewees in line with the provision of the Law 17-95 on the joint stock companies [14].

The disclosure of the compensation of executives is not applied by any of our interviewed companies since no acting law imposes such practices.

## **B. Evolution of best practices of corporate governance in Morocco**

In order to gauge the evolution of best practices of corporate governance in Morocco, we refer to the ten best practices depicted in the IMA[4] namely: 1/ adoption of the national code of corporate governance, 2- existence of a governance charter, 3/- separation between the functions of the Chairman and CEO, 4/- Independence of the board of directors, 5/ existence of specialized committees, 6/- assessment of the governance committee 7/- assessment of senior management, 8/ disclosure of executives' compensation, 9/ existence of incitation/ stock option schemes and 10/ disclosing information about the best practices of corporate governance in the annual reports.

### **1. Adoption of the national code of corporate governance (CNGE)**

According to the IMA survey [4], more than half of the companies reported referring to the national code of corporate governance. While in our study, we found that just one-third of our sample complies with this code.

This difference can be attributed to the difference of the panel questioned as well as the amalgamation between complying (full conformity to all provision) and referring (partial conformity.)

Thus, it is fair to conclude that equity listed companies have not improve their practices in terms of compliance to the CNGE[15].

### **2. Existence of a Corporate Governance Charter**

According to the IMA report, half of their surveyed sample has a code of good conduct or a charter of corporate governance. Our study reveals an improvement in terms of this practice attributed mostly to the financial sector which is abided to comply with the Circular BAM 4 / W / 2014 issued by the Central Bank of Morocco provisioning internal control and governance measures of credit institutions.

### **3. Separation between the functions of the Chairman and the CEO**

It should be noted that in Morocco the choice of mode of governance is left to the discretion of each company.

The one tiered mode remains predominant by the majority of companies surveyed in both studies (only 5 out 20 enterprises adopt the dual mode).

According to our respondents, Moroccan companies are reluctant to separate between the management and control

functions which impede the development process of corporate governance in Morocco.

### **4. Independence of the board of directors**

Our study depicts an amalgamation of understanding between the independence requirements as it is recommended by the international norms (ROSC and ISS) and the attribute of "non-executive" of the board members required by the National Code of Corporate Governance.

According to the IMA survey, the non-executive directors represent on average more than two-thirds of the board members.

Our study reveals a slight improvement during the past five years contributed by the compliance of the financial sector to the new provisions of BAM circular. We found that less than half of our panel (8 enterprises out of 20) has independent members in their board. The proportion of independent members does not exceed, on average, half of the board of their board.

### **5. Existence of specialized committees**

Based upon the acting code and the AMMC circular, it is up to the discretion of the board of director to set and determine the structure of these committees.

In other words, companies might either appoint members or can set up distinct structure for governance, audit and nomination committees.

The IMA survey indicates that two-thirds of companies have specialized committees. We noted an improvement (16 out of 20 enterprises) in this practice attributed to the new circular of the Moroccan Central Bank (BAM) which requires from credit institutions to set up specialized committees namely: the Audit, nomination and governance committees.

### **6. Assessment of the board of director**

The results of the IMA survey confirm that half of the companies surveyed have the work of their board of directors been assessed. According to our study, no improvement was observed in this practice as we observed the same results.

### **7. Assessment of executives**

According to the IMA survey, more than half of the surveyed firms confirm evaluating the performance of their senior management through key performance indicators (KPI).

We have observed, in our study of 2017, a solid improvement in this practice. The majority of our panel states that they are conducting an annual appraisal of their executives.

#### 8. Disclosure of Executive Compensation Information

Amid the regulatory framework in Morocco requiring compensation of senior management to be approved by shareholders, disclosing the compensation remains restrained to a very limited number of companies. This trend has not changed since the last report published by the IMA. The respondents in our study justify this fact by the sensitivity of the subject.

#### 9. Existence of an incentive/stock option plan

The results obtained from our study converge with the findings of the IMA survey in 2012. Only half of our panel confirms having a profit-sharing/ stock option plans.

We noticed no significant improvement in that practice. Furthermore, only Financial and Real Estate and Construction sectors have stock option schemes for their executives. Interestingly, no company confirms disclosing the stock option plans in their annual reports.

#### 10. Reporting in the annual reports

The results obtained in our study converge with the findings of the IMA survey in 2012. More than half of our respondents confirm communicating information about their best practices of corporate governance in the annual reports.

### V. CONCLUSION

To sum up, the evolution of best practices of corporate governance in Morocco remains restricted and even stagnant despite several initiatives taken by the market authorities to mention the latest the circular of BAM 4 / W / 2014.

We have raised a salient fact from this study. The implementation of best practices of corporate governance, with the exception of the financial sector, has not yet reached the regulatory stage and the code is still adopted on the basis of voluntary and non-binding membership.

Moreover, the outcomes of our research reveal that the financial and the real estate and construction sectors are the most conforming to the best practices of corporate governance. This fact is explained by the structure of the ownership which is predominantly institutional (local institutional investors or international groups).

On a global outlook, limits are as of today still persisting on what a code and even a "hard law" can achieve: cohesive regulatory frameworks have proven their limits in more than one advanced and market-oriented economy. Emphasis perhaps should be drawn to more innovative venues to enforce the corporate governance codes which could be a future development for this existing article.

### VI. LIMITATIONS AND CONSTRAINTS OF THIS STUDY

In this study, we used rigorous data collection and analysis methods to promote the validity of the results. However, the results presented in this study were obtained from voluntary responses of respondents, which are discretionary to their judgments, perceptions, and the practices applied within their respective companies. Our research was marked by a number of constraints such as the difficulty in establishing direct access with respondents, the limited size of our sample, the confidentiality and sensitivity of certain information and the time constraint.

As a result, we took recourse of complementary sources of information such as the annual reports of companies and the laws and circulars in force.

### ACKNOWLEDGEMENT

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# A Study of the Relationship between Work Engagement and Job Satisfaction in Private Companies in Kurdistan

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**Abstract**— *The purpose of this study is to investigate the relationship between work engagement and job satisfaction. The research aimed to examine each of ( equal opportunities, personal influence, nature of career, development opportunity, employee recognition, work challenge, supervisor behaviour, ethics and integrity, and job empowerment) and its relationship with job satisfaction in private companies in Erbil. The researcher used quantitative research method in order to measure the relationship between work engagement and job satisfaction, however only 108 respondents were participated in the current study. The researcher used multiple regression analysis to measure the relationship among variables. The researcher found that workplace challenge had the highest value among other work engagement elements = .671 and P-value = .000 which indicates that many private companies' employees are engaged to their job because of time management, Overwhelming workloads and communication. This research highlighted the significance of workplace challenge that inspires the individuals to be more engaged to their organization. Employee engagement is a positive attitude towards the workplace and is the degree that an individual is bind to the organization. Only small number of employees had participated in this research from private companies in Kurdistan, which limits the outcome of the study.*

**Keywords**— *Engagement, Job satisfaction, Kurdistan.*

## I. INTRODUCTION

Improved employee engagement can be both physical and mental, reflecting the behavioural and attitudinal fundamentals of the concept. In today's competitive environment there is a considerable body of indication representing the advantages to businesses of having strongly engaged employees. Several academician and scholars proved that engaged employees less likely will leave the organization for instance (Andrew, et al., 2017), meanwhile;

according (Li, et al., 2017), engaged employees will attend regularly. Nowadays, none of the businesses can survive without work engagement. Therefore, it is significant to recognize the conception of engagement and its possible consequence. According to (Moura, et al., (2014), engagement is a belief that demonstrates individual's strength of attachment to an organization. The purpose of this study is to identify the relationship between work engagements with job satisfaction in private universities in Kurdistan.

## II. LITERATURE REVIEW

According to Yuang, et al., (2016), employee engagement refers to individuals' participation or attachment to the organizations. According to (Ilkhanizadeh, and Karatepe, 2017), employee engagement is an effective reaction to the entire organization and the degree of employees' loyalty to their organization. According to Mróz, and Kaleta, (2016), employee engagement is basically employees' attitude to organization. According to (Orgamidez-Romsa, and Almeidab,2017), employee engagement is a psychological degree which describes the individuals' relationships with the organization and has associations to continue as a member in the organization. According to (Wingerden, et al., 2017), employee engagement is the degree to which the individuals have strong attachment to their organization. As per (Orgambídez-Ramos, et al.,2014) stated employee engagement is significant for every organization, because high levels of employee engagement results in higher level of job satisfaction. According to (Lu, et al., 2016) engaged employees mostly have no intention to quit their job. (Rayton, & Yalabik, 2014), proved a negative relationship between employee commitment and employee turnover intentions, furthermore they proved a positive and significant relationship between work engagement and job satisfaction. On the other hand many academic scholars proved a positive relationship between employee

engagement and employee satisfaction (Kooij, et al., 2017). Organizations can benefit from engaged employees in many ways for instance, reducing employee turnover and increasing level of job satisfaction (Karanika-Murray, et al., 2015).

According to (Bakker, and Demerouti, 2017), there is an argue as to whether work engagement is pointed out as behaviour or attitude statement in terms of psychological view, however (Lu, et al., 2014) stated that work engagement can be viewed as both psychological statements therefore it could be behaviourally and attitudinally stated for the aimed of the current research and in line with a strong literature, the researcher pointed out the work engagement as an affective-motivational state. Knight, et al., (2017), defined job satisfaction as emotion or feeling that an employee has regarding current job. Also, they pointed out that many academic scholars tried to determine several job satisfaction components, assess relative significance for each job satisfaction components and investigate the influence of all these job satisfaction components on employee's satisfaction and productivity. According to Trochimiuk, (2015), stated that professional development for employees will lead to increase their level of commitment and be more engaged to their tasks and duties. According to Karatepe, and Olugbade, (2016), job satisfaction defined as individual's overall attitude toward job. Boamah, et al., (2017), stated that inspiration is closely associated to job satisfaction. Many factors are related to job satisfaction for instance, social relationships, job analysis, employee training, desires and needs, recruitment and selection, orientation, working conditions, development and quality of management. (Aunola, et al., 2016). Furthermore, it has been pointed out that several researcher

and academicians attempted to determine several job satisfaction components, assess relative significance for each job satisfaction components and investigate the influence of all these job satisfaction components on employee's satisfaction. Job satisfaction is an attitude which is an outcome of outline and consistent of many precise likes and dislikes experiences with the job. According to Pawłowska and Zdziarski (2015), stated that the most important and essential asset for almost all organization is human resource. A job satisfaction for an individual considers as a degree of satisfaction and it depends on the job. Job satisfaction is a vital pointer of how an individuals' feel regarding of the job and defines how much they are satisfied with their job. The level of satisfaction of individuals linked with rise of organizational output. Job satisfaction of an individual considers an important factor is to the achievement of an organization. In every organization a high rate of individuals' satisfaction is strongly correlated with a low level of employee turnover. Therefore, keeping individuals happy and satisfied with their present job would be a leading priority for every organization. Human resource management practices attempt to allocate and assign the human capital in the great potential ways to attain long term organizational objectives, they offer penalty of advantages and benefits resulting increasing level of job satisfaction (Vera, et al., 2016). Moreover, according to Bartak and Jabłoński, (2016) motivated employees are expected to be more engaged and committed to their duties and responsibilities.

### III. CONCEPTUAL FRAMEWORK

#### Research Model

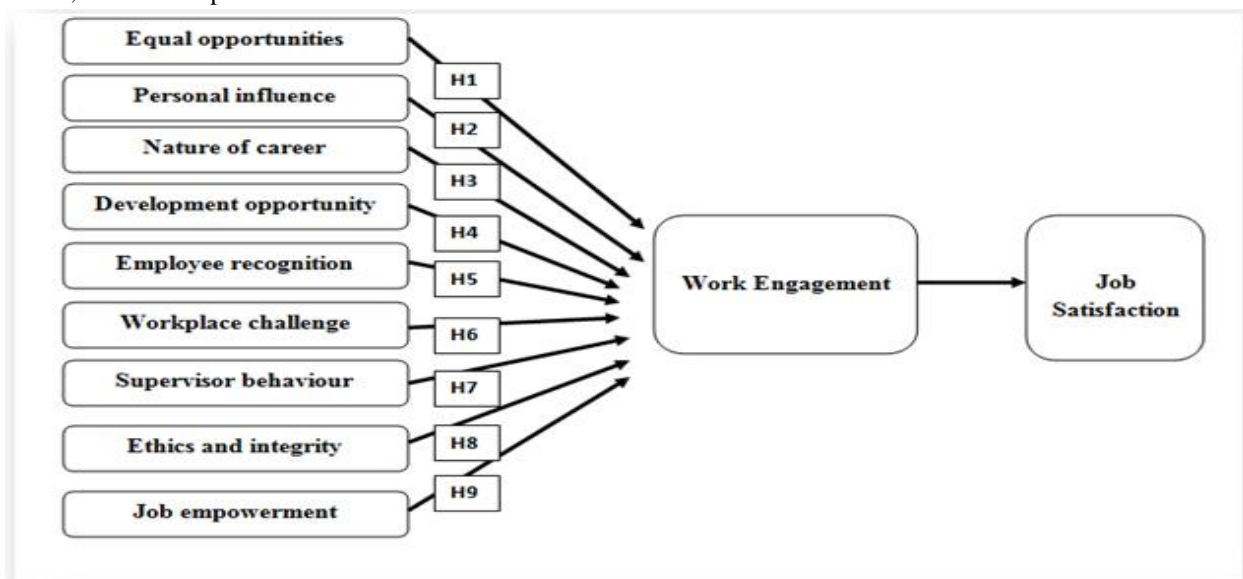


Fig.1: Research Model by the author, February, 2017

**Research Hypotheses**

**H1:** Work engagement mediates the positive relationship between equal employee opportunities (fair treatment) and job satisfaction.

**H2:** Work engagement mediates the positive relationship between personal influence and job satisfaction.

**H3:** Work engagement mediates the positive relationship between nature of career and job satisfaction.

**H4:** Work engagement mediates the positive relationship between development opportunity and job satisfaction.

**H5:** Work engagement mediates the positive relationship between employee recognition and job satisfaction.

**H6:** Work engagement mediates the positive relationship between workplace challenge and job satisfaction.

**H7:** Work engagement mediates the positive relationship between supervisor behaviour and job satisfaction.

**H8:** Work engagement mediates the positive relationship between ethics and integrity and job satisfaction.

**H9:** Work engagement mediates the positive relationship between job empowerment and job satisfaction

**Methodology**

The researcher used a quantitative research method to test the developed research hypotheses. Currently there are 8622 private companies registered in the Erbil Chamber of Commerce & Industry, these including general trade companies and other specialized companies. Based on the participants' request, the researcher kept companies identity confidentially; therefore the researcher kept any identifying information out of published reports. The researcher distributed 120 surveys at private companies in Kurdistan; however only 108 surveys were filled and received back from the participants, therefore the sample size for the current study is 130 participants.

**Analysis****Demographic analysis**

Table.1: Demographic analysis

Items		Frequency	Percent
<b>Gender</b>	Male	76	70.4
	Female	32	29.6
<b>Age</b>	20-25	16	14.8
	26-30	22	20.4
	31-35	25	23.1
	36-40	17	15.7
	41-45	15	13.9
	46-50	5	4.6
	51-55	5	4.6
	56 and above	3	2.8
<b>Marital status</b>	Single	48	44.4
	Married	60	55.6
<b>Level of education</b>	Bachelor	91	84.3
	Master	13	12.0
	PhD	4	3.7

As seen in table (1) demographic analysis for respondents participated in this research. Based on to the descriptive analysis, the researcher was able to analyze respondents' background information. Concerning the respondents' gender; it was found that 76 male from total of 108 respondents participated in this research and 32 female from total of 108 respondents participated in this research. Concerning the respondents' age; it was found that 16 from total of 108 respondents fall in a group of 20-25 years old, 22 from total of 108 respondents fall in a group of 26-30 years old, 25 from total of 108 respondents fall in a group of 31-35 years old, 17 from total of 108 respondents fall in a

group of 36-40 years old, 15 from total of 108 respondents fall in a group of 41-45 years old, 5 from total of 108 respondents fall in a group of 46-50 years old, 5 from total of 108 respondents fall in a group of 51-55 years old and finally only three respondents from total of 108 respondents fall in a group of 56 years old and above. Concerning the of respondents' marital status; it was found that 60 married respondents participated in this study and 48 single respondents participated in this study. Concerning the respondents' level of education; it was found that 91 respondents from total of 108 respondents had obtained college degree, 13 respondents from total of 108

respondents had obtained master degree, and only four respondents from total of 108 respondents had obtained PhD degree.

Table 2: Reliability Analysis

Variables	Item N.	Cronbach's Alpha
Supervisor behaviour	7	.829
Ethic & integrity	7	.770
Job empowerment	7	.741
Equal opportunities	7	.726
Personal development	7	.727
Nature of career	7	.751
Development opportunity	7	.855
Workplace challenge	7	.835
Employee recognition	7	.780
Job satisfaction	10	.773

The researcher implemented reliability analysis to (as seen in table-2) the values of Cronbach's Alpha for supervisor behaviour as independent factor, found to be  $.829 > .6$  this indicates that the items used to measure supervisor behaviour factor were reliable for the current study, the values of Cronbach's Alpha for ethic & integrity as independent factor, found to be  $.770 > .6$  this indicates that the items used to measure ethic & integrity factor were reliable for the current study, the values of Cronbach's Alpha for job empowerment as independent factor, found to be  $.741 > .6$  this indicates that the items used to measure job

empowerment factor were reliable for the current study, the values of Cronbach's Alpha for equal opportunity as independent factor, found to be  $.726 > .6$  this indicates that the items used to measure equal opportunity factor were reliable for the current study, the values of Cronbach's Alpha for Personal development as independent factor, found to be  $.727 > .6$  this indicates that the items used to measure Personal development factor were reliable for the current study, the values of Cronbach's Alpha for Nature of career as independent factor, found to be  $.751 > .6$  this indicates that the items used to measure Nature of career factor were reliable for the current study, the values of Cronbach's Alpha for Development opportunity as independent factor, found to be  $.855 > .6$  this indicates that the items used to measure Development opportunity factor were reliable for the current study, the values of Cronbach's Alpha for Workplace challenge as independent factor, found to be  $.835 > .6$  this indicates that the items used to measure Workplace challenge factor were reliable for the current study, the values of Cronbach's Alpha for Employee recognition as independent factor, found to be  $.780 > .6$  this indicates that the items used to measure Employee recognition factor were reliable for the current study, and the values of Cronbach's Alpha for Job satisfaction as dependent factor, found to be  $.773 > .6$  this indicates that the items used to measure Job satisfaction factor were reliable for the current study. However, the results revealed that all items used to measure the relationship between nine independent factors and dependent factor were reliable for the current research.

Table.1: Correlation Analysis

		1	2	3	4	5	6	7	8	9
Equal Opportunities	Pearson	1								
	Correlation									
	Sig. (2-tailed)									
Personal influence	N	108								
	Pearson	.399**	1							
	Correlation									
Nature of career	Sig. (2-tailed)	.000	.000							
	N	108	108							
	Pearson	.576**	.470**	1						
Development opportunity	Correlation									
	Sig. (2-tailed)	.000	.000	.000						
	N	108	108	108	108					
Development opportunity	Pearson	.347**	.389**	.365**	1					
	Correlation									
	Sig. (2-tailed)	.000	.000	.000	.000					
Development opportunity	N	108	108	108	108	108				
	Correlation									
	Sig. (2-tailed)	.000	.000	.000	.000	.000				
Development opportunity	N	108	108	108	108	108	108			

Workplace Challenge	Pearson Correlation	.632**	.696**	.615**	.611**	1				
	Sig. (2-tailed)	.000	.000	.000	.000					
	N	108	108	108	108	108				
Employee recognition	Pearson Correlation	.434**	.556**	.419**	.793**	.673**	1			
	Sig. (2-tailed)	.000	.000	.000	.000	.000				
	N	108	108	108	108	108	108			
Supervisor behaviour	Pearson Correlation	.561**	.753**	.547**	.634**	.772**	.730**	1		
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000			
	N	108	108	108	108	108	108	108		
Ethic & integrity	Pearson Correlation	.757**	.672**	.548**	.179**	.492**	.299**	.565**	1	
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000		
	N	108	108	108	108	108	108	108	108	
Job empowerment	Pearson Correlation	.778**	.455**	.571**	.244**	.504**	.308**	.437**	.644**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000	
	N	108	108	108	108	108	108	108	108	108
Job satisfaction	Pearson Correlation	.521**	.630**	.414**	.354**	.662**	.443**	.601**	.533**	.522**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000	.000
	N	108	108	108	108	108	108	108	108	108

\*\* . Correlation is significant at the 0.01 level (2-tailed).

The researcher attempted to find the correlation between nine independent variables and a dependent variable, therefore the correlation analysis was implemented (as seen in table-3). It was found that the value of Pearson correlation for equal opportunity = .521\*\* > .01 therefore there is a positive and significant correlation between equal opportunity and job satisfaction, in terms of the strength it was found to be a moderate correlation, the value of Pearson correlation for personal influence = .630\*\* > .01 therefore there is a positive and significant correlation between personal influence and job satisfaction, in terms of the strength it was found to be a strong correlation, the value of Pearson correlation for nature of career = .414\*\* > .01 therefore there is a positive and significant correlation between nature of career and job satisfaction, in terms of the strength it was found to be a weak correlation, the value of Pearson correlation for development opportunity = .354\*\* > .01 therefore there is a positive and significant correlation between development opportunity and job satisfaction, in terms of the strength it was found to be a weak correlation, the value of Pearson correlation for workplace challenge =

.662\*\* > .01 therefore there is a positive and significant correlation between workplace challenge and job satisfaction, in terms of the strength it was found to be a strong correlation, the value of Pearson correlation for employee recognition = .443\*\* > .01 therefore there is a positive and significant correlation between employee recognition and job satisfaction, in terms of the strength it was found to be a weak correlation, the value of Pearson correlation for supervisor behaviour = .601\*\* > .01 therefore there is a positive and significant correlation between supervisor behaviour and job satisfaction, in terms of the strength it was found to be a strong correlation, the value of Pearson correlation for ethics and integrity = .533\*\* > .01 therefore there is a positive and significant correlation between ethics and integrity and job satisfaction, in terms of the strength it was found to be a moderate correlation, and the value of Pearson correlation for job empowerment = .522\*\* > .01 therefore there is a positive and significant correlation between job empowerment and job satisfaction, in terms of the strength it was found to be a moderate correlation.

Table.2: Model Summary

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.736 <sup>a</sup>	.542	.538	.33447

a. Predictors: (Constant), empowerment, development, personal, career, ethic, challenge, recognition, behaviour, equal

It was found that the value of R square = .542 (as seen in table-4) this indicates that 54% of the variables have been explained.

Table.3: ANOVA

ANOVA						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	129.814	9	14.424	128.933	.000 <sup>b</sup>
	Residual	109.745	981	.112		
	Total	239.559	990			

a. Dependent Variable: satisfaction

b. Predictors: (Constant), empowerment, development, personal, career, ethic, challenge, recognition, behaviour, equal

It was found the value F = 128.933 and since the value is greater than .001, this indicates that that there is a positive association between variables used to test research hypotheses.

Table.4: Coefficients

Coefficients						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.687	.104		6.617	.000
	Equal opportunities	.448	.023	.521	19.213	.000
	Personal influence	.584	.023	.630	25.509	.000
	Nature of career	.414	.029	.414	14.336	.000
	Development opportunity	.269	.023	.354	11.925	.000
	Workplace challenge	.671	.024	.662	27.796	.000
	Employee recognition	.389	.025	.443	15.566	.000
	Supervisor behaviour	.571	.024	.601	23.659	.000
	Ethic & integrity	.446	.022	.533	19.831	.000
	Job empowerment	.497	.026	.522	19.274	.000

a. Dependent Variable: satisfaction

The researcher utilized multiple regression analysis to find the most effective and suitable factors increasing level of job satisfaction in private companies in Kurdistan. It was found that the value of B for equal opportunity = .448 > .001

and P-value = .000, this indicated that there is positive relationship between equal opportunity and job satisfaction, accordingly the first research hypothesis was supported which stated that ‘ ‘ Work engagement mediates the positive

relationship between equal employee opportunities (fair treatment) and job satisfaction”, the value of B for personal influence = .584 >.001 and P-value = .000, this indicated that there is positive relationship between personal influence and job satisfaction, accordingly the second research hypothesis was supported which stated that “ Work engagement mediates the positive relationship between personal influence and job satisfaction”, the value of B for nature of career = .414 >.001 and P-value = .000, this indicated that there is positive relationship between nature of career and job satisfaction, accordingly the third research hypothesis was supported which stated that “ Work engagement mediates the positive relationship between nature of career and job satisfaction”, the value of B for development opportunity = .269 >.001 and P-value = .000, this indicated that there is positive relationship between development opportunity and job satisfaction, accordingly the fourth research hypothesis was supported which stated that “ Work engagement mediates the positive relationship between development opportunity and job satisfaction”, the value of B for workplace challenge = .671 >.001 and P-value = .000, this indicated that there is positive relationship between workplace challenge and job satisfaction, accordingly the fifth research hypothesis was supported which stated that “ Work engagement mediates the positive relationship between workplace challenge and job satisfaction”, the value of B for employee recognition = .389 >.001 and P-value = .000, this indicated that there is positive relationship between employee recognition and job satisfaction, accordingly the sixth research hypothesis was supported which stated that “ Work engagement mediates the positive relationship between employee recognition and job satisfaction”, the value of B for supervisor behaviour = .571 >.001 and P-value = .000, this indicated that there is positive relationship between supervisor behaviour and job satisfaction, accordingly the seventh research hypothesis was supported which stated that “ Work engagement mediates the positive relationship between supervisor behaviour and job satisfaction”, the value of B for ethic and integrity = .446 >.001 this indicated that there is positive relationship between ethic and integrity and job satisfaction, accordingly the eighth research hypothesis was supported which stated that “ Work engagement mediates the positive relationship between ethics and integrity and job satisfaction”, and the value of B for job empowerment = .497 >.001 and P-value = .000, this indicated that there is positive relationship between job empowerment and job satisfaction, accordingly the ninth research hypothesis was supported which stated that “ Work engagement mediates

the positive relationship between job empowerment and job satisfaction”.

#### IV. CONCLUSIONS

Employee engagement is a positive attitude towards the workplace and is the degree that an individual is bind to the organization. This research highlighted the significance of workplace challenge that inspires the individuals to be more engaged to their organization. Only small number of employees had participated in this research from private companies in Kurdistan, which limits the outcome of the study. The researcher used quantitative research method in order to measure the relationship between work engagement and job satisfaction, however only 108 respondents were participated in the current study. The researcher used multiple regression analysis to measure the relationship among variables, in private companies, most of the employees depend and get excited more upon the workplace challenge, and it demonstrates a positive indication of the employees revealing the attachment and engagement of employees to the organization. According to multiple regression analysis, the researcher found that workplace challenge had the highest value among other work engagement elements = .671 and P-value = .000, which indicates that many private companies’ employees are engaged to their job because of time management, Overwhelming workloads and communication.

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# Analysis of the Relationship between Lifestyle and Coffee Consumption Habits, from the Myth Approach, in the Municipalities of Orizaba, Tehuipango, and Zongolica Veracruz.

