

Academic Journal of Research and Scientific Publishing

International peer-reviewed scientific journal

The Thirty-Fifth Issue

Publication date: 05-03-2022

ISSN