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**Abstract**— *Coffee consumption habits have evolved along with society for more than 300 years around the world. Social changes imply different lifestyles in each culture. Lifestyles influence the myths used by people in their consumption decisions. The objective of this research is to determine the relationship between lifestyle and coffee consumption habits, from the perspective of myth, in the inhabitants of the Mexican municipalities of Orizaba, Tehuipango, and Zongolica. A survey was conducted with a sample of inhabitants of the three municipalities studied. The statistical analyzes applied were the central limit theorem, Pearson, and Chi-square. The results show that the variables Consumption habits-Lifestyle-Myth, are highly dependent on the level of perception of people. It is concluded that the coffee myth corresponds to the "family union" in the study municipalities. This myth is not characterized in the evolutionary stages contemplated in the "waves of coffee".*

**Keywords**— *Coffee, Consumption habits, Lifestyle, Myths.*

## I. INTRODUCTION

Consumption habits are a "talk". Roland Barthes defines the "talk" in his book "Mythologies". According to Barthes, "talk" constitutes a semiological system that gives rise to myth. The myth can be linguistic or non-linguistic (Barthes, R., 2010). For example, we must consider history to analyze the lifestyles of people. By knowing the lifestyle of people, it is possible to know the habits of coffee consumption. In this way, the myth is characterized.

Coffee is a beverage that is prepared by infusion. The infusion is made with roasted and ground coffee seed. This definition refers linguistically to the raw material (seed) that is transformed (toast, grind and infuse). The result of the transformation is a liquid suitable for human consumption (drink). However, the *Real Academia Española* (RAE) also shows definitions such as drunk coffee (breakfast), concert

coffee (establishment where music is played), Irish coffee (with cream and whiskey), among others. These last definitions have characteristics that are related to social places or with a defined habit of consumption (Real Academia Española, 2017).

Sociology, anthropology, and epidemiology are the sciences that have contributed most to the development of the concept of lifestyles. These sciences define lifestyles as group behavior patterns. Behavioral patterns have a strong influence on the social structure. Lifestyles are composed of habitual reactions and patterns learned in the processes of socialization. The learning is done with parents, classmates, friends, and siblings or by the influence of the school and the media. The learnings are interpreted and applied in diverse social situations. Lifestyles are not fixed, but they present constant changes (Álvarez, L., 2012).

Digital and online innovation is essential in technological change in companies and society. Social networks are alternatives of supply and demand in the digital market. These social networks serve to develop customer loyalty strategies in digital marketing. The most representative social networks are Facebook, YouTube, Twitter, and Instagram. (Quevedo Tacha, P. A., 2017).

"Consumption habits" is a compound word. Its concept is composed of the words "habit" and "consume." The RAE defines "habit" as a special way of proceeding or behaving acquired by repetition of equal or similar acts or originated by inherent tendencies. The same RAE defines "consume" as Using groceries or other goods to satisfy needs or desires. Therefore, consumer habits are unique ways of behaving when using a good. The good has the objective of satisfying needs and desires. These decisions are repeated equally or similarly.

Marketing helps individuals get what they need and want. This help is made through the creation and exchange of products and values. The relations of creation and exchange of value are studied in disciplines such as psychology, neuromarketing, and behaviorism (models of consumer behavior). These models seek to understand what happens in the conscience of the buyer. The buyer's conscience influences the decision to acquire a product or a service. Thus, consumer behavior defines the marketing mix. The marketing mix seeks to position products in the minds of consumers. For example, marketing decisions can be oriented towards design, production volume, distribution, and location. Brain processes explain the behaviors and decision making of consumers. In this way, marketers can make marketing decisions based on consumer behavior. (Torrez, R. et al., 2017; Victoria K. Wells, 2014)

The mass media are a way of transmitting marketing strategies. Television is an essential means of communication. Among others, the advertisements that are transmitted corresponding to the food sector. Not all foods

and beverages are considered healthy. However, the content of 'healthy' food advertisements may encourage individuals to build their concept of healthy eating. The changes in diet are associated with the expectation of a modern and "Americanized" diet. This induced perception contributes to the development of health problems. The Caribbean and the Antilles are an example of the trends of diseases related to diet. The most common diseases are diabetes, obesity, hypertension and heart disease. There are also intertwined ecological, economic and social changes that hinder access to a local source of healthy protein (del Castillo, J. A. G., & Sánchez, C. L., 2017, López-Briones Reverte, C., 2017, Paddock, J. R., 2017).

Cultural aspects are essential to know the elements to which people assign value. Cultural transformation implies that new generations build urban culture and lifestyles. These constructions are made from new practices, representations, and imaginaries about their place of residence and the patrimonial. These representations hinder the homogenization of culture and consumption. Cultural aspects are linked to myth. The myth is a semiological system. Semiology is a tripartite relationship between the signifier the meaning and the symbol. Relationships are a communication system that does not necessarily imply a human being as a sender but as a receiver. Authentic visions are semiological. Thus, myth is a mode of meaning. It is composed of a three-dimensional scheme. The three dimensions are the signifier, the meaning and the sign (Myth). The signifier has sensorial reality (the senses capture it). The meaning is determined by the concept. The concept is built based on history (learning). The sign is the union of the signifier and the meaning. The sign is the myth (Matus, C., 2017, Rapaille, C., 2007, Eco, U., 2016, Zeind-Palafox, E., 2017, Barthes, R., 2010).

The objective of this article is to show the relationship that exists between lifestyles and coffee consumption habits. This relationship builds a coffee myth. The myth of the inhabitants of the municipalities of Zongolica, Tehuipango, and Orizaba is studied.

## II. BACKGROUND

### 1. The context of coffee consumption.

Coffee is a favorite product and is marketed internationally. Coffee consumption is increasing in the world. Many people consume more than one cup of coffee per day. It is common to have a favorite type of coffee associated with a specific context. The coffee drink has individual sensory characteristics. Also, it is a stimulant due to the caffeine it has. Some research shows that lifestyles cause an increase in the consumption of high-quality coffee. For example, Korean people of the "Y" generation are those who consume the most high-quality coffee. (Ruiz, LMP, & Gómez, JAM,

2017, Spinelli, S. et al., 2017, Kim, D. & Jang, S., 2017; Sarabia-Peynado, J. & Vásquez-García, M., 2017).

Soft drinks, energy drinks, and coffee predominate in products with caffeine content. Caffeinated products are widely available in the market. The consumption of products with caffeine is increasing among adolescents. Adolescents consume products with caffeine for reasons of stimulation, pleasant feelings and availability in the market. Adolescents prefer to consume coffee in more diverse social contexts. However, they consume energy drinks in sports contexts and living with friends. Contexts determine the type of beverage with caffeine content (Kim, D., & Jang, S., 2017; Ludden, A. B, et al., 2017).

Montero Bravo et al. (2006) studied the behavior of eating habits and other lifestyles according to the degree of knowledge that people have about nutrition and dietetics. The results indicated that eating habits are not relevant to the type of food that people choose. However, people choose the type of coffee consumed based on the information they have about the product. Information and education are essential in coffee consumption decisions (Sarabia-Peynado, J. & Vásquez-García, M., 2017).

## 2. Evolution in coffee consumption.

Coffee has evolved in three stages called "coffee waves." The companies "My Coffee Box" (2017) and "Animal Gourmet" (2014) describe what are considered the three "waves of coffee." Coffee waves also appeared in Mexico, but at different times (Escamilla-Prado & Landeros-Sánchez, 2016).

The first wave refers to the way to prepare the drink. The preparation can be soluble, milled or with milk (and its variants). The first wave is socially framed at the end of World War II. The coffee industry privileged the volume of production and low prices. The first stage ends in 1989 in Mexico. Arabica coffee was produced under the classification of "conventional." The International Coffee Organization regulated commercialization. The New York Stock Exchange set the price of coffee in the category of "commodities." Mexican coffee had a lower price due to "poor quality" (Escamilla-Prado, E., Landeros-Sánchez, C., 2016).

The second wave is contextualized in the European industrial revolution. It is characterized by the creation of espresso extraction machines. The espresso machines led to the creation of coffee shops. The cafeterias motivated the distinction of "conventional" and "specialty" coffee. The second wave of coffee appears in Mexico from 1990 to 2010. The way coffee is produced changes. Coffee goes from conventional production to organic production. Coffee gets certifications by particular attributes. The attributes were: organic, fair, friendly with the birds, seal of small producers and sustainable. The coffee grower organizations

were incorporated into these forms of production. The leading organizations that participated were from Oaxaca and Chiapas. There is a relationship between the attributes of the packaging and the decision to purchase independent brands in the coffee category. Independent brands compete with leading brands. The visual attributes of packaging can influence the buyer for their choice between leading or independent brands. In the visual attributes of the package, the psychology of the color can influence the purchase preference (Escamilla-Prado, E., Landeros-Sánchez, C., 2016, Aranda, P. A. L., 2017, Rincón Ruiz, C. P., 2017).

Finally, the third wave is characterized by the conscience of the consumer. It assigns importance to the impact of coffee in different dimensions. The dimensions are mainly considered as social, environmental, health and "art" aspects in preparation. The third wave of coffee appears in Mexico as of 2010. Coffee is produced in micro-lots. The lots are formed in quantities of 20 to 150 bags. The coffee drink has extraordinary properties. Coffee is considered a specialty. The baristas and roasters contributed to the formation of the third stage. Current US customers helped the introduction of specialty coffee to different markets (Escamilla-Prado, E., Landeros-Sánchez, C., 2016).

## 3. Assessment of coffee consumption.

The assessment of coffee consumption can be approached from the following aspects: 1) preference of the context; 2) physiological sensitivity to caffeine; 3) symbolic attributes. The preference of the context provides information on what is valued in the experience of coffee consumption. The tasters and non-tasters prefer to consume coffee in a social context. Physiological sensitivity refers to the metabolism capacity of caffeine and the number of fungiform papillae. Symbolic attributes are related to culture and can be studied with semiotic tools. People value sensory properties when they metabolize caffeine faster and have fewer fungiform papillae. On the contrary, people value social characteristics when they metabolize caffeine slowly and have a more significant number of fungiform papillae. The symbolic attributes characterize coffee as a specialized product. Specialization is a competitive advantage. For example, Jamaican coffee has characteristics that are considered a competitive advantage. Its competitive advantages help cushion the bargaining power of global coffee buyers (Spinelli, S. et al., 2017, Mighty, M. A., 2017).

The societies have a diversity of consumption. The field of consumer culture addresses the role of ritual processes in consumption. Consumers share moral dispositions and cultural practices. Consumers manipulate ritual processes to distinguish themselves from other consumers. The ritual processes influence the tastes of consumers. The practices performed by people are linked to the social class to which they belong. The new urban middle social classes share

some qualities inside and outside society. Under this context, everyday coffee consumers are analyzed. There are ethnographic studies about the coffee consumption of knowledgeable people. The studies point to taste as a ritual of transformation. Regular consumers can become knowledgeable consumers because of the taste. The concept of coffee flavor can differentiate between mass consumption and the consumption of connoisseurs. There are studies on coffee from an anthropological perspective. Anthropological studies seek to analyze the dimensions covered by the "coffee world." Television offers ads related to coffee. The anthropological analysis can be done considering the context of television programming. The context of the programming conditions the perceptions of the coffee spectators. The programming context includes cultural aspects of the viewers (Shaker-Ardekani, R., & Rath, J., 2017, Quintão, RT, et al., 2017, Sherry Jr, J. F., 1995).

#### 4. Cross perception, characteristics and sensory properties of coffee.

Some studies deal with perception. A perception technique is cross perception. Cross perception research can be useful for people who prepare coffee. The baristas can use the information to decide the presence of the coffee and transmit a message according to the expectations of the consumer. This technique serves to investigate interactions between different sensory modalities. The relationships between taste and expectations serve to study the perception of the coffee consumer. These studies can be done in a multicultural way. An example is the study of cross perception that was carried out with people from China, Colombia, and the United Kingdom. The results indicated that people expect aromatic coffee in cups with a little diameter. People also expect coffee to be more bitter and intense in small cups. On the contrary, people expect coffee to be sweeter in larger diameter cups. The results are also related to aspects of culture. Participants in the United Kingdom expect coffee cups to be hotter (George Van Doorn et al., 2017).

The third wave of coffee involves the consumption of high-end coffee or premium coffee. A high-end coffee is one that has information about production processes, sensory, social and functional characteristics, health benefits, origin. High-quality coffee is consumed in exclusive coffee shops. The consumption of high-end coffee is studied from the aspect of value creation and capital accumulation. The accumulation of capital is a characteristic of neoliberal globalization. Neoliberalism studies the creation of value from social and economic theories. Social and economic theories study the production and extraction of surplus value through global trade. Toast and baristas create surplus value when they develop a new quality lexicon for coffee. The

surplus value is one of the best ways to generate value for money in the coffee market. The perception of luxury value motivates the consumption of high-quality coffee. Luxury value is characterized by materialism, conformity, visible trends and functional dimensions. Surplus value uses social and cultural capital in the creation of symbols. The surplus value of coffee confirms the classic patterns of dependence on the accumulation of global capital (Fischer, E. F., 2017, Sarabia-Peynado, J., & Vásquez-García, M., 2017; Kim, D. & Jang, S., 2017).

There is a generation of people called Millennials. Millennials look for new experiences. Value-added products produce new experiences and social status. International trade is a new shopping experience. Electronic commerce allows transactions with few intermediaries. With e-commerce, it can buy premium products. Social status is a privilege derived from the consumption of premium products. The perception of coffee depends on the context. However, the willingness of consumers to acquire products with ethical attributes does not always translate into real purchases. One cause of this result is the consumer's lack of credibility that the product has ethical attributes. Some current perceptions are: coffee is a beverage that accompanies it to close the most important business of life. Coffee can help to feel better; coffee helps live with the people in harmony, coffee is a social network without ICTs (Sarabia-Peynado, J. & Vásquez-García, M., 2017; Ruiz, LMP, & Gómez, JAM, 2017; Carlos Montero et al., 2013).

### III. RESEARCH METHODOLOGY

Myths are convictions that people have about a specific topic. These convictions depend on the perception that people have of the phenomenon in question. Perception is based on processes of experience, culture, and learning. Thus, myths are the appropriate sociological tool for studying the behavior of coffee consumers.

The structure proposed by Roland Barthes is used to study the myth of coffee that consumers have. The author proposes a system of three elements: Meaningful (symbol), Meaning, Myth. In the present study, the signifier is approached with the study of consumption habits. The meaning is studied with the lifestyles of people (*Fig.1: Methodology to structure the myth of coffee*). The myth is the relationship that exists between lifestyle and coffee consumption habits. The myth is also complemented by what people think about coffee. The sample consisted of 27 people. The municipalities considered were Zongolica, Orizaba, and Tehuipango. The distribution was as follows: 6 people based in Zongolica; 5 people based in Orizaba; 16 people based in Tehuipango.

The measuring instrument used was the questionnaire. The questionnaire used Likert questions.

The technique of application of the questionnaire was the interview. The statistical tests that were used were the

Central Limit Theorem, Vertical Pearson Correlation, Frequency Distribution and Chi-square.

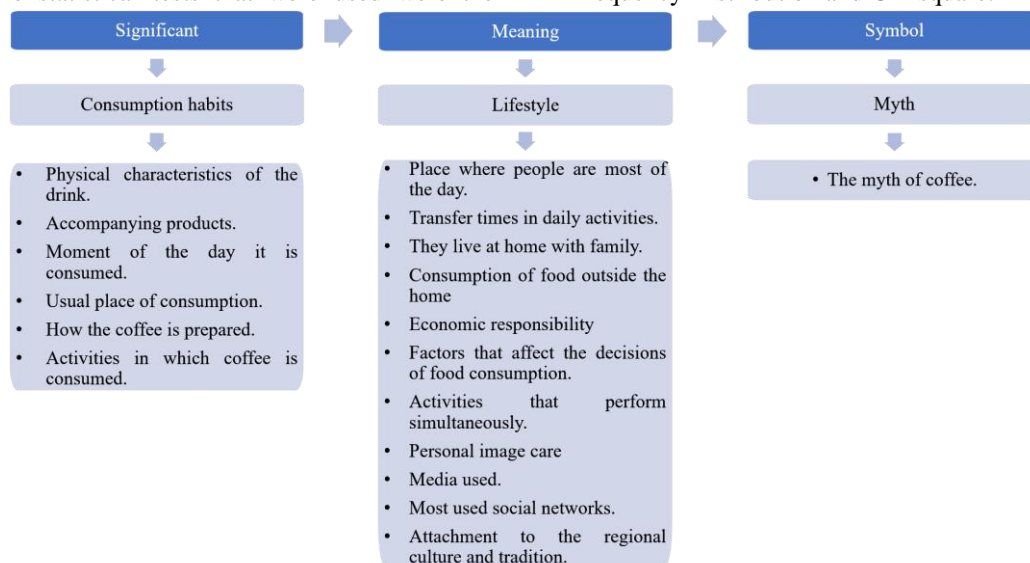


Fig.1: Methodology to structure the myth of coffee.

**IV. RESULT AND DISCUSSION**

The data showed a normal distribution based on the Central Limit Theorem. There was a variation of 0.14 only in the straight average of the general database (Table 1).

Table.1: Proof of normality with the Central Limit Theorem.

Central Limit Theorem			
Municipality	Population average.	Vertical average.	Horizontal average.
General	2.85	2.85	2.99
Orizaba		2.80	
Tehuipango		2.84	
Zongolica		2.83	

Table 2 shows the correlations obtained in Pearson's vertical correlation analysis.

Table.2: Vertical correlation of Pearson.

Vertical Pearson Correlation	
Correlation -Item vs. Item	Correlated items
Consumption Habits (CH)	
0.75 - CH1m - CH1k	The coffee I drink is covered with chocolate chips/whipped cream/ice cream-CORRELATED WITH-The coffee I drink is Latte.
0.81 - CH1m - CH1l	The coffee I drink is covered with chocolate chips/whipped cream/ice cream-CORRELATED WITH-The coffee I drink has another added flavor.

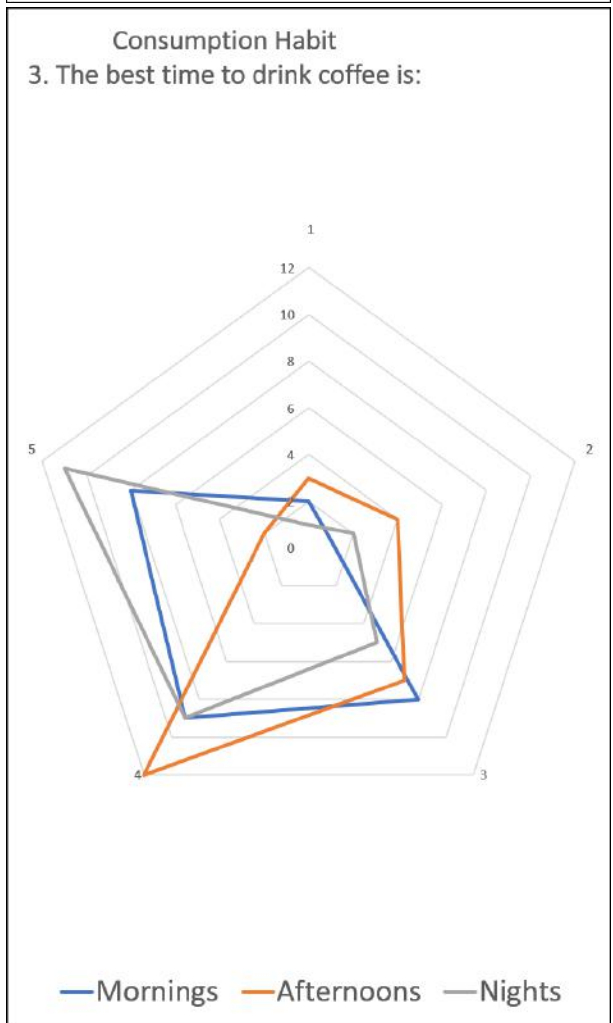
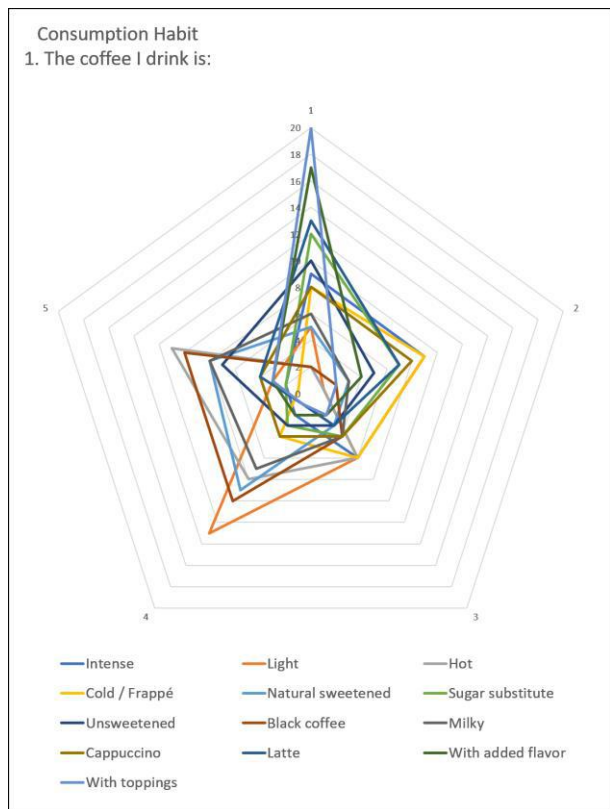
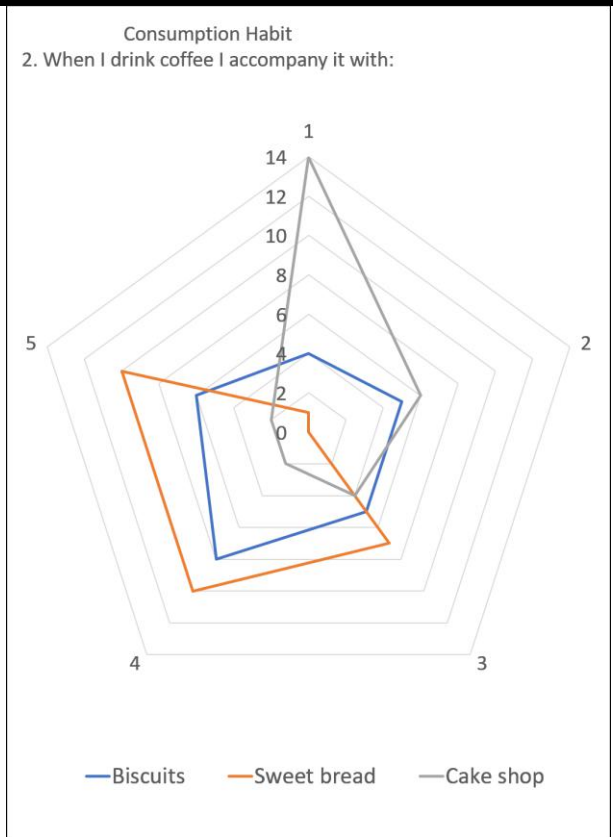
0.74 - CH2c - CH1m	When I drink coffee I accompany it with pastry/cake-CORRELATED WITH- The coffee I drink is covered with chocolate chips/whipped cream/ice cream.
0.72 - CH4e - CH1k	The way to prepare the coffee I drink is in capsule coffee machine-CORRELATED WITH-The coffee I drink is Latte.
0.78 - CH4e - CH4d	The way to prepare the coffee I drink is in capsule coffee machine-CORRELATED WITH-The best place where I drink coffee is in Cafes.
0.7 - CH6c - CH4b	The people I drink coffee with is family-CORRELATED WITH-The best place where I drink coffee is at Home.
0.83 - CH7b - CH4a	I drink coffee when I move-CORRELATED WITH-The best place where I drink coffee is when I move.
Lifestyle (LS)	
0.7 - LS13c - LS11	The social network that I use the most is Whatsapp-CORRELATED WITH-I take care of my image.
0.77 - LS13c - LS12b	The social network that I use the most is Whatsapp-CORRELATED WITH-The most used means of communication is a cell phone with internet.
Myth (My)	
0.79 - My1h - My1g	Coffee is Wisdom-CORRELATED WITH-Coffee is meditation.
Consumption Habits (CH)- Lifestyle (LS)	
0.79 - LS3 - CH4b	I live at home with my family-CORRELATED WITH-The best place where I drink coffee is at Home.

Table 3 shows the level of sensitivity of the variables with the Chi-square analysis.

Table.3: Analysis of Chi-square.

Chi-square analysis (p=0.5)			
Degrees of freedom.	Chi calculated.	Chi observed.	Interpretation.
284 (71 rows and four columns)	1215.86	324.31	The variables are highly dependent on the level of appreciation of the people.

Fig. 2 presents the results in coffee consumption habits. Fig. 3 presents the results of the lifestyle of people. Fig. 4 shows the myths with which people relate to coffee.





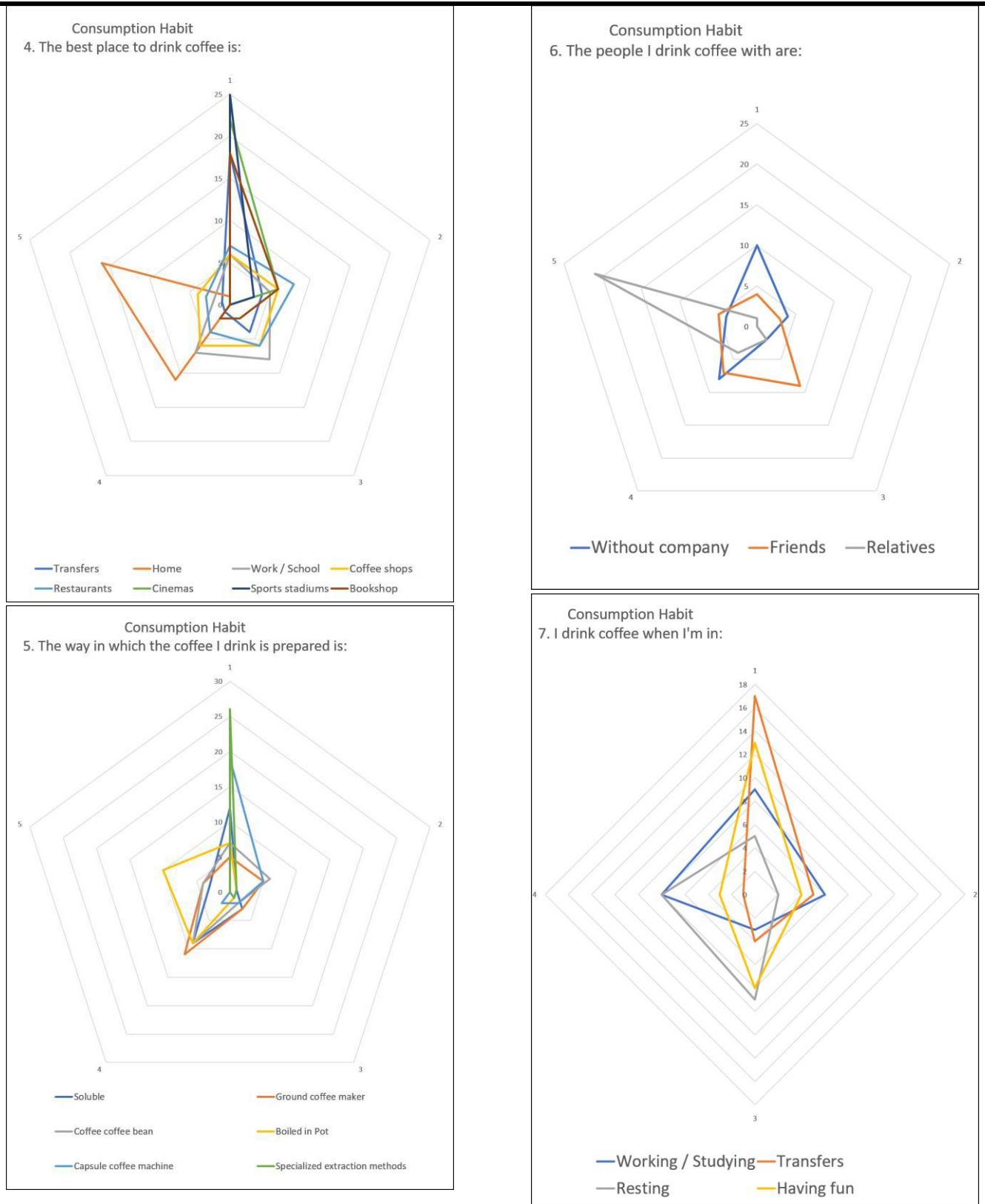
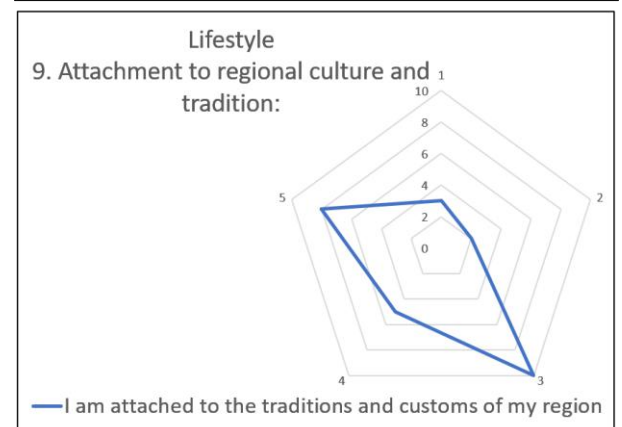
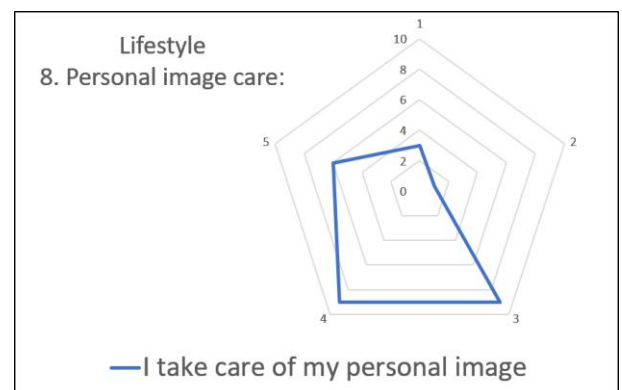
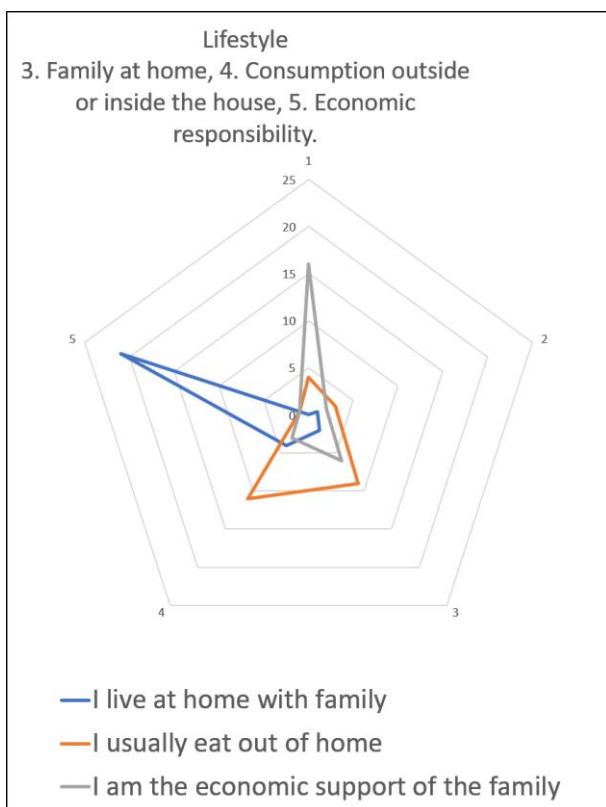
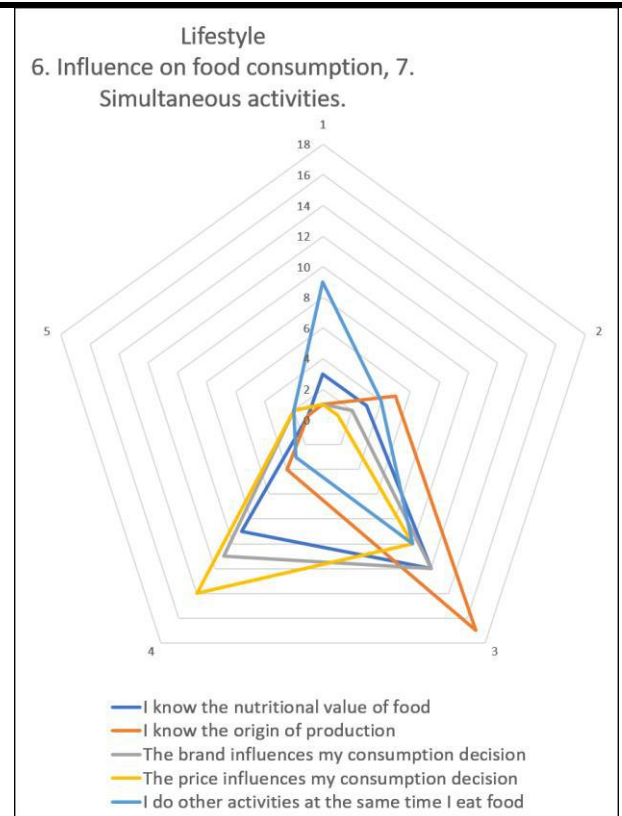
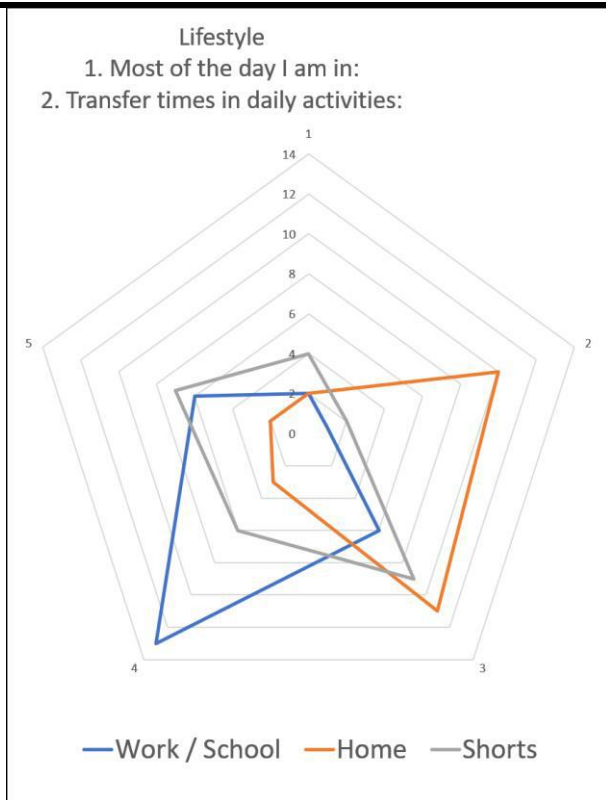


Fig.2: Preference in coffee consumption habits.



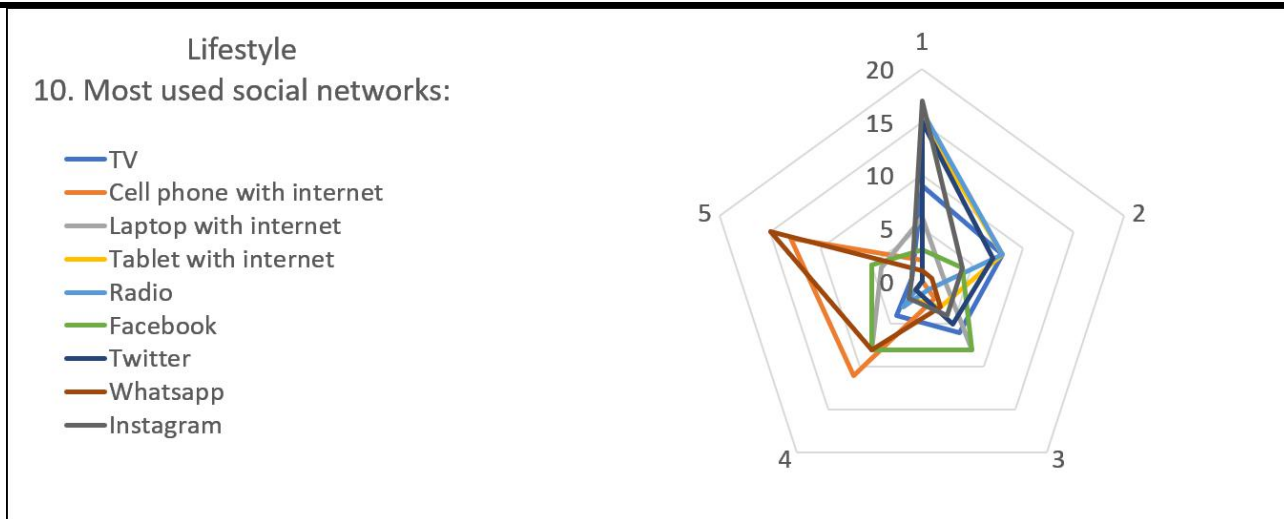


Fig.3: Predominant elements in the lifestyle of people.



Fig.4: Myths with which it is commonly associated with coffee.

With the tables and figures that are shown, it is possible to make inferences based on the study variables. The first analysis corresponds to coffee consumption habits. Consumers drink coffee practically all day, however, prefer to drink it more often in the evenings and nights. The home is the favorite place to drink coffee with family members. People usually rest when they drink coffee. The characteristics of the drink are black coffee, hot, light and naturally sweetened. People prefer to accompany coffee

with sweet bread and cookies. The coffee is prepared mainly soluble, in coffee pots ground and boiled in a pot.

The second analysis is related to the lifestyle of people. Individuals spend most of their time at work or school. The time of transfer from their homes to their work/school is short. Most people live with their families and do not have the main economic responsibility in their homes. People usually eat outside the home and at the same time perform other activities. Individuals do not know the nutritional value of their food, but the origin of production. The price and the brand constitute relevant elements in the decisions of purchase and consumption. Individuals give value to the care of the personal image. The roots of the traditions and culture of the region show heterogeneity in the population. WhatsApp is the most used social network. The use of mobile phones with internet access is preferred for communication.

The third analysis corresponds to the myth. Coffee is mainly related to positive attributes. However, respondents think that coffee can be harmful to health.

## V. CONCLUSION

The analysis of the results shows that the characterization of the coffee myth is involved in the inhabitants of the municipalities analyzed.

The signifier (Consumption Habits) is hot, black, sweet (natural) coffee and accompanied by bread or cookies.

The meaning (Lifestyle) is the family. Coffee unites work and family environments. People are influenced by communication technologies, social networks and the transformation of culture.

The family unit is the myth of coffee for the inhabitants of the municipalities analyzed. This myth is not characterized in the evolutionary stages contemplated in the "waves of coffee."

The global trends in coffee preparation and consumption are not relevant in the municipalities studied.

The results can serve as support for the development of marketing strategies for coffee in the area.

## VI. ACKNOWLEDGEMENTS

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# Quantic Analysis of the Adherence of a Gram-Negative Bacteria in A HEPA Filter

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**Abstract**— It is known that Gram-negative bacteria (GNB) are the most frequent bacteria in hospital units. It is also known that GNBs generate a greater number of nosocomial infections in critical areas. In the present work, the adhesion of the bacterial cell wall (BCW) to the compounds of the material layers of a high efficiency filter (HEPA) was analyzed. The analysis was carried out by means of molecular simulation and quantum chemistry. The BCW and HEPA molecules were designed using Hyperchem software for simulation. The calculations of the quantum interactions of the molecules were carried out using the theory of the electron transfer coefficient (ETC). It obtained from 4 to 6 compounds that are more likely to interact even as a chemical reaction. The compounds of the glass fibers are the ones that work best for the adhesion and destruction of the BCW.

**Keywords**— Quantum study, Bandgap, Electron Transfer Coefficient, Adhesion, Bacterial Cell Wall, HEPA filter.

## I. INTRODUCTION

In the hospital units, we can find an environment contaminated by the diversity of patients with their illnesses. Within this contaminated environment, there are the problem of the generation of acquired infections, called intra-hospital or nosocomial infection (NI) infections that aggravate the quality of the patient's health, generating extra costs of stay and treatment. In Mexico it has been estimated that the frequency of NI in hospital units varies from 2.1 to 15.8%, the most common being pneumonia, urinary infection, surgical infection, and bacteremia [1]. More than 1.4 million people in the world get infections in the hospital. Between 5% and 10% of patients who enter modern hospitals in the developed world will contract one or more infections [2].

## Most frequent Gram-negative bacteria in a hospital

Bacteria with rod characteristics (bacilli) are classified based on the structure of their cell wall in Gram-positive bacteria and Gram-negative bacteria.

The data provided by the U.S. National Healthcare Safety Network (NHSN) indicate that GNB is responsible for more than 30% of the NI and that these bacteria predominate in cases of in-hospital pneumonia (NIH) in 47%, and urinary tract infections in 45%. Infections caused by GNB trigger problematic characteristics due to their ability to adapt and acquire genes that code for the mechanisms of resistance to antibiotics [3].

Some GNB organisms that predominate over respiratory infections (causing NIH) are *Haemophilus influenzae*, *Klebsiella pneumoniae*, *Legionella pneumophila*, *Pseudomonas aeruginosa*. On urinary infections are: *Escherichia coli*, *Proteus mirabilis*, *Enterobacter cloacae*, *Serratia marcescens*; on blood infections are: *Klebsiella*, *Escherichia coli*, *Enterobacter* and *Pseudomonas aeruginosa*; and on gastrointestinal infections are: *Helicobacter pylori*, *Salmonella enteritidis*, *Salmonella typhi* [4].

## Bacterial cell wall

The bacterial cell wall (CBW) has a thickness of 10 x 25 nanometers (nm) and is constituted by murein, lipoproteins, and lipopolysaccharides that constitute up to 80% of the weight of the cell wall. In Gram-positive bacteria (Gram +) the cell wall is formed by several layers of murein or peptidoglycan. In Gram-negative bacteria (Gram -) the wall is formed by a single layer of murein and by lipoproteins [5].

## The ETC theory.

The BG is defined as the energy difference between the valence band and the conduction band. In the BG there

are no electronic states available; this means that when an electric field is applied the electrons cannot increase their energy.

In quantum theory, it is known as HOMO and LUMO, and in the old theory they are known as E- and E+. The LUMO is defined as the range of electronic energy that allows acceleration in electrons by the presence of electrical currents and is also called conduction band; HOMO is defined as the highest energy interval that is occupied by electrons in absolute zero value and is called valence band. The HOMO is the most electron-filled orbital, while the LUMO is the orbital that lacks electrons. The HOMO equaled to zero (HOMO 0) is the last layer full of orbitals meaning that it is in the last valence orbital. The LUMO equaled to zero (LUMO 0) is the last layer that lacks electrons

EP is defined as the total potential energy of the molecule. It is an electrostatic field vector that is defined as the potential that the electron needs to jump the Bohr radius (0.53 Armstrong) by its calculated natural electromotive force (EMF). The negative E value (E-) is the electrostatic potential with negative poles, while the positive E value (E+) is the proton-electron potential [6]. The EP, in other words, means that having 1 EP is having 1 volt for Armstrong. The EP is obtained by the absolute difference of E- and E+.

The ETC is defined as the dimensionless parameter that describes an electrochemical reaction, which is interpreted as the number of times the potential energy needs to jump to the BG. It is calculated by dividing the BG and the EP entirely. That is, if it has a BG of 10 and an ETC of 40, it means that you need 40 times the EP value in EV so that the BG of 10 jumps from the HOMO to LUMO.

The quantum well is defined as the area in which the value of the ETC may fall. These zones are divided into 3 (Fig. 1):

1. The high probability area. It is the area below the inferior limit of the ETC of a compound (ZONE I) where a very high probability that a chemical reaction or simple molecular interaction occurs.
2. The medium probability area. It is the area between the inferior and superior limit of the ETCs of both compound interacting (ZONE II).
3. The low probability area. It is the zone above the superior limit of the ETC of a compound (ZONE III). It is the zone where a very low probability molecular interaction occurs [7 - 11].

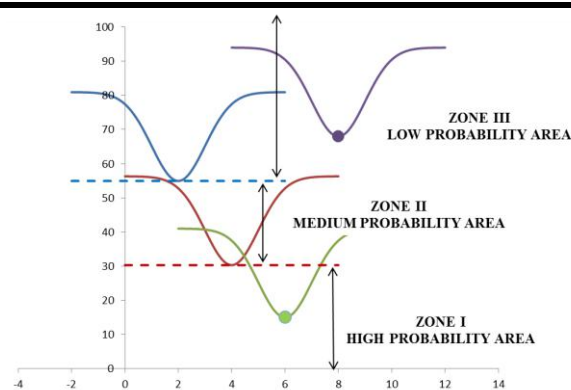


Fig.1: Probability zones for molecular interaction according to their quantum wells ETCs

### HEPA air filters

The objective of high-efficiency air filters (HEPA) is to remove the particles that are inside an air conditioning system for the purification of the environment. These filters are composed of a random fiber mesh with diameters between 0.5 and 2.0 micrometers ( $\mu\text{m}$ ) composed of layers of various compounds such as cellulose, synthetic fibers (polyacrylonitrile) or glass fibers, also use latex and chitosan.

## II. MATERIALS AND METHODS

We carried out the values, and simulation of the molecules of the compounds with the HYPERCHEM software. The software must be in SEMIEMPIRICAL form to perform the calculation of the BG, the EP, and the ETC. When the complete molecule is drawn, the values of HOMO (-), LUMO (+), E- and E+ are obtained, in value at zero and with a density of 0.015. The values that are recorded will be captured in an Excel sheet, and the operations will be carried out to obtain BG, EP, ETC. To obtain the cross-band of the compounds, it is done taking the value HOMO and E- of the first compound and the value of the LUMO and E+ the second compound. The lower ETC of the cross band will be the value that will determine which compound will be more reactive and will serve as data that will be placed in the quantum well graphs. To establish the limits of the graphs, the higher ETC will be placed at the upper limit and the lower ETC as, the lower limit of the compounds to be compared. The molecules that were taken for the simulation are listed in Table 1.

Table.1: Molecules interacting

Chemical substance	Abbreviation	Molecule
Bacterial cell wall	CBW	

Molecules of HEPA filter compounds

Silicon oxide	SiO <sub>2</sub>	<chem>O=[Si]=O</chem>
Polyacrylonitrile methylacrylate	AMA	<chem>*CC(=O)OC(C)C#N</chem>
Polyacrylonitrile methyl methacrylate	AMM	<chem>*CC(=O)OC(C)C#N</chem>
3 cellulose monomers	3C	<chem>O[C@@H]1[C@H](O)[C@H](O)[C@@H](CO)O1</chem>
Latex	Latex	<chem>*C=C(C)C</chem>
Chitosan	Cht	<chem>*NC(=O)N[C@@H]1[C@H](O)[C@@H](O)[C@@H](CO)O1</chem>

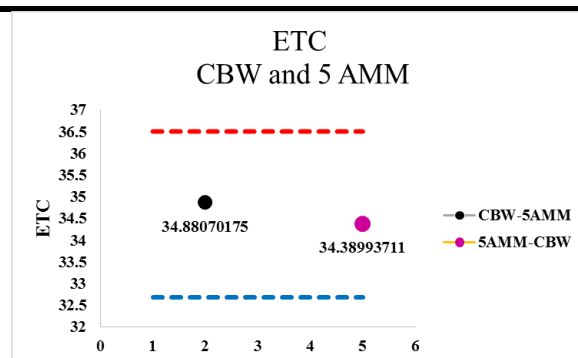


Fig.4: It can be seen that both cross-band options are in the medium probability zone; but, there is more affinity of the WCB as an oxidizing agent.

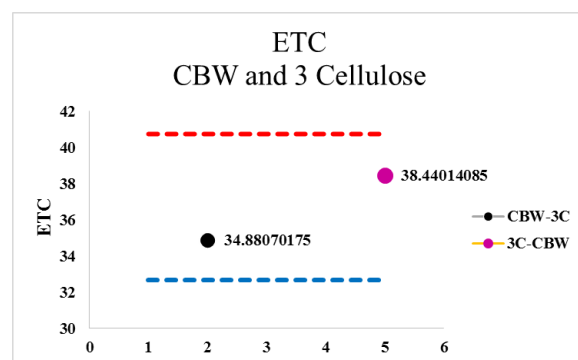


Fig.5: The CBW tends to behave as a reducing agent and adhere to the lower limit. Both cross-band interactions are in the medium probability zone.

### III. RESULTS AN DISCUSSIONS

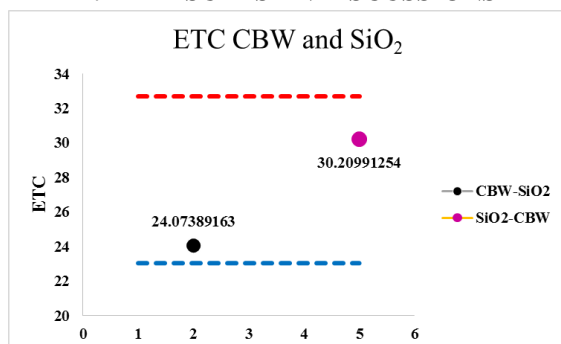


Fig. 2: The CBW tends to be reducing and adhering by approaching the lower limit.

In Fig 2, Fig 5 and Fig 7 it can be argued that CBW tend to react by adhering to the compounds. Since their ETC values obtained from the cross band are close to the lower limit of the quantum well (approaching more than 75% of reaction probability). Concluding that CBW acts as a reducing agent.

In Fig 4 and Fig 6 it can be argued that by keeping both compounds in the middle range of the quantum well limit will depend on external conditions to know which compound is most likely to react as a reducing agent and achieve adherence.

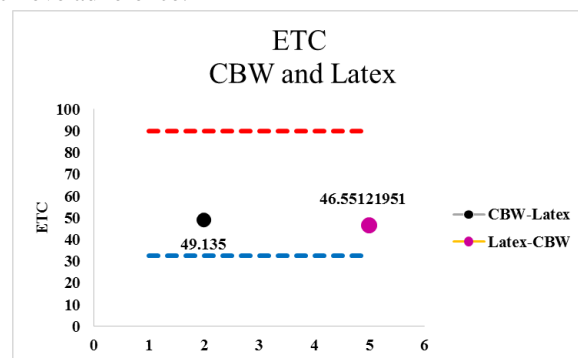


Fig.6: Both cross-band interactions are located in the medium probability zone. It is a similar case shown in Figure 4; but the difference is highlighted in the values of the ETCs.

In Fig 3 it can be argued that the value of the ETC obtained from the crossed band exceed the lower limit of the quantum well, meaning that the PCB acts as a reducing agent with a reaction probability above 75%.

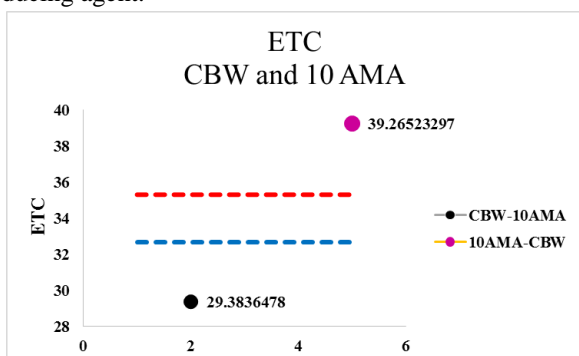


Fig.3: Both interactions of cross-bands are outside the medium probability zone; but, the CBW (as a reducing agent) has a lower ETC than the lower limit that places it in the high probability zone.



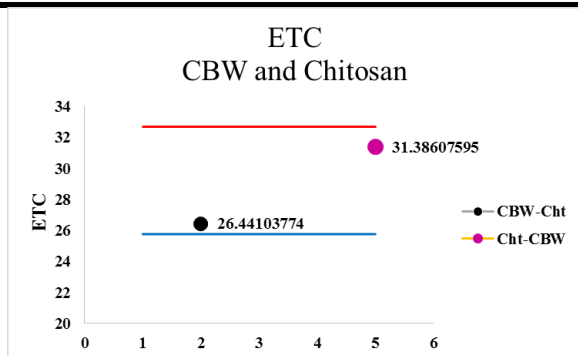


Fig.7: Both cross-band interactions are located in the medium probability zone. It is a similar case shown in Figure 2; but the difference is highlighted in the values of the ETCs.

It can be determined that the closer the value of the cross-band ETC is to the lower limit (which represents the 75% reaction probability). It is determined that this compound will be the best compound to act as an oxidant since it is sought that the PCB is the one that acts as a reducing agent to achieve its adherence to the compounds. According to this, the compound that works best as an oxidant concerning PCB is silicon, for obtaining the smallest value of ETC in its cross-band.

#### IV. CONCLUSION

The lower cross-band values of the ETC indicate that they are the best reactants. According to this lower value in the crossed bands of ETC, the compounds that work best as oxidants are Silicon (24,073), Chitosan (26,441), Polyacrylonitrile-Methyl acrylate (29,383) and Cellulose (35,150). PCB is more likely to react by adhering to the compound as long as it works as a reducer or antioxidant. Among the compounds used, the silicon yields a lower value of ETC (24,073), establishing that it is the material that will work best for the attraction of the PCB molecules. For the compounds with the same probability of reacting (latex and polyacrylonitrile-methylmethacrylate), it will depend on external conditions to know which is more likely to adhere. In conclusion, the filters made with higher layers of silicon or glass fibers will be the best for the adhesion of the PCB, improving the environment of microbial agents.

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# Adaptations to Soil Erosion: A Review

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**Abstract**—Soil erosion which is now one of the impacts of climate change due to increased precipitation events across the globe needs adaptations for adjusting to the actual and expected change in its occurrence more than mechanical/engineering measures for the management of the phenomenon. The objective of this paper is to conduct an in-depth review of adaptation strategies to soil erosion. The research made a review of academic/journal articles, internet materials, news articles, conference papers, books and publicly available materials on adaptations to soil erosion. From the review, most authors have a unity of opinion on adaptive strategies to soil erosion, including the use of mulching, cover cropping, reduced tillage, contour bonds, tree planting, wood logs and ploughing across the slope as they have been found to increase soil yield and reduce soil loss as well as its accompanying adverse impacts. Recommendations of the study includes: (1) enhancement of the existing adaptive measures; (2) a shift from rain-fed agriculture to dry season farming; (3) training the affected people on adopting the adaptive measures which are currently ignored in most communities; and (4) encouragement of the participation of land holders through grants in soil erosion management based on the adaptive techniques.

**Keywords**— Adaptive Measures, Climate Change, Environmental Sustainability, Rainfall, Review, Soil Erosion.

## I. INTRODUCTION

Soil is an important natural resource which when effectively managed could increase the livelihoods of households in sedentary agricultural communities (Bukari, 2013). Soil erosion is recognized as one of the world's most serious environmental problems, globally about 80% of the current degradation of agricultural land is caused by soil erosion (Mohamed 2015). Jing, Wang and Zheng (2005) were of the opinion that soil erosion is a serious environmental, economic and social problem; it does not only cause land degradation and soil productivity loss, but also threatens the stability and health of society

in general and sustainable development of rural areas in particular. Shougang and Ruishe (2014) opined that soil erosion is one of the most serious environmental problems in the world today because it threatens agriculture and also the natural environment. Soil erosion in the African continent as a whole has caused an average annual crop yield decline of 8.2% and 6.2 for Sub-Saharan African and that if higher soil erosion rates continue unabated average possible food production will drop (Pimentel, 2006).

Soil erosion is a natural geomorphologic process resulting from water and land interactions but accelerated to become an environmental hazard by human activities such as clearing of forests for cultivation, poor farming practices and encroachment into marginal lands (Farayi, 2011). Denton (2000) defined soil erosion as the physical wearing of the earth's surface by the action of water or wind, it has been occurring for some 450million years, since the first land plants formed the first soil. Soil erosion is the removal of topsoil than the soil forming processes can replace it, due to natural, animal and human activities such as over grazing, over cultivation, deforestation and mechanical farming (Francis, 2012). Soil erosion is an accelerated process under which soil is bodily displaced and transported away faster than it can be formed (Igbokwe, Akinyede, Dang, Ono, Nnodu and Anike, 2008)

Favis-Mortlock (2005) opined that there are two main types of soil erosion; geological and accelerated soil erosion, geological soil erosion happens at the same rate as soil is formed while accelerated soil erosion is the loss of soil at a much faster rate than it is formed. On the basis of causes of soil erosion; it can be classified as erosion by gravity, water splash, erosion due to rain water, rill, gully and stream bank erosion due to the action of flowing water (Madhu, 2008).

Agents of soil erosion could either be wind, water, ice, waves and gravity, depending on the external dynamic agent that generates detachment, transportation and deposition of soil particles (Junge, Abaidoo, Alibi and Starhr, 2007).The rate and magnitude of soil erosion is

affected by rainfall intensity and runoff, soil erodibility, slope gradient and length, vegetation, and control treatments (Ritter, 2012). Soil erosion is influenced by natural and anthropogenic factors; natural factors influencing soil erosion are soil texture, soil structure, rainfall intensity, slope, soil type, climate, erosivity, erodibility and by the covering degree of the soil with vegetation, but most importantly by anthropogenic factors, through actions such as land cultivation, deforestation, construction (Kirchof and Salako, 2012). Adaptation refers to the process of adjusting to actual or expected climate change and its impacts (Quandt and Kimathi, 2016). The appropriateness of a particular adaptation strategy is highly dependent on time and place as they are influenced by the cultural and indigenous observations and practices (Obert, Paramu, Chipu and Owen, 2016). Some of the adaptive strategies to reduce the effects of soil erosion include shifting cultivation, ridging across slopes, planting on raised mounds and avoidance of deep ploughing (Bukari, 2013). His work further revealed that farmers who successfully applied the traditional methods improved upon their output levels per land area and the standards of living of their families. This study focuses on adaptations to soil erosion so as to build in sustainability into management of the phenomenon.

### 1.1 Statement of the Problem

The efforts to eradicate poverty, which is one of the Millennium Development Goals (MDGs), can only succeed when soil erosion is kept to a minimum (Pimentel, 2006). Soil erosion is common in all areas of the world, but developing countries suffer more because of the inability of their farming populations to replace lost soils and nutrients (Mohamed, 2015). He further stated that soil is one of the natural resources on Planet Earth, but though soil is a renewable natural resource, yet it can become finite, with the passage of time, through its degradation. Phatak, Dozier, Bateman, Brunson and Martini (2002) opined that globally it has been estimated that about 1.1 billion hectares of land is affected by soil erosion, with annual global loss of agricultural land due to erosion estimated at 3 million hectares (Woreka, 2004). Behera and Panda (2009) stated that it is impossible to achieve food security without overcoming the problem of nutrient depletion. The continuation of high soil erosion will eventually lead to a loss in crop production even though fertilizers and other inputs often result in increased yield in the shortterm (Pathak, Wani and Sudi, 2005). Francis (2012) asserted that soil erosion results in infertility and lead to desertification and devastating flooding. Soil erosion impacts negatively on crop productivity and environmental quality and depresses the

socio-economic status of lithosphere; it is therefore a threat to the landowners' livelihoods as well as the overall health of an ecosystem (Egbai, Eric and Ogogo, 2012).

### 1.2 Objective

The objective of this paper is to conduct a review of adaptations to soil erosion.

## II. CONCEPTUAL FRAMEWORK: ENVIRONMENTAL SUSTAINABILITY

This research is based on the concept of environmental sustainability. Environmental sustainability is defined as a condition of balance, resilience, and interconnectedness that allows human society to satisfy its needs while neither exceeding the capacity of its supporting ecosystems to continue to regenerate the services necessary to meet those needs nor by our actions diminishing biological diversity (Morelli, 2011). From this definition, it can be distilled that the major goal of environmental sustainability is to achieve sustainable development.

The World Conference on Environment and Development (WCED) (1987) defined sustainable development as development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Adaptations to soil erosion will reduce the adverse impacts of the phenomenon on the environment and socio-economic conditions of the affected people. Therefore, this study is set to review adaptations to soil erosion with a view to making recommendations that will build in sustainability into soil erosion management.

## III. METHOD

The researchers gathered 39 materials for the research and summarized the characteristics of 10 deemed to be more relevant to adaptations to soil erosion in the review. This literature research made a review of academic/journal articles, internet materials, news articles, conference papers, books and publicly available materials on adaptations to soil erosion. This enabled the researchers to make a synthesis of various researchers' views on adaptations to soil erosion.

## IV. LITERATURE REVIEW

Soil erosion is a worldwide natural disaster and a number of studies have been undertaken with a view to grasp a clear understanding of its origin, processes, factors, effects and control (Hughes, Prosser, Stevenson, Scott, Lu, Gallatand Morgan, 2001). Globally, about 80% of the current degradation of agricultural land is caused by soil erosion (Angima, Scott, O'neil, Ong and Weesies, 2003).

Wakindiki, Rungumaand Mochoge (2000) studied local adaptations to soil erosion in Tharalm Kenya, and found out that farmers had developed ingenious soil and water conservation practices in response to soil erosion and low soil moisture. According to them, the main indigenous adaptation methods used were intercropping, trash lines, stone bunds, minimum tillage and grass strips. They also discovered that farmers' decision to adapt a particular technique was influenced by the technique's ability to control runoff, associated crop yield increment, farming system, availability of the raw material, and the labour requirement. Mgbenka, Nicholas, Igbokwe and Ebe (2012) studied soil and water conservation in Eastern Region of Nigeria and stated that the adaptive soil erosion control measures are water-harvesting, grass strips, crop rotation, planting trees and shrubs.

Troeh, Hobbs and Donahue (2014), in their book on soil and water for productivity and environmental protection, stated some techniques for adaptation to soil erosion which include biomass mulches, crop rotations, no-till, ridge-till, added grass strips, shelterbelts, contour row-crop planting, and various combinations of these. Basically all of these techniques require keeping the land protected from wind and rainfall energy by using some form of biomass cover on the land which means either leaving most of the crop residues on the cropland or planting cover vegetation on a harvested cropland.

An Assessment of Farmers' perception and adaptation mechanism to soil erosion by Abiy, Getahunand Genene (2015) in Ethiopia showed that farmers in the area were mainly annual crop producers on slope farmland with traditional adaptation methods and most of the farmers use contour farming, furrow making, residue laying on farmland, and strip cropping methods for maize sowing during furrow making (*gulgualo*), trash line (*gilalo*) and contour farming methods for millet and chili pepper sowing. Mohamed (2015) studied the causes the effects of soil erosion in Somaliland and stated that the major local adaptation to soil erosion in that area was crop rotation which is designed for nutrient cycling and reduced tillage. Eze and Osahon (2016) studied the perception of soil erosion control in Southeast, Nigeria and reported that the farmers controlled erosion using techniques like mixed cropping, strip cropping and tie ridging.

Bukari, (2013) conducted a research on indigenous perceptions and adaptations to soil erosion in Zampe community of Bole, Ghana and noted that some of the

adaptive strategies to reduce the effects of soil erosion include shifting cultivation, ridging across slopes, planting on raised mounds and avoidance of deep ploughing. The most important and common strategy to control soil erosion in the tropics and sub-tropics is convincingly known as conservation tillage (Erenstein 2003). The causes and effects of soil erosion were assessed by Balasubramania, (2017) in Mysore who came up with adaptation methods used by individuals to control soil erosion which were: crop rotation, reduced tillage, mulching, and cover cropping. Edward and Simon (2001) noted that conservation, minimum tillage, mulches and cover crops prevent runoff initiation by intercepting raindrops in a handbook of processes and modelling in the soil-plant system.

Dimelu, Ogbonna and Enwelu (2013) studied the soil erosion conservation practices in Enugu, and the results showed that the soil conservation techniques used as adaptive measures were crop rotation, mulching, liming, contour bonds and terracing. They noted that the farmers that practised crop rotation and mulching had a significant increase in their crop yield and this conservation practice was encouraged for increased production, income for farmers and enhanced food security for the nation. In a study conducted in Kogi by Onu and Mohamed (2014) on soil erosion prevention and control, it was revealed that mulching, cover cropping, strip cropping and contour bonding were the local controls for soil erosion. Tesfaye and Kasahun (2015) studied the soil erosion control practices in Oromia, Ethiopia and stated that the control measures used were crop rotation, compost, animal manure and intercropping. David and Michael (2013) carried out a literature review of soil erosion threats to food production and asserted that the control measures taken to by the local people were biomass mulches, crop rotation, no-till, ridge-till, added grass strips, shelterbelts and contour row-crop planting. A study on the perception of soil erosion problems and conservation in Ghana by Farida and Fariya (2015) showed that use of stone bunds, local grass, tree planting, drainage, ploughing, trench and wood logs were adaptive measures to the phenomenon. They noted that the local conservation methods increased yield because soil erosion was reduced. In a study by Eze and Mbah (2013) on challenges to soil erosion control measure in Anambra State Nigeria, it was revealed that the major adaptive control measures by the farmers were strip cropping and making ridges across the slope.

Table.1: Summary of Characteristics of some of the Studies that Describe Adaptations to Soil Erosion

S/N	Author(s)	Topic of Research	Method(s)	Results	Recommendations	Conclusion
1	Abiy, Getahun and Genene (2015).	Assessment of Farmers' Perception and Adaptation Mechanism to Soil Erosion Problem in Shomba Kichib, Gimbo District, Kaffa Zone, South West Ethiopia.	Direct observation, Interview, Structured questionnaire.	The results showed that farmers used traditional adaptation methods such as contour farming, furrow making, residue laving on farmland, and strip cropping for maize sowing.	Farmers whose land slope is more than 8% should get continuous awareness creation training at Farmers Training Centres (FTCs). The training should also focus on the role of integrating physical and biological soil and water conservation practices.	The very sloping nature of the study area has to be given due emphasis and priority for an appropriate designed soil and water conservation practices.
2	Balasubramanian (2017).	Soil Erosion – Causes and Effects in Mysore.	Focus group discussion, Review of literatures.	Soil conservation practices farmers use to curb soil erosions were crop rotation, reduced tillage, mulching, cover cropping and cross-slope farming.	Soil conservation practices are tools the farmer can use to prevent soil degradation and build organic matter.	Soil erosion remains a key challenge for agriculture in several countries. Proper management of this valuable resource is vital to sustain long-term agricultural productivity.
3	Bukari (2013).	Indigenous Perceptions of Soil Erosion, Adaptations and Livelihood Implications: The Case of Maize Farmers in the Zampe Community of Bole in the Northern Region of Ghana.	Focus group discussion, Questionnaire.	The findings indicated that some of the adaptive strategies to reduce the effects of soil erosion included shifting cultivation, ridging across slopes, planting on raised mounds and avoidance of deep ploughing.	Modern agricultural extension services were needed, not to replace, but to complement the local knowledge systems in order to ensure sustainability.	It was revealed that farmers who successfully applied the traditional methods improved upon their output levels per land area and the standards of living of their families.
4	Dimelu, Ogbonna and Enwelu (2013).	Soil Conservation Practices among Arable Farmers in Enugu North Agricultural zone, Nigeria.	Interview.	Most of the farmers used conservation practices such as crop rotation, mulching, liming, contour bonds and terracing.	The farmers who practised crop rotation and mulching had a significant increase in yield, so more farmers should adopt it.	The conservation practice holds a great potential for increased production, income for farmers and enhanced food security for the nation.

S/N	Author(s)	Topic of Research	Method(s)	Results	Recommendations	Conclusion
5	David and Michael (2013).	Soil Erosion Threatens Food Production	Review of literatures.	Soil conservation techniques including biomass mulches, crop rotations, no-till, ridge-till, added grass strips, shelterbelts, contour row-crop planting, and various combinations of these were the adaptive measures from works reviewed.	Basically all the adaptive techniques should be employed for the land to be protected from wind and rainfall energy by using some forms of biomass cover on the land which means either leaving most of the crop residues on the cropland or planting cover vegetation on a harvested cropland.	Worldwide, soil erosion continues unabated while the human population continues to increase rapidly and 66% of the world population is now malnourished. If soil conservation is ignored and population control is ignored, more malnourished people and more deaths will occur.
6	Farida and Fariya (2015).	Farmers' Perception on Soil Erosion Problems and Conservation Methods among Rural Farmers in Talensi-Nabdam, East Region of Ghana.	Interview.	The conservation method adopted by the farmers include; stone bunds, grass, manure, local grass, tree planting, drainage trench, wood logs and ploughing across the slope.	The conservation process increased soil yield, so more of this method should be adopted by more individuals in the area, so as to stop the soil erosion menace.	If soil conservation is ignored there will be loss of soil and reduced food production.
7	Mohamed (2015).	Cause and Effect of Soil Erosion in Boqol-jire Hargeisa, Somaliland	Review of literatures, Interviews.	Crop rotations are designed for nutrient cycling, integrated pest management is applied for the prevention of pests, and reduced tillage is carried out for soil conservation.	Crop rotation should be practised by all farmers to ensure nutrient cycling.	Farmers' perception and attitudes towards soil erosion and conservation practices is decisive in protecting soil losses from erosion.
8	Onu and Mohamed (2014).	Competency Improvement needs of Farmers in Soil Erosion Prevention and Control	Survey, Interviews, Questionnaire.	The study showed that farmers used mulching, cover cropping, strip cropping and contour	Rural-based programmes should be held for the competencies in soil erosion prevention and control for increased crop	Soil erosion prevention is much better however when it happens proper conservation

S/N	Author(s)	Topic of Research	Method(s)	Results	Recommendations	Conclusion
		for Enhancing Crop Production in Kogi State, Nigeria.		bonding to control soil erosion.	production.	measures should be consistently used.
9	Tesfaye and Kasahun (2015).	Assessment on Farmers' Practices in Soil Erosion Control and Soil Fertility Improvement in rift Valley Areas of East Shoa and West Arsi Zones of Oriomia, Ethiopia.	Interview.	To tackle the problem a good number of farmers used measures such as crop rotation, compost, animal manure and intercropping to adapt to soil erosion.	Participatory soil and water conservation mechanism involving farmers should be implemented taking into consideration farmers' decision on soil and water conservation activities more fruitful and sustainable.	It was discovered that deforestation is the major cause of soil erosion in that area, so it should be controlled.
10	Wakindiki, Runguma and Mochoge (2000).	Technical Note on Local Adaptations to Soil Erosion and Low Soil Moisture in the Semiarid Tharaka District, Kenya.	Personal interview, Direct observation, Workshop discussion, Structured questionnaire.	Soil and water conservation practices in response to soil erosion and low soil moisture, the main indigenous methods used were intercropping, trash lines, stone bunds, minimum tillage and grass strips.	Sustainable soil and water conservation programmes should incorporate indigenous soil and water conservation.	Generally farmers' decision to adopt a particular technique was influenced by the technique's ability to control runoff, associated crop yield increment, farming system, availability of the raw material, and the labour requirement.

Source: Researchers' design, 2017.

## V. RESULTS AND DISCUSSION

Adaptations to soil erosion become very necessary in the face of high costs of mechanical/engineering techniques which are not within the reach of the affected people and landholders. From Table 1 which summarizes the characteristics of some of the studies reviewed in this research, the topics of all the studies capture adaptation to soil erosion and also made use of standard methods for carrying out research such as observation, interview, questionnaire and focus group discussion. Almost all the researchers across the globe (eg. Abiy, Getahum and Genene, 2015; Balasubramanian, 2017; Bukari, 2013; Dimelu, Ogbonna, Enwelu, 2015; Farida and Fariya,

2015) have a unity of opinion on adaptive measures for soil erosion, including strip cropping, crop rotation, wood logs, ploughing across the slope, mulching and contour bonding which are indigenous methods affordable by the affected people in various communities.

Based on the results of the studies, they made a number of recommendations that would help in the encouragement and enhancement of adaptive measures for soil erosion management. Such recommendations include participatory soil and water conservation programmes (eg. Wakindiki, Runguma and Mochoge 2000; Tesfaye and Kasahun, 2015) and practice of crop rotation by all farmers to improve nutrients enrichment of soils that

enhances water retention capacity and reduces incidence of soil erosion. It is noteworthy that none of the studies came up with a recommendation on adaptation that is climate change related given the fact that the exposure of the soil during the climate change-induced due to agricultural practices which increases the incidence of soil erosion.

## VI. RECOMMENDATIONS

Soil erosion is one of the environmental phenomena to which the adage: "Prevention is better than cure" is most applicable. A number of territories such as the bad levels of Loess Plateau China, Dustbowl of Arizona and Dakata in US and Agulu-Nnaka-Oko in Anambra State Nigeria would not have arisen if adequate adaptive measures were taken to manage them by the affected people at their early stage of formation. In light of this background and based on the results of this review that the following recommendations have been made;

1. Increasing vegetation cover of soils in this climatic change-driven 21st century characterized by increased incidences of rainfall is very expedient so as to reduce the power of rainfall to induce soil erosion. To this end, laws for afforestation and against deforestation should be enacted by governments with provisions to punish offenders adequately.
2. Shifting from rain-fed agriculture to dry season farming becomes necessary to avoid tillage of soils during the rains which predisposes them to the impact of raindrops and runoff that detaches and transports soil particles respectively in the rain splash-sheet-rill-gully erosion processes.
3. Both the affected people and the landholders should be empowered through grants from governments, donor agencies and non-governmental organization (NGOs) to manage soil erosion using adaptive measures at an early stage in the development of soil erosion. This will ensure their participation as major stakeholders in their soil erosion management process.
4. Creation of awareness generally among the populace on human actions and inactions that trigger soil erosion and the consequences of their activities is a veritable tool to the management of the menace. Training and sensitization in soil erosion management should include agricultural practices that uncover the soil and expose it to the erosive power of rainfall.

## VII. CONCLUSION

From the review of many studies on adaptations to soil erosion across the globe, the study concludes that the management of soil erosion should be driven by the affected people and the landholders who know when the menace starts developing on their lands and at such can easily apply the indigenous knowledge to stem the occurrence of the phenomenon. To achieve this, there major stakeholders should be given grants and be made to pay a little counterpart funds as part of their commitment.

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# Robust Statistical Pearson Correlation Diagnostics for Bitcoin Exchange Rate with Trading Volume: An Analysis of High Frequency Data in High Volatility Environment

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**Abstract**— *Cryptocurrency is a digital or virtual currency that uses cryptography for security, transfer process and storage in ledger. This paper is to validate the correlation between exchange rate changes and trading volume changes. Data selected for this study is hourly data starting from 4 November 2017 until 7 November 2017. Methodology implemented in this study started with normality diagnostics and followed by correlation diagnostic. In this study, Pearson correlation calculation is implemented to evaluate the association between two variables namely exchange rate and trading volume. Pearson's correlation coefficient ( $r$ ) is a measure of the strength of the association between the two variables. Result shows the coefficient of association is 0.123. Therefore, this study proved that the association between exchange rate changes and trading volume changes is very weak association. This value occurred because there is high volatility in hourly data and existence of outliers. The significant of this finding will help investors to recognize the relationship between trading volume and exchange rate. Therefore, it will help investors to make better decision in developing investment portfolio.*

**Keywords**— *Bitcoin, Volatility, Correlation, Exchange rate, Trading volume.*

## I. INTRODUCTION

Bitcoin cryptocurrency is defined as a digital currency in which encryption techniques are used to regulate the generation of units of currency. Bitcoin cryptocurrency involve with a complex process with the bitcoin cryptocurrency in which encryption techniques are used to regulate the generation of units of currency. Then the system will verify the transfer of funds, operating independently from central bank. It is, however, not subject to regulation by central banks, does not enjoy the backing of goods or services with intrinsic value (Rees, 2014).

Abu Bakar et al. (2017) explains the process of bitcoin cryptocurrency transaction procedure was started with the User A transfer digital currency to User B. The transaction needs to go through the blockchain path. A blockchain is an open, distributed ledger that can record transactions between two parties efficiently and in a verifiable and permanent way (Reid and Harrigan, 2013). A transaction is a transfer of bitcoin value that is broadcast to the network and collected into blocks. A transaction typically references previous transaction outputs as new transaction inputs and dedicates all input bitcoin values to new outputs (Miers, et al., 2013). Ledger is open to all users in the networks, and all users refer to one public ledger of transaction chain (Moore and Christin, 2013).

Cryptocurrency make it easier to transfer funds between two parties in a transaction; these transfers are facilitated using public and private keys for security purposes. These fund transfers are done with minimal processing fees, allowing users to avoid the steep fees charged by most banks and financial institutions for wire transfers.

Cryptocurrency defines an electronic coin as a chain of digital signatures (Okamoto, 1995). Each owner transfers the coin to the next by digitally signing a hash of the previous transaction and the public key of the next owner and adding these to the end of the coin. A payee can verify the signatures to verify the chain of ownership. Bitcoin miners help keep the Bitcoin network secure by approving transactions (Kroll et al., 2013). Mining is an important and integral part of Bitcoin that ensures fairness while keeping the Bitcoin network stable, safe and secure (Ron and Shamir, 2013).

Innovation in cryptocurrency was increasing popularity and the Bitcoin are expected to be a medium of exchange between the buyer and seller. Therefore, this study was performed to investigate the bitcoin transaction. Specifically, this study will validate the correlation

between exchange rate changes and trading volume changes.

## II. LITERATURE REVIEW

Bitcoin cryptocurrency is different from conventional currency because it is not a fiat money or specific money. Bitcoin is also not regarded as legal tender by a central authority or backed by goods or services having an intrinsic value (Christopher, 2014) and bitcoin is also decentralised in the sense that it is not issued by a government or single institution (Ram, et al, 2016).

The price of bitcoin is based on supply and demand. The exchange rate of cryptocurrency fluctuates widely depending on news or speculations (Abu Bakar and Rosbi, 2017). According to Abu Bakar and Rosbi (2017), bitcoin cryptocurrency involved with high volatility. They found the standard error for Bitcoin volatility is 4.458 % showing a high value of volatility.

A defining feature of a cryptocurrency and arguably its most endearing allure is its organic nature; it is not issued by any central authority, rendering it theoretically immune to government interference or manipulation (Bohme, et al., 2015). Most cryptocurrencies are designed to gradually decrease the production of currency, placing an ultimate cap on the total amount of currency that will ever be in circulation, mimicking precious metals (Barber, et al., 2012).

Abu Bakar and Rosbi (2017) conclude that a bitcoin transaction is a transfer of bitcoin value that is broadcast to the network and collected into blocks. A transaction typically references previous transaction outputs as new transaction inputs and dedicates all input bitcoin values to new outputs. Transactions are not encrypted, so it is possible to browse and view every transaction ever collected into a block. Once transactions are buried under enough confirmations, they can be considered irreversible. This system is vulnerable to hacking activity. Bitcoin cryptocurrency also has no physical form and exists only in a network. Bitcoin cryptocurrency is no intrinsic value in that it is not redeemable for another commodity, namely gold.

## III. RESEARCH METHODOLOGY

This section describes the methodology implemented in this study starting from data selection, data transformation, normality diagnostics and Pearson correlation diagnostics. This study performed Pearson correlation analysis for exchange rate changes to trading volume changes.

### 3.1 Data selection

There are two variables selected in this study namely exchange rate (USD/Bitcoin) and total trading volume (USD). Both of the variables are collected hourly starting

from 4 November 2017 until 7 November 2017. These data are collected from <https://www.worldcoinindex.com>.

### 3.2 Mathematical derivation for exchange rate changes and trading volume changes

This study evaluates the correlation between exchange rate changes and trading volume changes. Therefore, calculation for exchange rate and trading volume changes need to be derived.

Firstly, this study derived the percentage changes for exchange rate using Equation (1).

$$\Delta EX = \left( \frac{EX_t - EX_{t-1}}{EX_{t-1}} \right) \times 100\% \dots\dots\dots (1)$$

Where:

- $\Delta EX$  is percentage changes of exchange rate,
- $EX_t$  is exchange rate value for trading period  $t$  and
- $EX_{t-1}$  is exchange rate value for trading period  $t-1$ .

Next, this study derived the percentage of changes for trading volume as stated in Equation (2).

$$\Delta TV = \left( \frac{TV_t - TV_{t-1}}{TV_{t-1}} \right) \times 100\% \dots\dots\dots (2)$$

where:

- $\Delta TV$  is percentage changes of exchange rate,
- $TV_t$  is exchange rate value for trading period  $t$  and
- $TV_{t-1}$  is exchange rate value for trading period  $t-1$ .

### 3.3 Normality statistical test

The probability density of the normal distribution is:

$$f(x) = \frac{1}{\sqrt{2\pi\sigma^2}} e^{-\frac{(x-\mu)^2}{2\sigma^2}} \dots\dots\dots (3)$$

Where:

- $\mu$  is the mean or expectation of the distribution,
- $\sigma$  is standard deviation, and
- $\sigma^2$  is variance for data distribution.

Properties of a normal distribution:

- (a) The mean, mode and median are all equal.
- (b) The curve is symmetric at the center. Data are distributed around the mean,  $\mu$ .
- (c) Exactly half of the values are to the left of center and exactly half the values are to the right.
- (d) The total area under the curve is 1.

The null-hypothesis of Shapiro-Wilk normality test is that the population is normally distributed. Thus, if the p-value is less than the chosen alpha level, then the null hypothesis is rejected and there is evidence that the data tested are not from a normally distributed population. On the opposite side, if the p-value is greater than the chosen alpha level, then the null hypothesis that the data came from a normally distributed population cannot be rejected.

The Shapiro-Wilk test is a method to evaluate whether a random sample comes from a normal distribution. The test gives you a W value. The W value larger than chosen alpha (0.05), will concludes the distribution of data follows normal distribution. The, if the data shows small values of W, it is indicate your sample is not normally distributed. The formula for the W value is:

$$W = \frac{\left( \sum_{i=1}^n a_i x_{(i)} \right)^2}{\sum_{i=1}^n (x_i - \bar{x})^2}$$

where:

$x_i$  is the value in the sample  $(x_1, x_2, x_3, \dots, x_n)$  ;

$x_{(i)}$  is the ordered sample values  $(x_{(1)}$  is the smallest value in the sample);

$\bar{x} = \frac{(x_1 + x_2 + \dots + x_n)}{n}$  is the sample mean;

$a_i$  is constants that derived generated from the means, variances and covariances of the order statistics of a sample of size  $n$  from a normal distribution. The calculation of  $a_i$  is described in below equation.

$$(a_1, a_2, a_3, \dots, a_n) = \frac{m^T V^{-1}}{(m^T V^{-1} V^{-1} m)^{1/2}}$$

where:

$V$  is the covariance matrix of those order statistics;

$$m = (m_1, m_2, m_3, \dots, m_n)^T$$

Element in Equation (8) is represented as:

$m_1, m_2, m_3, \dots, m_n$  are the expected values of the order statistics of independent and identically distributed random variables sampled from the standard normal distribution

### 3.4 Pearson correlation diagnostics

The Pearson product-moment correlation coefficient is a measure of the strength of a linear association between two variables and is denoted by  $r$ . The Pearson product-moment correlation develops a line of best fit through the data of two variables. Then, the Pearson correlation coefficient,  $r$ , indicates how well the data points fit this modeling line.

Consider the Pearson product-moment correlation coefficient of two  $n$ -dimensional vectors  $X = \{X_1, X_2, \dots, X_n\}$  and  $Y = \{Y_1, Y_2, \dots, Y_n\}$ . Pearson correlation is states as the ratio between the covariance of  $X$  and  $Y$  and the product of their standard deviations. Pearson's correlation coefficient when applied to a population is commonly represented by below equation:

$$\rho_{X,Y} = \frac{\text{cov}(X,Y)}{\sigma_X \sigma_Y}$$

where cov is the covariance,  $\sigma_X$  is the standard deviation of  $X$ , and  $\sigma_Y$  is the standard deviation of  $Y$ .

Then, covariance expressed as below:

$$\text{cov}(X,Y) = E[(X - \mu_X)(Y - \mu_Y)]$$

where  $E$  is the expectation and  $\mu_X$  is the mean of  $X$ .

Therefore, Equation (12) can be written as:

$$\rho_{X,Y} = \frac{E[(X - \mu_X)(Y - \mu_Y)]}{\sigma_X \sigma_Y}$$

Then, mathematical equation for  $\rho$  can be expressed in terms of uncentered moments. Mean of population is expressed as next equation,

$$\mu_X = E[X], \mu_Y = E[Y]$$

Variance of population is expressed as next equation,

$$\begin{aligned} \sigma_X^2 &= E[(X - E[X])^2] = E[X^2 - 2XE[X] + (E[X])^2] \\ &= E[X^2] - 2E[X]E[X] + (E[X])^2 \\ &= E[X^2] - 2E[X]^2 + (E[X])^2 \\ &= E[X^2] - E[X]^2 \end{aligned}$$

$$\sigma_Y^2 = E[Y^2] - E[Y]^2$$

Standard deviation of population is expressed as next equation,

$$\sigma_X = \sqrt{E[X^2] - E[X]^2},$$

$$\sigma_Y = \sqrt{E[Y^2] - E[Y]^2}$$

Covariance of population is expressed as next equation,

$$\begin{aligned} E[(X - \mu_X)(Y - \mu_Y)] &= E[(X - E[X])(Y - E[Y])] \\ &= E[(XY - XE[Y] - YE[X] + E[X]E[Y])] \\ &= E[XY] - E[X]E[Y] - E[X]E[Y] + E[X]E[Y] \\ &= E[XY] - E[X]E[Y] \end{aligned}$$

Therefore, Equation (14) can be represented as:

$$\rho_{X,Y} = \frac{E[XY] - E[X]E[Y]}{\sqrt{E[X^2] - [E[X]]^2} \sqrt{E[Y^2] - [E[Y]]^2}}$$

Then, the equation for sample is derived. Sample Pearson's correlation coefficient is commonly represented by the letter  $r$ . Consider the sample of dataset  $x = \{x_1, \dots, x_n\}$  containing  $n$  values and another dataset  $y = \{y_1, \dots, y_n\}$  containing  $n$  values then that formula for  $r$  is:

$$r_{x,y} = \frac{\text{cov}(x, y)}{s_x s_y}$$

where cov is the covariance,  $s_x$  is the standard deviation of  $x$ , and  $s_y$  is the standard deviation of  $y$ .

Then, sample covariance can be expressed as below:

$$\text{sample cov}(x, y) = \frac{\sum_{i=1}^n (x_i - \bar{x})(y_i - \bar{y})}{n-1}$$

Therefore, Equation (16) can be written as:

Then, mathematical equation for  $r$  can be expressed in terms of uncentered moments. Mean of sample,

$$\bar{x} = \frac{\sum_{i=1}^n x_i}{n}, \quad \bar{y} = \frac{\sum_{i=1}^n y_i}{n}$$

Variance of sample,

$$\begin{aligned} s_x^2 &= \frac{1}{n-1} \sum_{i=1}^n (x_i - \bar{x})^2 = \frac{1}{n-1} \sum_{i=1}^n ([x_i]^2 - 2x_i\bar{x} + \bar{x}^2) \\ &= \frac{1}{n-1} \left[ \sum_{i=1}^n (x_i)^2 - n\bar{x}\bar{x} \right] \\ &= \frac{1}{n-1} \left[ \sum_{i=1}^n (x_i)^2 - n \left( \frac{\sum_{i=1}^n x_i}{n} \right)^2 \right] \\ &= \frac{1}{n-1} \left[ \sum_{i=1}^n (x_i)^2 - \frac{\left( \sum_{i=1}^n x_i \right)^2}{n} \right] \\ &= \frac{1}{n(n-1)} \left[ n \sum_{i=1}^n (x_i)^2 - \left( \sum_{i=1}^n x_i \right)^2 \right] \end{aligned}$$

$$\begin{aligned} s_y^2 &= \frac{1}{n-1} \sum_{i=1}^n (y_i - \bar{y})^2 \\ &= \frac{1}{n(n-1)} \left[ n \sum_{i=1}^n (y_i)^2 - \left( \sum_{i=1}^n y_i \right)^2 \right] \end{aligned}$$

Standard deviation of sample,

$$\begin{aligned} s_x &= \sqrt{\frac{1}{n(n-1)} \left[ n \sum_{i=1}^n (x_i)^2 - \left( \sum_{i=1}^n x_i \right)^2 \right]} \\ s_y &= \sqrt{\frac{1}{n(n-1)} \left[ n \sum_{i=1}^n (y_i)^2 - \left( \sum_{i=1}^n y_i \right)^2 \right]} \end{aligned}$$

Covariance of sample,

$$\begin{aligned} \text{cov}(x, y) &= \frac{\sum_{i=1}^n (x_i - \bar{x})(y_i - \bar{y})}{n-1} \\ &= \frac{1}{n-1} \sum_{i=1}^n (x_i y_i - x_i \bar{y} - \bar{x} y_i + \bar{x} \bar{y}) \\ &= \frac{1}{n-1} \left[ \sum_{i=1}^n x_i y_i - \sum_{i=1}^n x_i \bar{y} - \sum_{i=1}^n y_i \bar{x} + \sum_{i=1}^n \bar{x} \bar{y} \right] \\ &= \frac{1}{n-1} \left[ \sum_{i=1}^n x_i y_i - n\bar{x}\bar{y} - n\bar{y}\bar{x} + n\bar{x}\bar{y} \right] \\ &= \frac{1}{n-1} \left[ \sum_{i=1}^n x_i y_i - 2n\bar{x}\bar{y} + n\bar{x}\bar{y} \right] \\ &= \frac{1}{n-1} \left[ \sum_{i=1}^n x_i y_i - n\bar{x}\bar{y} \right] \\ &= \frac{1}{n-1} \left[ \sum_{i=1}^n x_i y_i - n \left( \frac{\sum_{i=1}^n x_i}{n} \right) \left( \frac{\sum_{i=1}^n y_i}{n} \right) \right] \\ &= \frac{1}{n-1} \left[ \sum_{i=1}^n x_i y_i - \sum_{i=1}^n x_i \left( \frac{\sum_{i=1}^n y_i}{n} \right) \right] \\ &= \frac{1}{n(n-1)} \left[ n \sum_{i=1}^n x_i y_i - \sum_{i=1}^n x_i \sum_{i=1}^n y_i \right] \end{aligned}$$

Therefore, Equation (18) can be represented as:

$$r_{x,y} = \frac{\left[ n \sum_{i=1}^n x_i y_i - \sum_{i=1}^n x_i \sum_{i=1}^n y_i \right]}{\sqrt{\left[ n \sum_{i=1}^n (x_i)^2 - \left( \sum_{i=1}^n x_i \right)^2 \right]} \sqrt{\left[ n \sum_{i=1}^n (y_i)^2 - \left( \sum_{i=1}^n y_i \right)^2 \right]}}$$

#### IV. RESULT AND DISCUSSIONS

This section describes the result for statistical test of normality data characteristics. Then, this study performs Pearson correlation diagnostics to evaluate the association between changes of exchange rate with changes of trading volume.

##### 3.1 Normality characteristics of data for exchange rate

This section describes the normality checking for data distribution of exchange rate. The function of this analysis is to validate the normality characteristics. Figure 1 shows the dynamic behavior of exchange rate. The value of exchange rate is referring as value of United States Dollar (USD) to the value for each of Bitcoin. Data were collected hourly starting from 4 November 2017, 0:00 until 7 November, 24:00. There are 97 observations. The maximum value is 7,557.82 USD on 6 November 2017,

03:00. Meanwhile, the minimum value is 6,996.70 USD on 7 November 2017, 16:00.

Then, this study calculated the percentages of changes with respect to previous observation period. Figure 2 shows percentage of changes for exchange rate of Bitcoin.

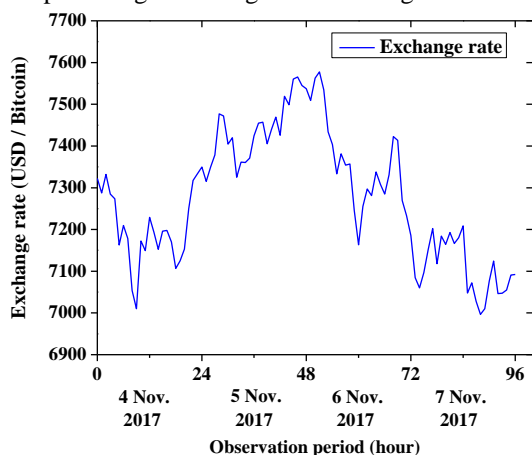


Fig. 1: Dynamic behavior of exchange rate (USD/Bitcoin)

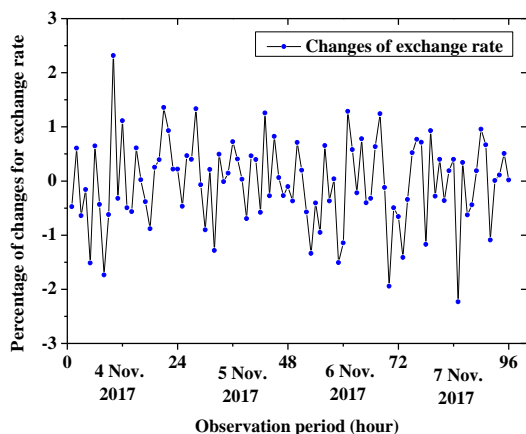


Fig. 2: Percentage of changes for exchange rate

The maximum value is 2.3168 on 4 November 2017, 10:00. Mean of the data distribution is -0.0301 and standard deviation is 0.79764.

Next, this study validates the normality characteristics finding using histogram, normal probability plot and statistical test. Figure 3 shows the histogram of exchange rate changes. The distribution of exchange rate changes follows the normal distribution line. Figure 4 is normal probability plot of exchange rate changes in percentages. Data distribution is near to normal distribution line. Therefore, the data distribution is follow normal distribution.

Then, this study validated the normality using Shapiro-Wilk normality test. Table 1 shows the Shapiro-Wilk normality statistical test. The p-value is 0.567. Therefore, the data distribution is follow normal distribution.

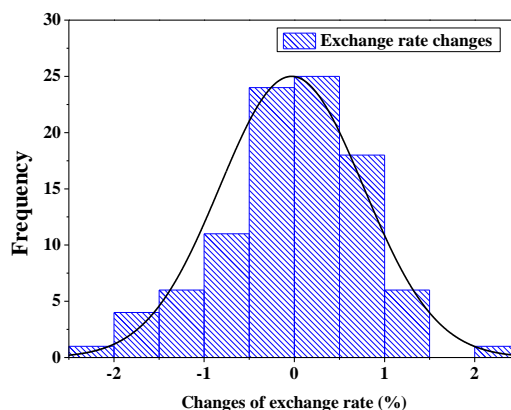


Fig. 3: Histogram of exchange rate changes

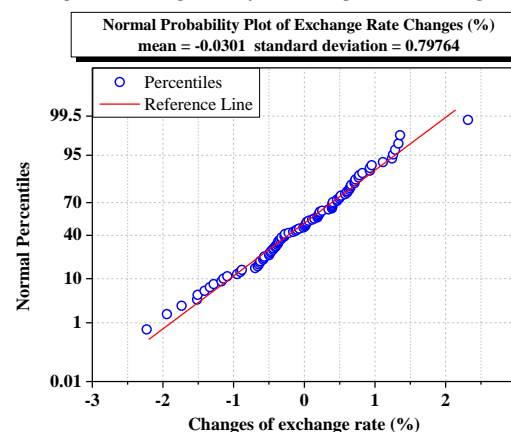


Fig. 4: Normal probability plot of exchange rate changes

Table 1: Normality test using Shapiro-Wilk

	Shapiro-Wilk test		
	Statistics	Degree of freedom	Probability value
Exchange rate changes	0.988	96	0.567

### 3.2 Normality characteristics of trading volume data

This section describes the normality checking for trading volume data. Data selected in this study involving data of trading volume starting from 4 November 2017, 0:00 until 7 November 2017, 24:00. The minimum value of trading volume is  $1.860 \times 10^9$  USD on 5 November 2017, 18:00. Meanwhile, the maximum value of trading volume is  $2.998 \times 10^9$  USD on 4 November 2017, 10:00.

Then, this study calculated the percentage of changes in the trading volume. Figure 6 shows the percentage of trading volume changes. The analysis shows the maximum value is 9.8619 on 6 November 2017, 13:00. Meanwhile, the minimum value is -6.4298 on 4 November 2017, 17:00. Mean of the data distribution for changes of trading volume is -0.38392. In addition, the standard deviation of data distribution for trading volume changes is 2.82637.

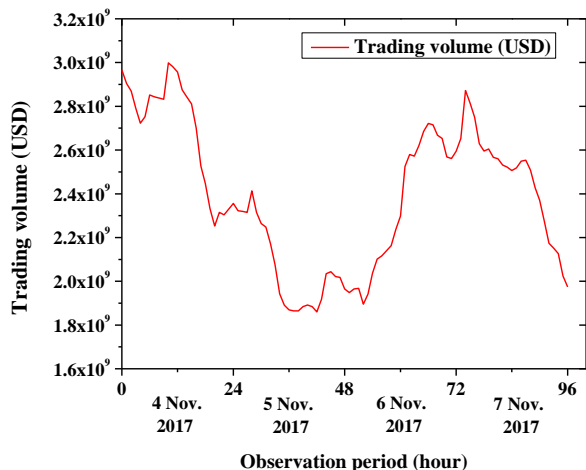


Fig. 5: Dynamic behavior of total trading volume (USD)

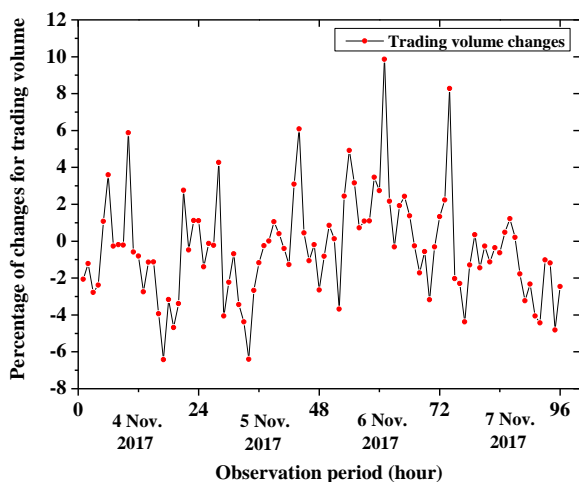


Fig. 6: Percentage of changes in trading volume

Next, this study performed normality test diagnostics to evaluate the data distribution of changes for trading volume data. This study implemented graphical approach and numerical statistical test approach to validate the normality of data distribution.

Figure 7 shows the histogram for trading volume changes in percentage. The distribution is near to normal line. However, there are outliers in right side of normal distribution. Figure 8 shows the normal percentiles plot for trading volume changes. The distribution of data is near to reference line. Figure 8 indicates the present of outliers.

Table 2 shows the numerical prove of normality statistical test using Shapiro-Wilk approach. Probability value is 0.004. Therefore, data distribution is deviate from normal distribution. The presence of the outliers contributes to the non-normal distribution of data.

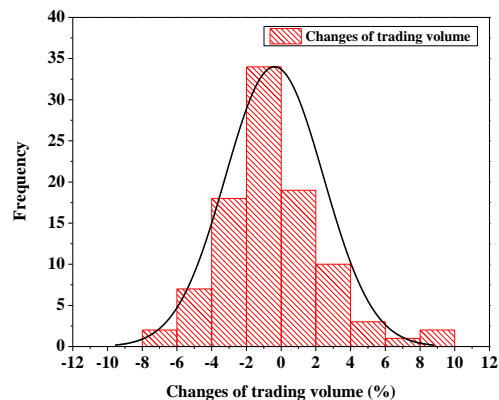


Fig. 7: Histogram of trading volume changes

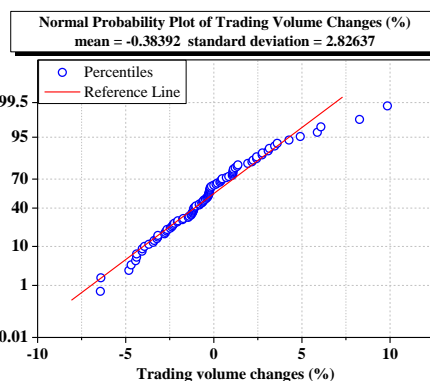


Fig. 8: Normal percentiles for trading volume changes

Table 2: Normality test using Shapiro-Wilk

	Shapiro-Wilk test		
	Statistics	Degree of freedom	Probability value
Trading volume changes	0.959	96	0.004

### 3.3 Correlation diagnostics of exchange rate changes with trading volume changes

This section describes the correlation analysis between exchange rate changes with trading volume changes. Analysis that implemented in this section is using Pearson correlation method.

First, this study validated the correlation using graphical method namely scatter plot between two variables. Figure 9 shows the scatterplot graph between trading volume changes and exchange rate changes.

Next, this study validates the association between trading volume changes and exchange rate changes using Pearson correlation analysis. Table 2 shows the Pearson correlation diagnostics. Result shows the Pearson correlation is 0.123 that indicates very weak positive correlation. Significant value is larger than 0.05, this concludes there is no significant correlation between trading volume changes and exchange rate changes.



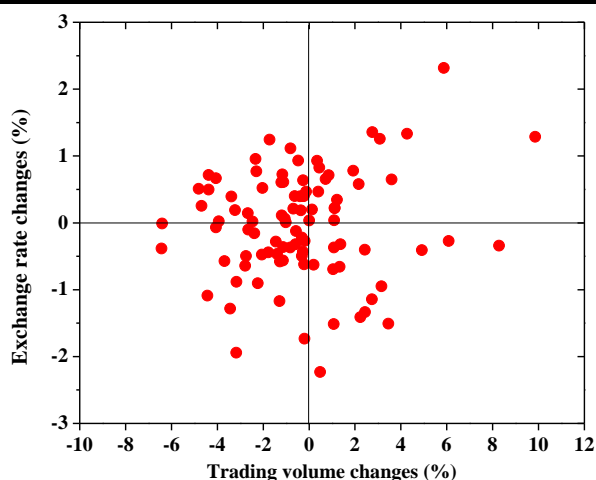


Fig. 9: Normal percentiles for trading volume changes

Table 2: Correlation diagnostics

	Correlation parameters	Trading volume changes
Exchange rate changes	Pearson correlation	0.123
	Significant (2 tails)	0.234
	Sum of squares and cross products	26.275
	Covariance	0.277
	Number of observations (N)	96

### V. CONCLUSION

This objective of this study is to develop robust Pearson correlation diagnostics between trading volume changes and exchange rate changes. Data selected in this study are collected hourly starting from 4 November 2017, 0:00 until 7 November 2017, 24:00. Main findings of this study are described as below.

- (a) In this study, two variables of data is collected namely exchange rate (USD/Bitcoin) and total trading volume (USD). Both of the variables are collected in hourly starting from 4 November 2017, 0:00 until 7 November, 24:00.
- (b) This study calculated the percentages of exchange rate changes with respect to previous observation period. The maximum value is 2.3168 on 4 November 2017, 10:00. Mean of the data distribution is -0.0301 and standard deviation is 0.79764.
- (c) This study validated the normality of exchange rate changes using Shapiro-Wilk normality test. Shapiro-Wilk normality statistical test shows the p-value is 0.567. Therefore, the data distribution is follow normal distribution.

- (d) Then, this study calculated the percentage of changes in the trading volume. The analysis shows the mean of the data distribution for changes of trading volume is -0.38392. In addition, the standard deviation of data distribution for trading volume changes is 2.82637.
- (e) Next, this study performed the numerical prove of normality statistical test using Shapiro-Wilk approach for trading volume changes. Probability value is 0.004. Therefore, data distribution is deviate from normal distribution. The presence of the outliers contributes to the non-normal distribution of data.
- (f) Next, this study validates the association between trading volume changes and exchange rate changes using Pearson correlation analysis. Numerical result shows the Pearson correlation is 0.123 that indicates very weak positive correlation.

The findings of this study are important to investors and economics expert to validate the dynamic behavior of exchange rate associated with trading volume. High volatility environment contributes to the non-normality data distribution. In the same time, high frequency data for Bitcoin also indicates high volatility. Therefore, the finding of this study shows there is very weak positive correlation between trading volume changes and exchange rate changes.

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# A Review of Environmental Implications of Dredging Activities

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**Abstract**—Dredging is a global anthropogenic excavation activity of removing sediments from water bodies and depositing it elsewhere. It is a mixed blessing as it has both beneficial and adverse impacts. This paper is on a review of environmental implications of dredging. The objective of the paper is to review previous works by researchers on the environmental consequences of dredging. The method used is a review of academic/journal articles, internet materials, conference / workshop papers, textbooks, bulletins and publicly available materials on dredging activities. The results of the study revealed that previous authors whose works were reviewed have a convergent view that apart from the beneficial impacts of dredging (e.g. keeping waterways navigable, flood and storm protection and provision of materials for road construction and building), it has lots of adverse environmental impacts, including environmental pollution, erosion, widespread hydrological changes, reduction in the population of aquatic lives like destruction of fish spawning grounds and benthic organisms and resuspension of particulate matter column that has elevated levels of lead, copper, zinc and nickel in Phytoplankton. Recommendations of the study include: (1) establishment of environmental legislations and regulations for dredging operation; (2) use of green technology in dredging activities to minimize suspension of sediments and contamination/pollution of dredging environments; and (3) creation of awareness among dredging contractors, regulators and marine communities where dredging take place on the economic and ecological values of the marine ecosystems that are usually very sensitive, fragile and productive.

**Keywords**— *Dredging, Environmental Implications, Marine Ecosystems, Review Sediment, Sustainable Development.*

## I. INTRODUCTION

Dredging is a worldwide excavation activity that involves removing sediment from a sea, river, or lakebed and depositing it at a new location ( Brunn, Gayes, and Eiser, 2005; Thomsen, McCully, Wood, Pace and White, 2009). They further reported that uses of dredged materials are vast and include construction of ports, waterways, dykes,

and other marine infrastructure, land reclamation, flood and storm protection, extraction of the construction industry (e.g for road construction and buildings) and in environmental remediation of contaminated sediments. International Association of Dredging Company (IADC) (2012) opined that population growth and increasing number and size of infrastructure projects mean that demand for dredging, volume of aggregate, and turnover will most likely increase. Since dredging impacts the marine environment, sustainable management of the activity is required, based on in-depth understanding of how dredging affects marine habitats and associated fauna and flora (Thrush and Dayton, 2002; David, Hitchcock and Bell ,2004; Erftemeijer and Lewis, 2006).

Globally, dredging activities certainly affect the global economy and in fact still plays a huge role in global trade (Bob, 2015). IADC (2012), reported an estimated 11.68 billion of dredging work. In Nigeria, dredging activities are a major environmental problem (Abubaker, Alzubi and Alzyond, 2011). They further noted that mining industries and dredging practices in particular are vastly known for their hazardous working condition and the unstable nature of the earth-crust which minerals are extracted is causing threat to life and properties of the society. According to Robbins (2006), dredging is an excavation activity of operations usually carried out at least partly under water, in shallow seas or fresh water areas with purpose of gathering up bottom sediments and disposing them at a different location. He further asserted that dredging helps to keep waterway navigable, and also a way of replenishing sand on some public beaches, where sand has been lost because of coastal erosion.

Walker, Hillman, Kendrick and Lavery (2001) defined dredging as an activity that is done or carried out using a device, machine or vessel that is used to excavate and remove materials from the bottom of a body of water, for example, a scoop is attached to the rope or pole by which a man can draw sediments up from the bottom of a pond, or river. In the view of Watson, Revenga and Kura (2006), dredging involves the excavation and relocation of sediments from lakes, rivers, estuaries or seabed and is a critical component of most major marine infrastructure development along the coast. Despite the necessity of

dredging for industrial development, its potential impacts on the environment are particular concern as multiple potential stressors associated with dredging activities are sediment stress (suspended and deposited), release of toxic contaminants, hydraulic entrainment and noise pollution (Reine, Clerk and Dickerson, 2014; McCook, Schaffelke, Erftemeijer and Warne, 2015). The process of dredging creates spoils (excess materials), which are carried away from the dredging area; dredging can create disturbance in aquatic ecosystem after with adverse impacts (Bertha, 2009). He further claimed that dredging can create much effect on land. Dredging has a number of undesirable geomorphic consequences, showing the vertical incision and bank destabilization can occur from dredging activities (Mmom and Chukwu-Okeah, 2012).

### 1.1 Statement of the Problem

Dredging has created a lot of problems and these include change in the aquatic ecosystem, environmental pollution, flooding of coastal land and erosion, infrastructural damage, flooding of coastal land and reduction in the population of aquatic lives useful to man (Fortes, 2001). He further reported that dredging activities often disturb sediments reducing visibility and smothering reef organisms. Ohimain and Van Mensvoort (2004) asserted that dredging has been associated with widespread hydrological changes as it may disrupt the dynamic interrelationship between environmental components and socio-economic functions of these coastal areas, thus creating an imbalance in the ecosystem. The extent at which dredging occurs in rivers, lakes, ponds, coastal regions is becoming a treat (IADC) (2012). Environmental Protection Agency (EPA) (2013) reported that dredging activities has potential to change the environment, as well as toxicant, the nutrients (elements), particularly nitrogen and phosphorus which control the rate of marine plant growth, can be released from sediments during dredging with a risk of triggering algae blooms. Dredging activities potentially affect not only the site itself, but also surrounding areas, through a large number of impact factors such as turbidity, sedimentation, resuspension and release of contaminants effects can be immediate or develop over a longer time frame and they may be temporary or permanent in nature (Wolanski and Gibbs, 2004).

### 1.2. Objective of the Study

The objective of this paper is to review environmental implications of dredging activities.

## II. CONCEPTUAL FRAMEWORK: SUSTAINABLE DEVELOPMENT

This paper adopts the concept of sustainable development as its framework. The World Conference on Environment

and Development (WCED) (1987) defined sustainable development as the development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

Morelli and Greenwood (2010) claimed that sustainable development is meeting the resource and service needs for current and future generations without compromising the health of the ecosystems that provide them and more specifically as a condition of balance, residence and interconnection that allows human society to satisfy its needs while neither exceeding the capacity of its supporting ecosystems to continue to regenerate the services necessary to meet those needs by our actions diminishing biological diversity.

This study is focused on a review of the environmental implications of dredging so as to build in sustainability into the management of the phenomenon.

## III. METHOD

This research made use of a review of academic articles, journals, internet materials, textbooks, conference papers and publicly available materials on dredging activities. The researchers assembled thirty of these materials for this research, but summarized the characteristics of 10 deemed more relevant to environmental implications of dredging for the review. This enabled the researchers to make a synthesis of various researchers' views on implications of dredging activities.

## IV. REVIEW OF RELATED LITERATURE

Watson, Ravenga and Kura (2006) conducted a study on Trawling and Dredging in Western Australia and asserted that dredging involves the excavation and relocation of sediment from lakes, rivers, estuaries or seabed and is a critical component of most major marine infrastructure development along the coast. Hitchcock and Bell (2004) carried out a study on marine aggregate dredging in Florida and reported that sediment plumes cannot be under estimated as it is a phenomenon that has the capacity to extend the footprint of impact beyond the limits of the dredging activity itself. Copper, Curtis, Hussain, Barrio Fajon, Defew and Nye (2011) studied implications of dredging in United Kingdom and claimed that changes in sediment composition can have implications for residents and recolonizing fauna, resulting in the establishment of fauna community that differs from the assemblage present before the dredging. They also asserted that marine aggregate dredging is to identify those locations where it is more and less important to try to preserve sediment particle size composition, and to determine whether there is a rational scientific justification for the active restoration of sediment particle size composition at site of former marine aggregate dredging.

In their study on impact of dredging seagrasses in the Netherlands, Erfteimeijer and Lewis (2006) reported that dredging and disposal of dredged materials can lead a temporary decrease in water transparency, increased concentrations of suspended matter and increased rates of sedimentation. They also opined that impacts can be significant when dredging or disposal is done in the vicinity of sensitive marine environments, such as coral reefs and sea grass bed. Cooper, Boyd, Eggleton, Limpenny, Rees and Vanstaen (2007), in their study on marine aggregate dredging in England, and asserted that deposition of sediment from plums created during dredging operations will likely inhibit recovery of benthic communities. Wilber and Clarke (2001) did a research on suspended sediment in Charleston and noted that dredging released nutrients that led to depletion of oxygen from high phytoplankton production. Michael, Woodley, Todd and David (2015) conducted a study on suspended sediment in Vicksburg and claimed that river channel maintenance relies on frequent dredging to keep the water ways navigable. Nayar, Miller, Hunt and Goh (2007) were of the view that dredging of channel and excavation of the banks exposed the underlying layer of historically contaminated sediments, compromising partially decomposed organic matter from dredging activities, resuspension of sediment partially accounted for higher concentrations of organic carbon in water column, in their study on impacts of dredging in Singapore. A research by Nayar, Goh and Chou (2004) on heavy metals from dredging in Singapore revealed that dredging operations potentially released toxins into the marine environment. They further claimed that in Zeebrugge and Singapore dredging, operations led to resuspension of particulate matter column that has elevated levels of lead, copper, zinc and nickel recorded in phytoplankton.

Walker, Hillman, Kendrick and Lavery (2001) researched on ecological significance of dredging in Western Australia and asserted that dredging in shallow near-shore waters associated with significant conservation values, adverse effects on marine habitats due to direct seabed disturbance and indirect effects could offset shipping movements and seabed shoreline stability. A research by Desprez (2000) on impact of marine aggregate dredging in France indicated that extraction of marine aggregate has its impact on the seabed as dredging activity has conventionally targeted bottom substrate associated with benthic fauna. Mmom and Chukwu-Okeah (2012), in their study on sand dredging in Calabar, opined that increasing anthropogenic disturbances have imposed considerable impacts on river channel. They further reported that high dredging activities had resulted to serious incision of the river channel deepening the river bed and increasing velocity of flow. Rinaldi, Wyzga and Surian (2005) conducted a study on sediment mining in Italy and claimed that channel incision of alluvial river as a result of sediment depletion arising from dredging had series of detrimental effects on the river channel, including ground water table lowering, flood flow increase, the destabilization of infrastructures, sea water encroachment in the area. Michael *et al* (2015) carried out a research on potential dredging impact in Vicksburg and reported that dredging is a complex activity, and its impact on aquatic ecosystems is poorly understood, over long-time scales. Muyideen, Abiodun and Ismaila (2013), in their study on impacts of dredging in Awoyaya Lagos, claimed that dredging activity pollutes the environment and the water source of the area, thereby endangering the life of people and aquatic animal in the area.

Table.1: Summary of Characteristic of some Studies on Environmental Implications of Dredging Activities.

S/N	Author(s)	Topic of Research	Method(s)	Results	Recommendations	Conclusion
1	Cooper, Curtis, Hussian, Barrio frojan, Defew, Nye and Paterson (2011).	Implications of Dredging Induced Changes in Sediment Particle Size Composition for the structure and function of marine benthic macro-faunal communities.	-Physical Observation -Laboratory analysis	The result suggested that the presence of gravel has an important role in the negative correlation in sediment composition of natural physical disturbance.	License enforcement should be put in place regarding changes in sediment composition.	Changes in sediment composition in the area are likely to have a reduced impact on the overall faunal assemblage, possibility and measurable in sediment composition.
2	Copper, Boyd, Eggleton, Limpenny, Rees and Vanstae (2007).	Recovery of the Seabed Following Marine Aggregate Dredging on the Hastings Shingle Bank Off the	-Site Observation -Laboratory Analysis.	The result from both sites provides a useful in-sight of the processes leading to recovery of the	Caution in assuring recovery figure should be applicable to intensively dredged areas.	A comparison of recent and historic dredged track features provided evidence of track

S/N	Author(s)	Topic of Research	Method(s)	Results	Recommendations	Conclusion
		South-east Coast of England.		seabed marine aggregate dredging at the site.		erosion.
3	David, Hitchcock and Bell (2004).	Physical Impacts of Marine Aggregate Dredging on Seabed, Resources in Coastal Deposits.	-Survey Strategy	The result reported that the geological conditions are more likely to result from dredging disturbance.	Deep-water extensive operations with screening of cargoes should be avoided.	It is clear that development of linear down tide extension near bed sediment plume provides a mechanism for potential impacts in areas where screening cargoes takes place.
4	Muyidean, Abiodun, and Ismaila (2013).	Environmental Impacts of Dredging in Awoyaya, Lagos State, Nigeria.	-Laboratory analysis -Physical Observation.	Water is acidic and soil has a very high percentage of silica.	Disturbance arising from dredging operation should be controlled and standards should be set to decrease disturbance of dredging operation.	The analysis carried out shows that dredging in Awoyaya has little impact on water and soil in the dredging area.
5	Mmon, and Chukwu-okeah (2011).	Sand Dredging and River Morphology Change Along Parts of New Calabar river in Akpor Area of Rivers State, Nigeria and its implication for Biological resources conservation.	-Laboratory Analysis -Physical Observation.	The high dredging activities in the area has resulted to serious incision of the river channel thereby deepening the river bed and increasing the velocity of flow.	Proper checking of dredging activities along the river course to protect the environment and biodiversity from net loss or decimation.	The dramatic river bed down-cutting as a result of sediment depletion has important implication for river management of the rivers.
6	Nayar, Miller, Hunt, Goh, and Chou (2007).	Environmental Effects of Dredging on Nutrients, Carbon and Granulometry in a tropical Estuary	-Laboratory analysis	The mean and range for nutrient concentrations showed relatively elevated levels post dredging were positively and significantly correlated with sand fraction.	Monitoring study should be used for effective management strategy to protect the environment.	The most obvious impact of the anthropogenic activities in tropical estuary was the bioavailability and dispersion of nutrients.
7	Nayar, Goh, and Chou (2004).	Environmental Impact of Heavy Metals from Dredged and Re-Suspended Sediments on Phytoplankton and Bacteria Assessed in In-situ Mesocosms.	-Site Observation -Laboratory analysis	The study revealed some high concentrations of heavy metals in suspended particulates and sediments in water level.	Mesocosms should be used for testing since it is very sensitive and reliable for modest investment.	Phytoplankton was inhibited, concentration of heavy metals that were available from sediment re-suspended by dredging.
8	Walker, Hillman,	Ecological Significance of Sea	-Laboratory analysis	Differences between sea	Parameters should be represented by a	The synthesis of these

S/N	Author(s)	Topic of Research	Method(s)	Results	Recommendations	Conclusion
	Kendrick, and Lavery (2001).	grasses: Assessment or Management of Environmental in Western Australia.	-Physical observation	grass habitats are less pronounced in terms of species presents.	probability distribution with values around the mean valve.	mult-disciplinary studies has required the development of new techniques to deal with stochastic processes.
9	Watson, Revenga and Kura (2006).	Fishing Gear associated with Global II. Trends in Trawling and Dredging.	Literature review	Composition of trawl and dredged catch is quite diverse.	Analysis should be extremely valuable to inform policy development and to help develop future management options.	Dredging usually associated with the catch of bivalves often peaked later than trawling had decline in most areas.

Source: Researchers' design, 2017.

## V. RESULTS AND DISCUSSION

Dredging activities have a lot of environmental implications. From Table 1, Nayar, Goh and Chou (2004) and Nayar *et al* (2007) are of the convergent view that resuspension of sediment partially accounted for higher concentrations of organic carbon, as dredging activity potentially release toxins into the marine environment. Mmom and Chukwu-okeah (2012) and Rinaldi *et al* (2005) were of the view that dredging activities have resulted to serious incision of river channel including ground water table lowering, flood flow increase, destabilization of infrastructures and sea water encroachment in the area. Muiyideenn *et al* (2013) asserted that dredging activity pollutes the environment and water source of the area as well endangering the life of people and aquatic animal in the area. Michael *et al* (2015) reported that dredging is a complex activity which has impact on aquatic ecosystem over long-time scales. They were of the divergent view that dredging is done to maintain water ways navigable.

David, Hitchcock and Bell (2004) reported that dredging disturbance will likely result to geological conditions. Mmom and Chukwu-Okeah (2011) deduced that high dredging activities have resulted to serious incision of river channel, deepening the river bed and increasing the velocity of flow. Generally, dredging activities have a lot of environmental implications that tend to pollute the environment as well as endangering life of people and aquatic animals. For example, in Zeebrugge and Singapore dredging operations led to resuspension of particulate matter column in phytoplankton (Nayar, Goh and Chou, 2004).

## VI. RECOMMENDATIONS

From the results of this study, the following

recommendations are hereby made:

1. Environmental legislations and regulations should be established to monitor dredging operations to reduce adverse environmental impacts.
2. The use of suitable dredging equipment should be encouraged in other to minimize suspension of sediments and contaminants at dredging sites.
3. Efforts should be made to create awareness among dredging contractors and regulatory bodies on the economic and ecological values of the marine ecosystem which are usually very sensitive, fragile and productive.
4. Disturbance arising from dredging operation should be controlled and standard should be set to decrease disturbance of dredging operations.

## VII. CONCLUSION

This paper discussed environmental implications of dredging activities through a review of works of pervious authors. Generally, the authors agreed that dredging is the excavation and relocation of sediment from river, lakes, estuaries and seabed. Dredging activities potentially because disturbance to aquatic ecosystem, changes in topography by creation of spoils, short term increase in turbidity which can affect aquatic species metabolism, environmental pollution and flooding of coastal areas and erosion. This study therefore, concludes that although dredging is beneficial in socio-economic terms, its adverse environmental consequences call for proper management to avoid a situation where they undermine the positive impacts.

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# A Study of the Corrosion Inhibition of Mild Steel in 0.5M Tetraoxosulphate (VI) acid by *Alstonia boonei* Leaves Extract as an Inhibitor at Different Temperatures.

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**Abstract**— A comparative study of the corrosion inhibition performance of *Alstonia boonei* leaves extract in 0.5M tetraoxosulphate (VI) acid at different temperatures (30°C, 50°C and 70°C) was undertaken. The results showed that *Alstonia boonei* leaves extract was more efficient as a corrosion inhibitor at 30°C compared to temperatures of 50°C and 70°C. The adsorption of *Alstonia boonei* leaves extract was found to obey Langmuir adsorption isotherm at all temperatures (30°C, 50°C and 70°C), but did not obey Freundlich adsorption isotherm at all temperatures. A study of the effect of temperature on corrosion rate and inhibition efficiency showed that corrosion rate increased with increase in temperature, while the inhibition efficiency decreased with increase in temperature.

**Keywords**— Adsorption, Corrosion, Efficiency, Inhibition, Isotherm.

## I. INTRODUCTION

One of the commonest methods of mitigating the corrosion of metals and alloys in corrosive environments is by the use of inhibitors. A corrosion inhibitor is a substance which when added in small concentrations to an environment, effectively reduces the corrosion rate of the metal exposed to that environment [1]. Corrosion inhibitors are commonly added in small concentrations to acids, cooling water, steam and other environments; either continuously or intermittently to reduce corrosion. Corrosion inhibitors reduce the rate of corrosion by adsorption of ion molecules onto the metal surface, increasing or decreasing the anodic and/or cathodic reaction, decreasing the diffusion rate for reactants to the surface of the metal and decreasing the

electrical resistance of the metal surface [2]. Chemical based corrosion inhibitors have been successfully used to control the corrosion of metals and alloys in various media [3-5]. However, due to the high toxic nature of chemical based corrosion inhibitors [6], there is need to develop environmentally acceptable and inexpensive green corrosion inhibitors. Green corrosion inhibitors are cheap, ecologically friendly and possess no threat to the environment [7]. There are numerous reports on the use of extracts from plants to control the corrosion of mild steel in several media. The leaves of *Nyctanthes arbortristis* acted as good corrosion inhibitor for mild steel in tetraoxosulphate (VI) acid medium [8]. The inhibition efficiency increased with increase in the concentration of the extract and maximum inhibition efficiency of 90% was obtained at inhibitor concentration of 1% v/v. Extract of *Citrus aurantiifolia* was found to be effective in 1M hydrochloric acid with efficiency of up to 97.51 % [9]. Ethanol extract of *Andrographis paniculata* inhibited the corrosion of mild steel in hydrochloric acid solution through the mechanism of physical adsorption [10]. Alcoholic extracts of eight plants (*Lycium shawii*, *Teucrium oliverianum*, *Ochradenus baccatus*, *Anvillea garcinii*, *Cassia italica*, *Artemisia sieberi*, *Carthamus tinctorius* and *Tripleurospermum auriculatum*) inhibited the corrosion of mild steel in acidic media through adsorption and acted as mixed type inhibitors [11]. Aqueous extracts of damsisa lupine and half – bar retarded the partial cathodic reaction of the corrosion of 7075 – T6 aluminium alloy in aqueous solution of 0.5 M sodium chloride [12]. Lupine extract had

the highest inhibition efficiency while half – bar extract had the lowest inhibition efficiency.

The inhibitive action of plant extracts could be attributed to the presence of phytochemical constituents present in the extracts [11-14]. Most of these phytochemical constituents have complicated molecular structures, large molecular weights and significant number of oxygen, sulphur and nitrogen atoms incorporated in their structures [11-14]. These compounds can adsorb on the metal surface via the lone pairs of electrons present in their oxygen, sulphur and nitrogen atoms [11-15]. The adsorption of such compounds decreases the surface area of contact with the corrodent, thereby reducing the corrosion of the metal. Extract of *Uncaria gambir* could serve as an effective corrosion inhibitor of mild steel in aqueous solution [16]. Electrochemical studies showed that the corrosion inhibition of mild steel in aqueous solution of *Uncaria gambir* extract was highest at a concentration of 150 ppm in solution with a pH of 5 [16].

Though, numerous plants have been studied and proven to possess corrosion inhibition potentials, there are still many that have not been studied for their anticorrosion potentials [11]. In order to increase the number of plants that possess anticorrosion potentials, we report the corrosion inhibition potentials of *Alstonia boonei* leaves extract. To the best of our knowledge, *Alstonia boonei* has not been studied for its corrosion inhibition properties, therefore the need to undertake the study. Phytochemical analyses of ethanoic extract of *Alstonia boonei* revealed the presence of the following phytochemical compounds: saponins, general glycosides, flavonoids, terpenoids and steroids, carotenoids, coumarins, alkaloids, anthraquinones and glycosides [17]. These phytochemical constituents are mostly responsible for the corrosion inhibition of plants [11–14]; therefore *Alstonia boonei* has anticorrosion potentials. In line with this, it became necessary to compare the corrosion inhibition performance of *Alstonia boonei* leaves extract at various temperatures (30°C, 50°C and 70°C). Secondly, to study the effect of temperature on the corrosion of mild steel in tetraoxosulphate (VI) acid medium using *Alstonia boonei* leaves extract as an inhibitor. This will be accomplished using Arrhenius and Eyring's equations.

Chemical reaction kinetics is the study of the rates of chemical processes [18]. It includes investigations of how different experimental conditions can influence the rate of a chemical reaction and yields information about the reaction mechanism, as well as the construction of mathematical models that can describe the characteristics of chemical reaction [19]

## II. METHOD

### 2.1 Materials and Equipment

The materials used for the study were: mild steel sheet, *Alstonia boonei* leaves, absolute ethanol, 0.5M tetraoxosulphate (VI) acid and distilled water. Equipment used were: Electronic balance, electric oven, stopwatch, beakers, abrasive papers and reflux condenser.

### 2.2 Preparation of corrosion test specimen

Mild steel sheet was mechanically press cut to produce corrosion test specimens each of dimensions 30 mm × 15 mm × 1.2 mm. A 3 mm diameter hole was drilled on each specimen to facilitate easy suspension and withdrawal from the corrodent. The surfaces of the test specimens were polished with abrasive papers to produce smooth surfaces. For surface treatment, the test specimens were decreased in absolute ethanol, washed in distilled water. The washed specimens were cleaned with cotton wool and oven dried. The dried specimens were weighed to obtain the initial weights and stored in a desiccator.

### 2.3 Preparation of plant extract

The leaves of *Alstonia boonei* were obtained from Uramuruwa Onuga forest in Umude Avuvu, Ikeduru, Imo State, Nigeria. The leaves were identified in the Department of Plant Science and Biotechnology, Imo State University, Owerri, Nigeria. The leaves were shade dried for two weeks. The leaves were grounded into powdery form and stored in airtight containers. A stock solution of the plant extract was obtained by refluxing 25 grammes of the powdered *Alstonia boonei* leaves in 500 mL of 0.5M tetraoxosulphate (VI) acid for three hours. The refluxed solution was filtered to remove any contaminant which might be present. The required concentrations of the extract (2.5 g/L, 5.0 g/L, 10.0 g/L, 25 g/L and 50 g/L) needed for corrosion studies were prepared from the stock solution.

### 2.4 Experimental

The weight loss measurements were carried out as previously described by [20]. However, weight loss measurements were conducted at temperatures of 30°C, 50°C and 70°C respectively. The mild steel specimens were each suspended and totally immersed in 0.5M tetraoxosulphate (VI) acid without and with different concentrations (2.5 g/L, 5.0 g/L, 10 g/L, 25 g/L and 50 g/L) with the aid of strings and rods for ten hours, washed thoroughly in ethanol, rinsed in distilled water, dried and weighed to obtain the final weight. The weight loss was obtained by computing the difference between the initial weight and final weight. From the weight loss results, the corrosion rate was computed using equation (1) [7]:

$$\text{Corrosion rate (mm/yr)} = \frac{87.6W}{\rho At} \dots (1)$$

Where  $W$  is the weight loss in grammes,  $\rho$  is the density of the specimen in  $\text{gcm}^{-3}$ ,  $A$  is the area of the specimen in  $\text{cm}^2$  and  $t$  is the exposure time in hours. The inhibition efficiency ( $I$  %) of *Alstonia boonei* leaves extract was computed using equation (2) [7] :

$$I\% = \left(1 - \frac{W_i}{W_o}\right) \times 100 \dots (2)$$

$W_i$  = weight loss in the presence of inhibitor

$W_o$  = weight loss in the absence of inhibitor

### III. RESULTS AND DISCUSSION

3.1 Comparison of the corrosion inhibition performance of the extract at different temperatures.

This is undertaken with a view to establish the temperature at which *Alstonia boonei* leaves extract will function optimally as a corrosion inhibitor in 0.5M tetraoxosulphate (VI) acid medium. Presented in Fig.1 are the calculated values of corrosion rates

(mm/yr) of mild steel in 0.5M tetraoxosulphate(VI) acid in the presence of *Alstonia boonei* leaves extract at temperatures of 30°C, 50°C and 70°C. The corrosion rate decreased as the concentration of the extract increased from 0.25 g/L to 50 g/L. A comparison of the corrosion rates at 30°C, 50°C and 70°C revealed that the corrosion rates obtained at 30°C were lower compared to the corrosion rates at temperatures of 50°C and 70°C. Maximum values of corrosion rates were obtained at temperature of 70°C. Also presented in Fig.2 are the calculated values of inhibition efficiency ( $I$  %) of

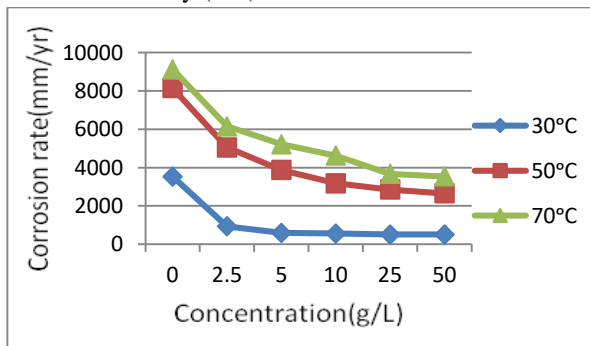


Fig. 1: Variation of corrosion rate with temperature

*Alstonia boonei* leaves extract at temperatures of 30°C, 50°C and 70°C. The inhibition efficiency increased with increase in the concentration of *Alstonia boonei* leaves extract, probably due to an increase in the surface area covered by the extract [7].

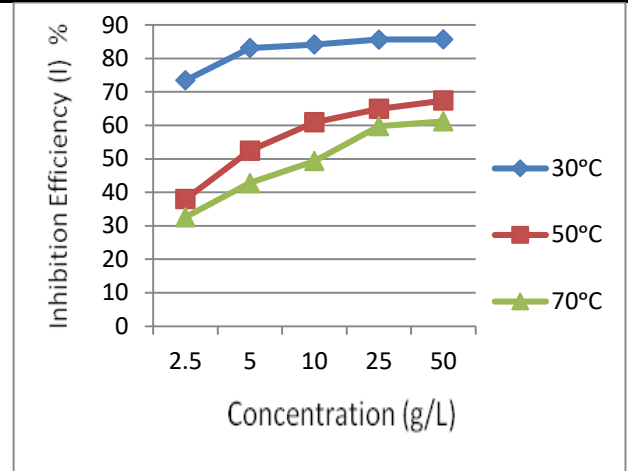
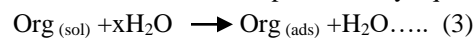


Fig. 2: Variation of inhibition efficiency with concentration

A comparison of the inhibition efficiencies obtained at different temperatures (30°C, 50°C and 70°C) showed that the extract was more efficient as an inhibitor at low temperature (30°C) compared to temperatures of 50°C and 70°C. The high inhibition performance of the extract at low temperature (30°C) could be due to the fact that as the temperature increases, there is weakening of the inhibitor film on the metal surface [21]. Therefore, a greater area of the metal surface is available for corrosion reaction at high temperature(s).

### 3.2 Adsorption isotherm

The adsorption process of organic inhibitor molecules occurs due to the replacement of water molecules adsorbed on metallic surface as represented by equation (3):



Where  $x$  is the number of  $\text{H}_2\text{O}$  molecules replaced by one organic molecule.

The degree of surface coverage ( $\Theta$ ) obtained from the weight loss measurements were used to evaluate the isotherm that best fits the data. The degree of surface coverage ( $\Theta$ ) was computed using equation (4) [7]:

$$\Theta = 1 - \frac{W_i}{W_o} \dots (4)$$

Where  $W_i$  and  $W_o$  are the weight losses in the presence and absence of the inhibitor respectively. Values of linear correlation coefficients obtained from the plots were used to determine the isotherm most applicable to the experimental data [21].

The Langmuir adsorption isotherm model is based on the assumption that the adsorption takes place at specific homogeneous sites within the adsorbent [14]. The Langmuir adsorption isotherm model is represented by equation (5) [14, 22]:

$$\frac{C_{inh}}{\theta} = \frac{1}{K_{ads}} + C_{inh} \dots (5)$$

Where  $K_{ads}$  ( $Lg^{-1}$ ) is the adsorption equilibrium constant and  $C_{inh}$  is the inhibitor concentration. Fig .3 shows the Langmuir adsorption isotherm plots for the adsorption of *Alstonia boonei* leaves extract at temperatures of 30°C, 50°C, and 70°C. Straight lines were obtained with  $R^2$  close to unity at each temperature. This is an indication that the adsorption of the extracts at temperatures of 30°C, 50°C and 70°C obeyed Langmuir adsorption isotherm [23]. It also indicates that *Alstonia boonei* extract species occupies typical adsorption sites at the metal /solution interface [24]. The values of the Langmuir

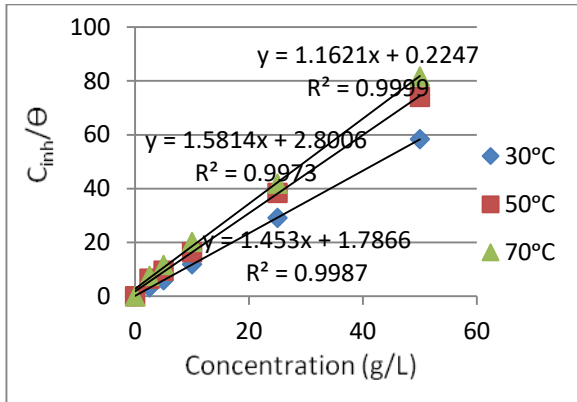


Fig. 3: Langmuir adsorption isotherm plots for the corrosion of mild steel in 0.5M H<sub>2</sub>SO<sub>4</sub> in the presence of the extract at different temperatures.

Table 1: Langmuir adsorption isotherm parameters for the corrosion of mild steel in H<sub>2</sub>SO<sub>4</sub> in the presence of the extract.

Temp (°C)	K (ads)	$\Delta G_{ads}^{\circ}$ (KJ/mol)	$R^2$
30	4.46	-21.17	0.999
50	0.56	-17.00	0.998
70	0.36	-16.79	0.997

Adsorption isotherm parameters obtained from the plots are presented in TABLE 1. The adsorption equilibrium constant ( $K_{ads}$ ) decreased with increase in temperature from 30°C to 70°C. Since the efficiency of an inhibitor is a function of the magnitude of the adsorption constant ( $K_{ads}$ ), large values of  $K_{ads}$  is an indication of better and stronger interaction between the inhibitor molecules and the metal, whereas small values of  $K_{ads}$  mean weak interaction [25]. The value of the adsorption equilibrium constant ( $K_{ads}$ ) obtained at 30°C is higher compared to the values obtained at 50°C and 70°C. This implies that *Alstonia boonei* leaves extract was more efficient as an inhibitor at 30°C compared to the other temperatures (50°C and 70°C).

The Freundlich isotherm is mostly used for heterogeneous surface energy systems (non-uniform distribution of

sorption heat) [26]. The Freundlich adsorption isotherm is defined by equation (6) [27]:

$$\text{Log}\Theta = \text{Log}K_{ads} + n\text{Log}[C] \quad (0 < n < 1) \dots (6)$$

Fig. 4 shows the Freundlich adsorption isotherm plots for the adsorption of *Alstonia boonei* extract at temperatures of 30°C, 50°C and 70°C. Straight lines were obtained with  $R^2$  values presented in TABLE 2. The values of  $n$  and  $K_{ads}$  were evaluated from the slopes and intercepts of the plots [27]. These values are presented in TABLE 2. The adsorption equilibrium constant ( $K_{ads}$ ) decreases as the temperature increased from 30°C to 70°C. The highest value of  $K_{ads}$  was obtained at a temperature of 30°C which is to further confirm that *Alstonia boonei* extract was more efficient at 30°C compared to temperatures of 50°C and 70°C. The  $n$  values lie between 0 and 1 at all temperatures which signifies strong bond between the extract and metal surface [28]. However, the  $R^2$  values obtained were not close to unity, therefore poor fit was obtained with Freundlich isotherm.

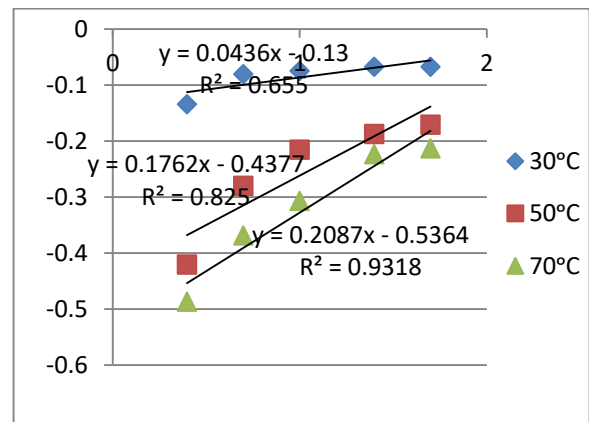


Fig. 4: Freundlich adsorption isotherm plots for the corrosion of mild steel in the presence of *Alstonia boonei* extract.

Table 2: Freundlich adsorption isotherm parameters for the adsorption of *Alstonia boonei* leaves extract on the metal surface.

Temp (°C)	$K_{ads}$	$n$	$\Delta G_{ads}^{\circ}$ (KJ/mol)	$R^2$
30	0.741	0.043	-16.65	0.655
50	0.366	0.176	-27	0.825
70	0.291	0.208	-16.18	0.931

The adsorption equilibrium constant ( $K_{ads}$ ) is related to the free energy of adsorption ( $\Delta G_{ads}$ ) by equation (6) [14]:

$$\text{Log}K_{ads} = -\text{Log}C_{H2O} - \frac{\Delta G_{ads}}{2.303RT} \dots (6)$$

Where  $C_{H2O}$  is the concentration of water in solution expressed in g/L,  $R$  is the universal gas constant,  $T$  is the absolute temperature. The free energy of adsorption ( $\Delta G_{ads}$ ) obtained using equation (6) are presented in TABLES 1 and

2. The results are negative in all cases which imply that the adsorption of *Alstonia boonei* extract on the metal surface is a spontaneous process [7, 15]. Values of  $\Delta G_{ads}$  up to  $-20$  KJ/mol are consistent with electrostatic interaction between charged inhibitor molecules and a charged metal (physical adsorption) [7, 23]. Therefore *Alstonia boonei* leaves extract inhibit the corrosion process by physically adsorbing onto the metal surface.

3.3 Effect of temperature.

The effect of temperature on corrosion rate and inhibition efficiency are presented in Figs. 4 and 5 respectively. The corrosion rate increased with increase in temperature and the inhibition efficiency decreased with increase in temperature. This could be attributed to the fact that at high temperatures, the desorption of the *Alstonia boonei* extract occurs and causes mild steel to be exposed to the corrodent [21].

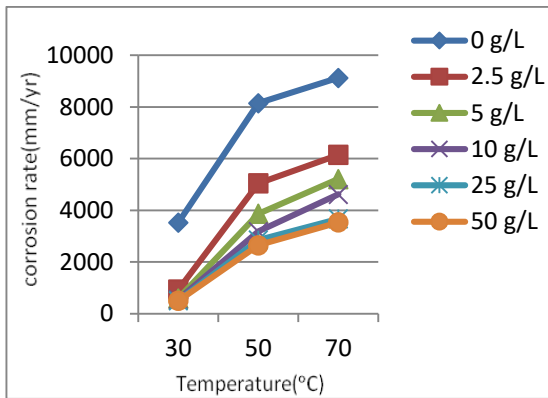


Fig. 4: Effect of temperature on corrosion rate

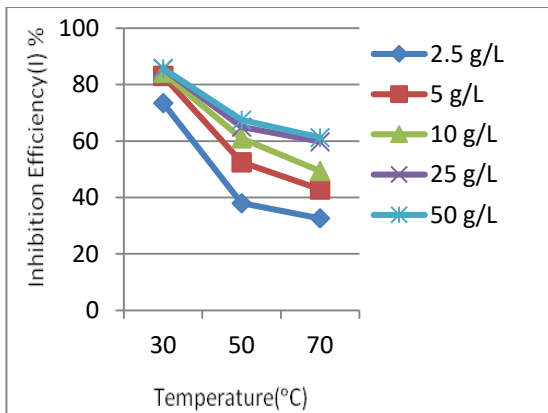


Fig 5: Effect of temperature on inhibition efficiency.

Consequently, massive deterioration of the specimen occurred at elevated temperatures.

The apparent activation energy ( $E_{app}$ ) for the corrosion of mild steel in 0.5M  $H_2SO_4$  is computed using Arrhenius equation in (7) [15]:

$$\text{Log CR} = \text{Log A} - \frac{E_{app}}{2.303RT} \dots (7)$$

Where CR is the corrosion rate, R is the gas constant and T is the absolute temperature. Fig.5 represents the plot of  $\text{Log CR}$  versus  $1/T$  for the corrosion of mild steel in 0.5M  $H_2SO_4$  in the absence and presence of various concentrations of *Alstonia boonei* extract. Straight lines were obtained. The values of the apparent activation energy ( $E_{app}$ ) were obtained from the slopes of the plots [7, 15] and are presented in TABLE 3. The values of the apparent energy of activation ( $E_{app}$ ) in the presence of various concentration of *Alstonia boonei* leaves extract were higher compared solution to the value obtained in the blank (0.0 g/L). Similar results were also gotten by [7, 15]. This could be attributed to the desorption of the inhibitor molecules (*Alstonia boonei* leaves extract) which occurs on the surface of the metal as temperature increases [21]. The increase in activation energy in the presence of the extract signifies physical adsorption [7, 21]

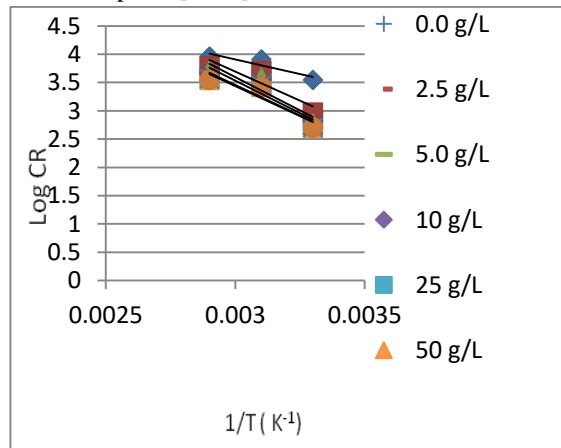


Fig. 5: Arrhenius plots for the corrosion of mild steel in 0.5M  $H_2SO_4$  without and with different concentrations of extract.

Table.3: Activation energy parameters for the corrosion of mild steel in 0.5M  $H_2SO_4$  in the presence and absence of *Alstonia boonei* extract

Concentration (g/L)	$E_{app}$ (KJ/mol)
0	19.74
2.5	39.10
5.0	45.09
10	43.92
25	41.15
50	40.44

The enthalpy of activation ( $\Delta H^\ddagger$ ) and the entropy of activation ( $\Delta S^\ddagger$ ) were computed using Eyring's equation given in (8) [27]

$$-\ln \frac{Rh}{Nt} R_c = \frac{\Delta H^\ddagger}{RT} - \frac{\Delta S^\ddagger}{R} \dots \dots \dots 8$$

Where  $h$  is the Plank's constant,  $N$  is the Avogadro's number,  $T$  is the absolute temperature,  $R$  is the gas constant,  $R_c$  is the corrosion rate.

Presented in Fig. 6 is the plot of  $-\ln\frac{hR_c}{K_B T}$  versus  $\frac{1}{T}$ .  $K_B$  is Boltzmann constant and equals the term  $\frac{R}{N}$  [27]. Straight lines were obtained. The activation parameters obtained from the slopes and intercepts [27] are presented in TABLE 4

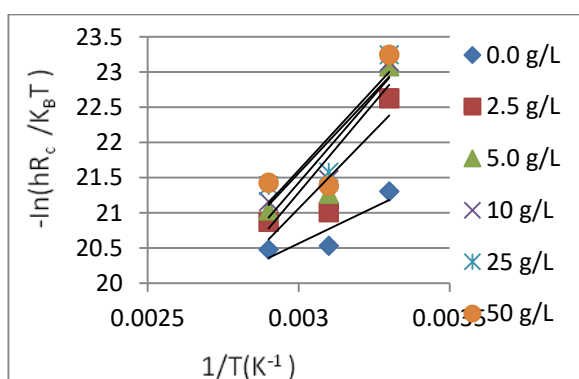


Fig 6: Eyrings plot for the corrosion of mild steel in 0.5M  $H_2SO_4$  in the absence and presence of the extract.

The enthalpy of activation ( $\Delta H^\ddagger$ ) in the presence of various concentrations of the extract was higher compared to the value obtained in the absence of the extract. This implies that the energy barrier of corrosion reaction increases with the concentration of the extract and activated complex can be formed faster in the blank solution [28, 29].

The positive values of  $\Delta H^\ddagger$  is an indication that the adsorption of the extract on the metal surface is an endothermic process [28]. The negative values of  $\Delta S^\ddagger$  in the presence and absence of the inhibitor is an indication that the activated complex in the rate determining step represents an association rather than a dissociation step [29]. This implies that there is more disorderliness in the solution without any extract [29].

Table 4: Activation parameters for the corrosion of mild steel in 0.5M  $H_2SO_4$  in the absence and presence of the extract

Conc. (g/L)	$\Delta H^\ddagger$ (KJ/mol)	$\Delta S^\ddagger$ (J/mol)
0	17.16	-119.47
2.5	36.52	-65.58
5.0	42.51	-49.44
10	41.35	-54.12
25	38.57	-63.92
50	37.86	-65.71

#### IV. CONCLUSION

Based on the experimental results obtained, *Alstonia boonei* leaves extract inhibited the corrosion of mild steel in tetraoxosulphate (VI) acid. Therefore, plant materials could replace synthetic chemicals as inhibitors. They are cheaper, readily available, renewable sources of materials, environmentally friendly and ecologically acceptable. The use of extracts from plants to control corrosion will lead to a reduction in maintenance cost. This is because the incessant breakdown of equipment will be greatly reduced, thereby reducing the frequency of replacing broken down equipment.

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# Sports Management Organization in Göktürk State

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**Abstract**— This study, which aims to determine the principles of traditional Turkish Sports Management and organizational structure, will examine the ethnocenosis system of Göktürk State, which is a state that uses only the Turkish alphabet and the first Turkish identity among the Turkish States established up to date, and try to determine the structure of sport management and organization which they formed mainly in war and physical education. In the study, a qualitative method called "descriptive field scanning", documentary or documentary study was followed (Karasar,1976). In order to determine the organizational structure of the Göktürk State, it has been analyzed with the observations of China, Rome, Orhun Abdüleri, epic poems, traveler's observations, archaic cosmology of Gokturk society and the discoveries of various fields working on that period. Turkish history can be considered as a military history until the last two hundred years. Turkish society is one in which, in the light of the available data, throughout history, military-civil distinction is not considered, and all members of the society are considered soldiers. "The army was in the people, the people in the army". Therefore; Göktürk State was formed in parallel with the state hierarchy in all the cities under the state government (Yaylak-Kışlak) in the structure of sport management organization.

**Keywords**— Sports Management, Göktürk State.

## Aim

This study, which aims to determine the principles of traditional Turkish Sports Management and organizational structure, will examine the ethnocenosis system of Göktürk State, which is a state that uses only the Turkish alphabet and the first Turkish identity among the Turkish States established up to date, and try to determine the structure of sport management and organization which they formed mainly in war and physical education.

The old institutions of a nation are the ideas, organizations and practices of an individual or institution of one country that may be of value to the past but of future generations. The organizational structure and practices of institutions are the common consciousness of that nation. If a person can not remember the past and consciously evaluate the present time and can not plan the

future in a healthy way, then a nation lacking the organizational structure of its institutions is in the same situation. For this reason, a nation needs to know its activities, past, and experience accurately. By taking advantage of these experiences, it will be able to assess the present and future of sport management as healthier. In this respect, the plans of the sporting organization for the future of the Turkish nation will be more accurate. In the study, a qualitative method called "descriptive field scanning", documentary or documentary study was followed (Karasar,1976). In order to determine the organizational structure of the Göktürk State, it has been analyzed with the observations of China, Rome, Orhun Abids, epics, the travelers of the period, the cosmology of Göktürk society's archaic rotation and the discoveries of various fields working on that period.

## I. INTRODUCTION

Scientists documentat that In the IV.V and the X. Century , In Hun monograph,a part of Han dynasty history, four more Turkish states were established in central China by the Hun tribe, the continuation of the Southern Huns.These states, the Han or the first Chao (304-329), the later Chao (319-352), Hsia (407-431) and North Liang (397-439), both conquered the Chinese lands and they forced the Chinese to migrate near Yangtze river. The new Han emperors of China, despite their short life spans, have built extraordinary palaces, buildings, bridges, opened many areas, introduced new laws and placed education first.These states, which do not have their own written language, have been well searched by the historical materialism of mankind, and their laws and laws have been determined by studying their own history using Chinese language and various books on Buddhism they have accepted (Baykuzu, 2008). The social processes that spontaneously develop in the form of social and economic societies are only human beings within the community. Human communities are ethnos. There is not one person left in the world outside etnos. Studies of the Central Asian History and the Volga's downward archaeological studies to determine the functional linkages between physical geography and paleontology (phenomenology or fossilology) have reached three conclusions. First; an ethnos depends on the geographical landscape and the dynamic state of the landscape, which

is directly related to the outcome of its historical fate economic activities. Latter; an archaeological culture of an ethnos, reflects the paleogeography of the landscape - the science that investigates the geography of the past ages - as a crystallized trail following the end of the fate of history. In this way, it is more convenient to determine the date of the events. The third is; (Gumilev, 2001) Under this light, the archaic culture, community life, individual characteristics, state-individual relations and social institutions were tried to be determined under the light of Göktürk states in the period of the union of the materials of history and archeology (materials) .

The nature of human action requires the handling of the matter in the context of a traditional distinction in social theory. The dichotomy of "objectivity" and "subjectivism", with the first of these concepts, are social theories that think that social object has priority in society as an individual and that analysis of social institutions as the main field of interest. In subjectivism; the human element is placed at the center of social analysis as opposed to objectivity. Objectivist tradition is justified in asserting that society or social institutions are more persistent in a sense and more irrelevant than singular members of society. They have better analyzed the problems related to large-scale social transformations, conflict, and change in general, with historical research (Kılıç, 2015). Myths, the stories of creation, describe how something is created or how a behavior, an institution, a way of working is experienced (Eliade, 1994). Mircea Eliade argues that modern pre-societies tend to rely on *tarihe* and that the beginning of things longs for the periodic turn of the mythical time (great time), which is why they believe that their behavior is regulated by the revelations created by the gods or by supernatural beings or mythical heroes, they have a supernatural and a root of love. According to him, everything that the archaic man has done, has been done before. His life is an endless repetition of movements initiated by others, and each gesture gains meaning and reality as it repeats a first action. From the examples we have seen from various cultures, the archaic society has sought to find out what people believe and why. The first of these results; For archaic human beings, reality is a celestial archetype (the archetypal society thinks that the behavior of people is "reveled" and thus they have a superhuman and transcendent root). Second result; facts that show that reality is achieved through participation in "central symbolism". Cities, temples, houses are real with similarities to the center of the world. Third result; Rituals and important religious gestures that gain meaning and embody the meaning attributed to them by consciously repeating a number of actions set forth by gods, heroes, or ancestors. For the Archaic people the rivers, cities and temples that the worlds surrounding them traveled on the

worlds, the mountains they climbed, the domesticated and processed regions, where the presence and influence of the human being felt. There is an extraterrestrial archetype that grasps all these as a plan, a form, or a twin, which exists at a higher cosmic level, pure and simple (Eliade, 2001)

One of the most important elements of social structure is undoubtedly social institutions. Social institutions are social realities that develop outside of the individual, which force them to behave in a certain direction and change within their own laws. The most important of these are; language, religion and art. There are those who claim that the mother of all other institutions is these three institutions (Printer, 2014). Today, sport is emerging as an independent institution that has the most roots, the most popular and widespread activity area of today, especially after the influence of religious institutions. All the goals and functions of sport are realized by the individual through the help of the individual. In other words, all social, cultural, civil and environmental goals can only be achieved through the training of individuals by making them sufficiently qualified and competent (Krench, Crutfield, 1980). During the period of the Göktürk state, the sport was particularly covered by the religious institution. He took part in social life as a complementary ritual of religious rituals. The Göktürks, who possessed the characteristics of a military society, developed "heroism" and "conformity" institutions, which are the institutions of other Turkic states, which provide a kind of war physical education in order to realize the aim of better defense and fighting. Social status in society has become a phenomenon.

The first example of the administrative organization we know of was the primitive (super) military organization that came with the priority bronze age. The management considers the managerial segments that differ in terms of content and method, according to the general statement that can be abstracted from concrete situations. Management principles and organizational principles (regional, production or functional), management-relationship and balance, personnel selection and placement rules, motivational methods etc. it is important that the general indications that can be abstracted from the sometime are important. However, management conscience is not enough to examine the common social processes and the common administrative phenomena that are determined by these different social groups. Economy, education, and culture provide a way to explore, find, abstract and manage the principles and rules of rational and scientific governance of different segments of society within a broad spectrum of advocacy (Fisek, 1980).

Society is not a static and constant human crowd. It is necessary but not enough for the community to be a person. Because society is a network of human relations.

If there is no interaction, communication and interaction between humans, this network will not form and we can not talk about society because of social dynamism. In sociology, all biological, psychosocial and geographical directions are meant to name social structure for society as a whole. Social structure consists of two elements. These are physical and cultural structures. Geographical structures constitute the elements of physical structure, social organizations, groups, elements, norms, status, institutions and organizations as cultural elements. Here is a typical example among the institutions and organizations in the cultural structure is sport. (Yazıcı, 2014).

The origins of the sport depend on the birth of mankind. The first sports in history were for defense and aggression, whether it was vehicle or vehicle. In ancient China and India sport was used for spiritual and body harmony, but it was used entirely for military purposes in Ancient Greece, Egypt and Persians (Charles, Bucher, 1987). Pierre De Coubertin, the founder of the modern Olympics, once again emphasized the unchanging military approach throughout the sport, saying that "the sport's true task is the best way to prepare young people for war." First of all, it is indispensable to investigate and to attain enlightenment with all its aspects and scientific impartiality in terms of understanding and interpreting today correctly.

The research on the ancient / early inner Asia history made with this understanding is also a preliminary in terms of revealing the historical realities of other Asian peoples such as China, Iran, Russia and the old Hindu European tribes as well as Turkish science. From this point of view, the cultural interaction between the inner Asian tribes will be clear. (Vasary, 2007). The life style of the Turks can be documented clearly in archaeological periods for both BC and AC. The determinants of lifestyles are found in archaeological discoveries. (Durmuş, 1998).

The homeland of the Turks is known as Central Asia (Turkestan). According to archaeological excavations, Turks have developed many cultures in this geography. Among these are the Anav Culture (4000 BC, West Turkestan), the production of various kitchenware where agriculture is made, as well as the construction of grain warehouses and irrigation canals. For Afanasyevo Culture (3300-1700 BC, Altaylar), horse skeletons and harnesses proved that the horses were domesticated by the Turks. In addition, metal housings and jewelery items and cloth pieces found in the guilds show that the people of the region are aware of the mining and weaving. Adronovo Culture (1200-200 BC, Caspian Sea north) Balkas appeared around the lake and the God Mountains. This layer of culture is the continuation of Afanasyevo Culturalism. The war tools and harnesses found here are

evidence of the Turks being a horse and warrior nation. Karasug Culture (BC 1300-700, Central Asia, Siberia, Mongolia), the continuation of the Adronovo Cultural Karasug Cultural layer, is regarded as the most advanced culture compared to its contemporaries in Central Asia. The finds that emerged here are; copper, bronze, iron, gold and silver, and many of the mines are going to be processed, horseback war cars are widely used and carpets, kilims etc. weaving has also improved.

The common point among these cultures is that Proto-Turks have developed a "Bozkir Culture" in the geography of Central Asia since 4500 BC. The group called the Vienna School (W. Koppers, O.Menghin, W.Schmind and F. Flour) binds the Altai as well as the people who connect this culture to the Indo-Germans in certain geographies in the development of mankind. This culture of horse nomadic culture controls the large territories and the people there. Therefore, a strict social and economic reconciliation had been established. This culture BC It became apparent from the 2500's. This culture based on the horse spread from Turks to Chinese, to Mongols, to Hindu-Europeans. According to somebody, this is the first civilization in the world. (Kafesoglu, 1987, Khazanov, 1930, Olkhovsky, 1995).

Turkish epics such as Oguz Kagan, Manas and Dede Korkut stories are important sources for physical education and sports in Turks. The Manas legend is an example. The international equestrian, archery, spear, sword and wrestling competitions held during the mourning ceremony held on the death of the Kyrgyz koe Köketay shed light on traditional Turkish sports branches. It was a tradition to organize international competitions in Turks and to make them an indispensable part of social life. It is understood from the sources of 1000 years and from Kyrgyz epics. It is known that in the ancient olympic games only Greek athletes competed, slaves, captives and non-Greek athletes were excluded from the competition. The first Olympics BC, when the Turks were thought to have begun in 770 BC. It is known as the first international competitions for archery and equestrian competitions with Chinese in 1000 years.

It can be listed in the form of determinative factors, laws, ordinances, customs, customs, traditions, prohibitions, rituals, religious ceremonies, fashion, social beings that affect socio-cultural structure and cause it to differentiate over time. Each of the above norms defines socioculturalism in this sense when it encompasses the social relations between people. Norms make social relations and interactions within a cultural structure predictable and predictable. In this respect, a socio-cultural structure comes to the fore at the end of the interaction and integration of institutions such as family, faith, economics, education, politics. This is the culture of

integrated content. Each nation has its own tradition and custom, etc. (Özönder, 1990)

### **Cosmology and Sports of the Göktürk State Nation in the Archaic Age**

In order to determine the Göktürk state sports management and organization understanding, it is necessary to understand what is the socio-cultural structure in accordance with the spirit of the period and the interest of individuals and institutions. For this reason, we can explain the culture of the archaic period and the construction of the Göktürk nation as follows: Myth is an important social force. The emergence of a myth community, its laws, makes it possible. It expresses and quantifies moral values, rituals and beliefs. It gains influence to traditions and traditions. It guides people's practical activities and teaches people the rules of behavior. Myth, the basic element of human civilization, is a living reality. Myth is at the same time a symbolic idiom that contains the future of society's life and the whole of the past. Myths that are not doubtful of the sanctity and truth are a system that collects and shapes the first scientific approaches of archaic societies, religious beliefs, various kinds of fine arts, philosophical knowledge and all layers of archaic society. (Malinowski, 1998)

Cultural elements of the Turkish individual living in Archaic period are formed as follows. The system of the universe as two universal breath, complementary but complementary, represented by all the formations of the sky and earth (earth), was the oldest and self-contained cosmology of Proto-Turk and Turks. The Turkish cosmology is called dichotomy (two primitive systems), based on two primitive representations of sky and place. Universalism was in the form of a centralized state religion. Tengri was considered to be the father of the Kagan. It was around the Gokturk state, which followed the political and cultural tradition of the East Huns, which the Chinese called Hsiung-nu. In the 4th and 5th centuries, when the Göktürks' kagan descent (the tribe of the Chinese called A-Shi-Na) was on the stage of history, the P'ing-ho- ho / Hoang- ho (the Ho- A Liang Taoist lived around the mountain, a shrine.

The centralist state philosophy was accepted in the Eastern Huns or in the Göktürks, but was interpreted according to them. During the times when they are particularly strong in the East Hunts and the Gokturks, the center of the world is not in China but in the army of their own Kagan. Ordu Orgin - Ötüken- Yiş was regarded as the four-way junction, the center of the universe. (In Göktürk texts, it is described as Tengri (Heaven) and Iduk (Sacred)). In the Gokturk State, like Kagan camp and city, Kagan Pavilions and temples were also regarded in the center of the universe and in the universe plan. The nine-

cell constructions facing four directions, one in the center, four in the center, four in the corners, were unique to the Kagan dwellings. Universal cosmology was as architectural as it is in every field, and also in the temples (Esin, 2001).

As Esin and Baykara have pointed out, cosmology of the Turkish-born Zhou state, which ruled in China before the Huns, was similarly applied in all the Turkish states that followed. Even the Seljuks and the Ottomans who chose Islam relate to similar practices. At certain times of the year, architectural works where rituals are arranged are mentioned. Various sources and travelers speak of the Göktürk state cities and their rituals, which are in a mooring (summer) and a fixed (winter) location. These rituals have common points. These points are; time similarity, military and sporting characteristics of the structure of the rituals. In particular, the organization structure and activities of the palace school called Pi-yung in the period of Chu are the characteristics of sports management. This situation; The Turks have shown their place in the social life and institutions since the previous centuries. The structure of the palace school called Pi-yung described below supports our views.

In the period of Chu, there was a palace school with military training. In this school, the ruler and the old heroes grew up young heroes with the son of the ruler at the head. The young heroes, who were called as the sons of the state and whose descendants were usually the Chu, learned to use guns, especially arrows, to drive two-wheeled carts of wagons, and to represent legends as dances. The weapons, armor and horse's clothing carried Turkish features. In the last months of spring, the Young heroes were hunting and setting on fire the bushes in the marsh. During the autumn and the celestial period, they made archery competition in music accompaniment. During the heavenly period, the place of the contest was probably held in a place called the Pi-yung in Chinese. The Pi-yung structure was on the left of the monarch spacious hall, which is similar to that of the sin-star team of the celestial ruler called ming-f'ang, who invented the fire. To the right of Mingtang, it was the Ling-f'ai tower, which aimed to determine the status of the stars. There was no doubt that Pi-yung was originally military. Because this place was in a round pool, it was a castle. Pi-yung was reached by crossing four bridges. Pi-yung was selected among the provincial and high-ranking heroes and subtle archers in archery competitions held in music accompaniment. Because in this contest, the point at which the music is pointing is not only mastery, but also training, accuracy, and celebration. Those who could not reach the target with the glass were offered drinks with horns. Each alp depicts the animal he has shot on his resident flag and this flag is considered to be his soul. Kağan was hunting only cattle and deer. The place of his

soul was a spear made of a cattle tail. In the feasts after the ceremonies, the rankings were their engagement mark, drums, drums, arrows, bows and axes; signs such as a goblet, which is the symbol of the right to drink, were distributed. On the military belt, they were hung with a sword and a wedge, a bone plate showing the ranks and a handkerchief called Turkish watercraft. The history of the nations is not only the history of the establishment of institutions and ideologies, but also the construction of the nation (Ludwig, 1975). For this reason, the nation needs to shape its bodies as well as the mentality worlds. Analyzing the biopolitical approaches that differentiate different periods in terms of both goals and instruments is an indispensable part of understanding the history of a nation (Beşirli, 2016)

Biopolitics; is part of the realization of the control and regulation of bodies on the population scale (Aksu, 2012). We can explain the physical supervision and regulation of the Göktürk state as follows; even if differentiated in the contemporary world, biopolitics did not differ for women and men in the archaic period. Despite the fact that women's primary duty was maternity, they played a role in all kinds of sports. Just as women are in the case of the heroes (inscriptions, epics, rock paintings, kurgan and miniatures). The social life in the Göktürk state has been shaped in parallel with the modern gender concept of today. The women and men Göktürks were subjected to a physical education in the form of wartime aggression-defense, and in the time of peace, they would take part in the economy (Heroism, blacksmithing, handicrafts, housework, trade, etc.).

In the Archaic period, the nations living in the steppe had to be vigilant at all times, not only by a specific task group but also by all their members. Otherwise, the slightest negligence to be shown in such a lively environment could confront the communities with the danger of raiding. This could have caused quite difficult results to compensate, and could even lead to the catastrophe of the community. This made it necessary for every individual in society to be prepared at all times in the face of any danger. So each individual was a warrior / soldier at the same time. In other words, there was no civil-military division in social life, and the people were in army and army were people (Ögel, 1983). This situation was also emphasized in Göktürk inscriptions.

### **Social Life, Institutions and Sports in Göktürk State**

One of the important elements of social structure is undoubtedly social institutions. Social institutions are social realities that develop outside the individual, drive it to certain directions, force it to change within its laws. The most important of these are; language, religion and art. There are those who say that the mother of all other institutions is these three institutions (Printer, 2014). The

concept of peripaticality was primarily developed within anthropological studies. On the other hand, it has been developed in different terminologies for the discussion of human communities. Robert Hayden defines this group as service nomads after underlining that pastoral (shepherd) and non-hunter-gathering nomads exist at least as a unique adaptation in South Asia (Hayden, 1979). Kumar calls them like symbiotic nomads by underlining the similarity of their discussion with the resident communities of idyllic and idyllic nomads. A-shih-na's (asena = Göktürk Kagan ancestor) adopted peripatetic strategies, and a dependent group gradually transformed into a warrior-pastoral tribe and gradually became the core of the Göktürk tribe federation, indicating that peripatetic groups could be diverted to different adaptations by differentiating them under unique conditions (Yılıgür, 2015). Divitçioğlu argues that the A-shih-na follow the form of a collective-hunter-anasoyl-matriarchal hunter-blacksmith-anasoyl-matriarchal and finally nomadic-shepherd-anaso-patriarchal social organization from the Chinese sources. Divitçioğlu, 2005). The integratedist rhetoric that the Göktürk state adopted for the social policy they have chosen to gather around other Turkic states and non-Turkish elements around the same living world is described in the Orhun Inscriptions. Entegrisism is described as being a follower of tradition by Garaudy (2010) and conservatism.

Existence integrationism of the Göktürk state; The Kokturk was a policy of collecting the other tribes under the influence of Turkish identity. Göktürk state shows itself in sport in socio-cultural life. As stated in Little sport is not just a physical activity, but also socialization. Sports is limited to a rules array. It also requires interlocking abilities according to the properties it carries. Whether it is training or contest, achieving success is possible by following rules that are not found in this daily life. This is a new situation process. The individual who has successfully completed the integration process now has some new features. More precisely, it has taken its place in society by developing some qualities. Apart from the economic value of hunting, which allows the development of sports branches and especially archery skills, military, social, managerial and sportive functions have appeared at the forefront. Organizations aimed at sports competitions take part in public life by organizing military festivals and ceremonial archery competitions that require a certain intensity of preliminary work (Öngel, 2001). In the early periods of Göktürk's history, today's modern law recognizes rights that are similar to those granted to women and children. During the periods when women and children were bought and sold as commodities in other societies with their contemporaries, and when they had all kinds of savings on their father's children and women, the Göktürk nation defined family

rights and a number of rights and responsibilities to each family member (Onay, 2012) Ibn-i Fadlan tells us that women participate in all kinds of social activities together with men, and that they manage the religious and official festivals themselves. In his travelogue, "women fight like men, agile ones, leaping on horses and their arms are strong", determining the war ability of women (Ibn-i Fadlan, 2010). According to sources in China, women played soccer while their wives were playing checkers. The women behave like men and participate in the war (Roux, 2006) In the old Turkish epics, the woman, the alp type woman who struggles for herself and the society, the companionship and the important role of the children as a spouse, a wife, a daughter and sister. In family and community life, he has always been regarded as an equal and side by side with men.

By field researchers; The Chu state says that the Huns and their followers, Gokturks, used music in religious ceremonies, festivals and sports training and competitions. Musicologists such as Jin Jan Min, Guen Yeweri and Chon In-Pyong, who studied about 28 notes on five-stringed pipe notes, said that 10 notes in the 28 music notes were musical notes belonging to Central Asia and Turks, while the rest of the notes were of Central Asian music They argued that they were notes developed by the influence of their notes. Another source of music originating from China sources, known as Göktürk, is Tu-jue yen (Turkish Music). Tu-jue Yen music is named after Chao-Zai, the first collection of Tang Dynasty stories by Zhang Zhuo. The results of the research on the history of Central Asia and Turkish music show that the period in which the Turks used the brightest note was the period of Göktürks and Uygurs (Ekrem, 2012).

About the religious rites of the Göktürk, Chinese texts give the following general information. In the second half of the fifth month (summer solstice), the great moon begins sacrificing the god of heaven and the god of the earth. Every year Göktürk Kagan takes Göktürk asylum to ancestors cave in order to sacrifice. Like the Chu, the Göktürks are also written in Chinese sources, where they hunt wild horses and deer as a preparation for the ritual (Esin, 2001).

War is an activity to sustain life rather than proof of strength for nomadic societies, and it is a source of livelihood for them. Therefore, for the nomadic Turkish societies, the importance of the economic dimensions of war is great. For this reason, it is possible for the Turks to regard war as a source of production and income expansion (Bozdemir, 1988).

Individuals who constitute the Gokturk state learn the political and social roles of their countries by learning the active and passive membership roles and internalize ideology and values systems so that even those who are familiar with them gain social status in the society of

Gokturk and Heroism institution and gain the social status by means of thought and action systems previously established as a member of Göktürk society they are placed in the system in which they can play the social role.

The idea of establishing a city in Göktürk state emerged in the late 4th century (AC) and many monuments, inscriptions and city remains were found in them, mostly in Mongolia (Ayyılmaz, 2004).

The Turks live apart from each other and sometimes a great chaginas come together. These were the horsemen of the horsemen. But it is not like known tribes; When the houses and businesses (factories) were once placed on the car, they were establishing cities with observers and artisans' dwellings (Gökalp, 1977). Women, like men, are equal and have equal conditions in social life. They have the rights of war and heroism. Women could be kagan, castle guardian governor and ambassador (Gökalp, 1976). Fishing has started to be used for cities since the time of Göktürk. Kagan, who made a place of conquest together with a Göktürk Kagan army or stayed in a place, formed a city that would form the center of a military city. In the city that was formed, it was surrounded by walls. The city was formed by walls. The Turkish city that developed in this structure was called "Ordubalık (Army City) " (Sumer, 1960). After Göktürks seized Fergana region, Turkish population started to settle in these cities intensively. For those cities, we can give example Taskent city, which was established earlier by the Huns and Talas city which began to develop during the time of the Western Göktürks (Demir, 2003). Chinese sources are an important indicator that the Göktürks have built cities and established cities (Chavannes, 2007). It allows the documents of the military governorates, governments and the provinces formed after the destruction of the power of the Göktürk by the Chinese. This document only allows the West Gokturk state to establish and build their own cities The Chinese who seized the territory of the Göktürk State formed two military governorships to manage these lands. One was Pei-t'hing military governor. There were 22 cities connected to this governor and the districts bounded to those cities. The other one was An-si (Kuça) military governor. There were 91 cities and counties linked to this governorate, which only showed Toharistan and its hometowns. The Fergana and Sogdian regions that participated in the Chinese Empire during the Hien-king period (656-660 BC) are not mentioned. In addition, there is no information about the cities of the East Göktürk State. Information about the economy, which comes from the Uighur state established in their place, from the Gokturk state, and the economy that has reached the day-to-day life in the Orhun inscriptions with the written labor law and accounting (Güvemli, Toraman 2014). This information; to be frugal, not to trust in the exchange with

the Chinese, the relation between politics and economics and the necessity of the national wealth. The data obtained shows that, Göktürk state is a more developed economy than its contemporary states. In Gokturk State, We see that heroism has taken its place as an important actor in institutional and sports houses and in the country's economy such as sports, religious and military.

Turks have taken education and training not only as a means of acquiring information but also as a means of protecting national identity. For this purpose they developed advanced training methods and specialized in education. Education was intensified on the writing and systematized for the first time in Pre-Turk writing schools. Tamgal Says that School is the oldest course given in the world. The text appeared here. Slyeth, Manisstav, Isub-Ög and Uw-On schools originated in different alphabets (Tarcan, 1988). B.C. In the 5th century the Persian rulers brought Scythian teachers and trainers to educate and direct their children (History I, 2000). Foreigners who live in cities where the Turks live as residents also have their own written language and schools. These groups are sometimes tied to the Huns and sometimes the Göktürks (Karakoç, 2004). It is understood that the Göktürk education systems have been adapted to the settlement and nomadic style of the Göktürk state (written works, kurgan, city remains, system, alphabet etc.). The results of the excavations in Central Asia and the scientific historiography give results in this view. Another document, also recorded in Chinese sources, supports the Russian historian Vasilyev Dimitri. In the year of 577 BC an Emperor Buddhist monk ordered the basic principles of Buddhism to translate into Turkish and distribute this text among nomadic Gokturks and make them try to join to Buddhism. Among the Göktürks, the fact that such a propaganda is made by the missionaries with written texts, not words, is evidence of the widespread literacy in the Göktürks. (Akyüz, 2005) In the barbaric communities of the Chinese living in northern China, large buildings were built where young unmarried young people on street crossovers day and night spent archery training and shooting. These archery training areas, which are also aimed at courage in the form of male homes, are a common tradition throughout Asia. In these sports houses, those who become more obvious in terms of shooting and hitting are divided into stages according to their skill. These stages were laid down hierarchically by generations and their colors. Belt was one of the characteristics of Turks in the period of Göktürk State. They shaped the belt for hanging straps for hanging small personal items with metal ornamental plates and needle-shaped toys. The word of belt was used both in real and side meaning about clothing and military and related to the number and type of the metal plates that embellished the arches, the level of the owner. Hence, the

generation seems to be an important trail, especially in terms of its continuity and history. (<http://www.kultur.gov.tr/portal/truzim.tr.asp:belgeno=32117>). According to the Chinese sources, In Göktürks "Qing-Ming" feast day (105 days after the change of the winter sun) is said about the fact that girls and boys played football with hair-filled balls. This was coinciding with the New Year's Day. This feast was celebrated in the form of exhibiting sports games based on body culture. For this reason it is possible to think of the feast as a "sports holiday". Tengri ritual, the New Year's Eve and the physical activities coincided with each other (Öngel, 2001)

It is understood from the fact that Göktürk women are placed on the front line in the society in the body activities in the case that they are reaching to the concept of gender which is still controversial today, which was early stages of the Göktürks.

According to Chinese chronicles, women are consulted on every issue in the Göktürks, and sometimes even women would decide to fight. Women became part of the war with men. Women were constantly involved in prey and wearing the same clothes as men who were at war (Rüdenko 1970).

Turkish women, like their male counterparts, have placed a special importance on riding, bowing, playing ball, wrestling and improving the body and being healthier. In fact, it is known that Turks perform horse racing activities during festivals, festivals and funeral ceremonies (Kafesoğlu, 1984, Gumilev, 1999) . There is a close relationship between Gökbörü and Göktürk. The people looked at the heroism and prowess of the people who played this game and told them the astronomers. As it is known, the wolf was the symbol of Göktürk. We can say that this game belongs to the Turks when we consider that Totem and the other name of Turks are the Gökbörü. The Göktürks therefore regarded as brave men as Gökbörü (Kaya, 2005). A.D. In 598 it was seen that Taogast was mentioned in the work of Theophylacte Simocatta, which enabled the Göktürk Kagan to reach the day-to-day letter of the Roman (Byzantine) emperor Maurice (Chavannes 2007). It is important to note that the Göktürks live in Taugast and the main point in terms of their position is that the people living in this city regularly perform body exercises every day. Archery houses, courage and fortitude trial houses, Pi-yung are seen as the first sports clubs to carry out archery training and have a very common function in Asia (Ögel, 2001). Wrestling, hunting, archery, horse riding, sword, footsteps, throwing, throwing and using buns, javelin, hood, polo, scorpion, snake, toe, etc, were used to be practiced thanks to the traditional tradition of Turkish customs and the society created by the life conditions (Güven, 1992).



## II. RESULTS

Human beings are born with power to take sensations, they perceive simple senses that unite these senses, separate them from each other, they actually hold, combine and hide. It compares these compounds with each other. It catches common and separate points nowadays. It becomes aware of all these objects and easily mark them to bring new combinations. Man uses this power in his relationships with self-similar individuals. In addition, people, after the first development of the same power, have accomplished a number of inventions with the tools they have done. This development puts forward the tables of progress of human intelligence when it is examined from generation to generation in terms of its conclusions concerning the crowd of individuals living together on the same place at the same time. This progress depends on the same laws, which are seen in the individual development of our forces. Because, at the same time, it is the result of this development, which is dealt with in many individuals united in the community. This table is a historical one because of being undergoing changes ever since. It comes into view after successive observations of human societies in separate periods (De Morquis, 2010).

In the archaic period farming became a more productive means of livelihood, a primary source of livelihood, when this cultivation was not so troublesome because of the nature of the soil, and when pastoral nations had achieved any excellence in the farming tools where it was easy to use the same animals for their work on their journeys. It has been seen that some plants provide better, more abundant food for the flocks. It was understood that it would be beneficial to distinguish these plants easily from other, less harmful or even dangerous food. In this way, necessary means were obtained. The people started to produce more than they could consume. Music, instruments, poetry are perfected in a leisure time that allows people who deal with them to be able to observe their own emotions, to make judgments on certain thoughts, and to choose among them, providing listeners with a slightly elaborate taste because they live more comfortably (De Morquis, 2010).

The language that a nation uses must come before the religion and art institutions. The idea of describing objects with signs, this civilization was seen over the human intelligence in turn. These markings are possible only when they are introduced into the language in a timely, gradual, and indiscernible manner. The publication has become the essence of a man of genius. It was the work of the whole community that a linguist came to the square. These two kinds of progress are also the property of the human race at the same time (De Morquis, 2010).

The art of making guns, the art of making food into meals and getting the cap legs for them, the art of keeping these foods for a while. It's time when it's impossible for new

new foods to be found. The art of preparing appropriate seasonal foods. All these arts that meet very simple needs are the first and productive products of a long association. Smooth movements make people less tired. Those who hear are those who have heard the movements or connections between them easily. Because of these two reasons, these movements are a source of pleasure. That's why dance, music, poetry, and the roots of the community are up to this early childhood. This period has also been used for public holidays as a fun of your youth of dance. It is also known how a few musical instruments are made in this period. (De Morquis, 2010). It is seen that various sports branches are added to these activities in Göktürk society.

In the Archaic period education consisted only of home education. The children would learn from them the traditions of the little things that constituted the history of the Buddhist or the family, the tribes that went on in the community, the national customs and the moral principles. The children were matured in their military duties at poetic friends' meetings (De Morquis, 2010).

Chinese sources have indicated; The Huns, the predecessors of the Göktürks established the Chu state in the Chinese territory, the first Chao (Han) state, the next Chao state, the Hsia state and the provinces of the Northern Liang states in BC and AC. They even set up the Ministry of National Education and showed progress in education. According to Chinese sources, we have the knowledge that they can perform hundred thousand people in a great order. This information tells us; Turks have a high organizational knowledge. Participants suggest that this training has already been given in well-planned locations. The history of the administration of H. Fayol, which scientifically revealed in the late 19th century, is under the light of the data, at least from the time of Mete Khan, and shows by Turks that even though the understanding of the place of production is different. One of the most important elements in the social life of the Göktürk nation is the body movements. These movements are seen in all the actions of the society such as war training, moving city building-disassembly training, transported city defense training, religious ceremonies and festivals.

Gokturk soldiers were constantly engaged in battle drills to be successful in the war and were working to develop their physical strength. They were consuming better foods to provide this (Gumilev, 2003).

The fact that the sport for defense and aggression left strong traces in social life points to the fact that institutionalization has been organized with it. The institutional identity and organizational structure of the Pi-Yung state sports school in the state of Chu, which is the predecessor of the Göktürk state. The Seljuk state (sports schools), the Anatolian Seljuk state (sports

schools), the Anatolian Beylikler period (sports schools), which were the successors of the Göktürk state, and four of these schools were passed to the Ottoman Empire. A sports corporation was transferred from the Ottoman Empire to the state of the Republic of Turkey (Kepoglu, 2013). The institutions and organization of sports in the Republic of Turkey and other Turkish states ,Sports management have similar characteristics in terms of philosophy.

The fact that the horse is a single and important means of transportation in the archaic period reveals the fact that halter is found for horse training and that Göktürk society attaches importance to equestrian sport later. As a strong evidence of this; Societies encountering Göktürks are trying to imitate the organization they organize and the materials they use. As stated in Chinese sources; When the Göktürks were on the horse, they were using the arrow so well that they were making a very skillful attack on the horse while walking on the horse. This combined movement demonstrates the specialization of horse riding . As a result of today's researches, it has been observed that spinning arrows backwards on the horse results in fairly long regular and organized body workouts and experiences. The acquisition of this skill is seen as the background of an institutional structure with central and provincial organization.

Another fact that all Turkish civilization researchers have decided on jointly is the fact that Göktürk state social life has been included in this hierarchy due to the fact that the sports houses they established due to the nature of military organization.

Gokturk, especially specializing in archery, equestrian, sword-making and wrestling sports, has become intertwined with almost all kinds of sports branches within the archaic period of men and women, aged and young. Researches and archaeological findings on Turkish civilizations have documented the activities of Göktürk in these sports branches. These activities can be grouped under the following headings:

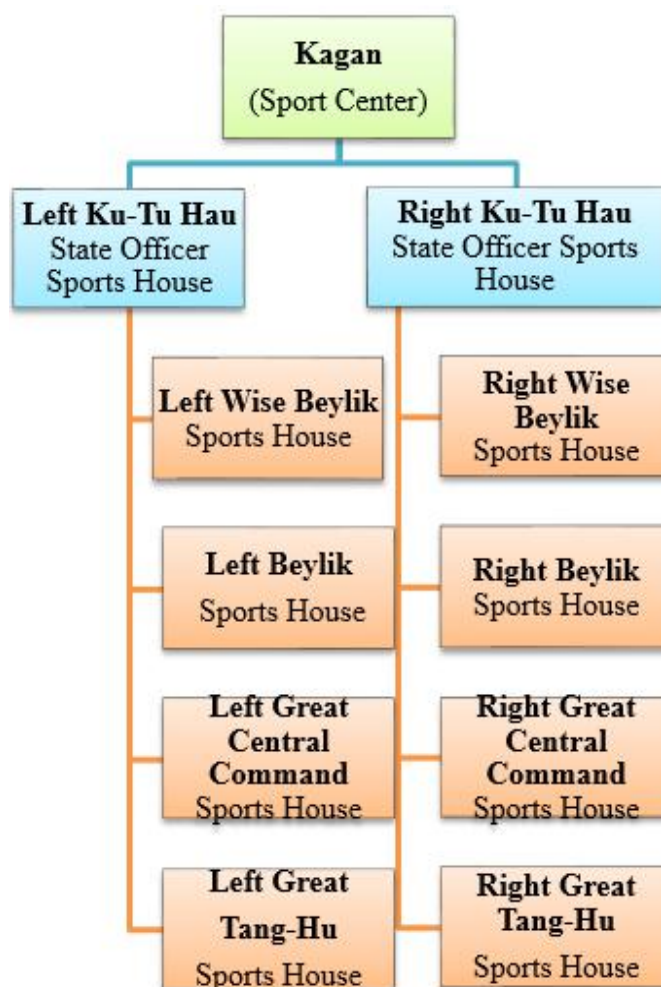
- War physical education
- Movable city building-disassembly training
- Movable city defense training
- Literacy training
- Religious ceremonies, mourning ceremonies and training of contestants in various festivals

The Gokturk nation, which is organized in a military manner in all spheres of social life, is understood from the continuity of successes in related sport branches as well as the necessity of establishing sport management and organization throughout the states of more than 200 years in archaic terms.

In the field studies related to the Turkish states and in the archaeological findings, it is seen that the Turkish states are similar in terms of sport management and

organization. Religion is an important element of the Turkish society in terms of life. The religious rituals of the Turks have always been related to sports branches. Even in the temples and areas where religious rituals were practiced, sports and religion showed similarities both in terms of practice and administration. After the adoption of pre-Islamic and Islamic religions, the practices carried out remained the same except for the religion of change in the Pi-Yung settlement during the Chu period, in the Atalar cave in the Hun and Göktürk period or in the temples around the temples, and in the Seljuks, Anatolian Seljuks, Anatolian Principalities and the Ottomans during the Ottoman Empire (both religious and sportive features). It has continued in the understanding of public administration. In the period of the Republic of Turkey; religious and state affairs are separated from each other, the connection between sports and religious temples is separated. However, in terms of public management understanding, the structure of the central and provincial organization remained the same.

#### GÖKTÜRK STATE SPORTS MANAGEMENT ORGANIZATION STRUCTURE



Turkish history can be considered as a military history until the last two hundred years. Turkish society is a society that can be counted as a soldier by all its

members, who can not imagine the military-civil distinction during the history in the light of the available data (Kafesoğlu, 1995) "The army was in the people and the people were in army" (Ögel, 1995) Therefore; Göktürk State was formed in parallel with the state hierarchy in all the cities under the state government (Yaylak-Kışlak) in the structure of sport management organization. Civil-military discrimination has a characteristic universality in other societies of the world. The existence of this classification is closely related to the patterns of life established in the relevant societies. The intention from the order of life is the nature of socio-economic activity. The socio-economic patterns that appeared in the archaic period are not so much. These can be divided into sub-units within themselves; agriculture societies, animal societies and merchant societies, collecting societies. Each of these categories leads to very specific characters in the society concerned. Man, who is dealing with soil, loses the physiological characteristics required by his military service, training, maneuvering and disciplined life when he is dealing with crops throughout the year, day and night, from planting to harvesting. For this reason, it is difficult to fight against groups with weapons and military capabilities. Whether he does not want it or not, it will be a military power by taking a look at feeding an inhabitant, or it will be a gentile man from outside. This, in both cases, produces the natural mechanism of class structure. Whatever the predominance of agriculture throughout history, this socio-economic model has led to the formation of class societies in China, India, Iran, Anatolia, Egypt, Ancient Greece and Rome, (Durant, 1996). Both the sources of nutrition and the aims of societies dealing with dealing, shouting, or trade are the type of society. Because agricultural societies are accumulating wealth in storing goods. The modular nature of the structure, which stands between the organization of the ten, the organization of the decimal army and the whole state, is a natural consequence of that lifestyle and worldview. İç-el- Dış-el, İç Oğuz-Dış-Oğuz, Bozok-Üçok, center-environment separations have made the dynamism of a social and political system and facilitated the operation of that system. But this structure never seems to walk in absolute rigidity. It is a modularism with a flexible and high maneuvering ability, where even the outermost ring that can meet the requirements when conditions are forced can assume the central role. (Kafesoğlu, 1987), the sports houses operating indoor and outdoor areas were constructed in accordance with the structure of tribe, İçel-Dış-el, İç Oğuz-Dış-Oğuz, Bozok-Üçok, center and surroundings. It is stated that Chinese, Byzantine and Muslim travelers traveled to Göktürk country on their travels, sports houses and Göktürk community played sport on a regular basis. The field related to Göktürk

society as a military society has been explained in alliance by the scientists who have done studies. Therefore; Archaic Göktürk is a part of sport religion ritual in the belief of society. Both combat physical education and hunting considered as economic activity require a regular workout. Another sign that Göktürk society is a military society is that the structure of society is seen in the states established after that. The cultural reflection of the military-civic unity in society is natural. It is possible to capture the same unity in almost every branch of Turkish culture, both in official and private life. Up to the Tanzimat in the mid-19th century, military ranks and titles also included administrative and municipal areas. However, after the Tanzimat, civilian bureaucracy became a root of civil-military separation. But military titles are also used in the titles given to the civilians. In other words, civilian soldiers were separated and civilian administrators were still "pasha", in practice. Like Cevdet Pasha (historian-lawyer), like Ahmet Vefik Pasha (edip), like Talat Pasha (postman) (Akdağ, 2004-2005). For this reason, the Göktürk state sports administration had been shaped in a military manner by public administration consciousness because there was no civil organization in the society due to the culture they had. The sport management structure mentioned above is that the Göktürk State I was under the captivity of the Chinese Empire and II. It was formed based on the public administration structure established in Göktürk state.

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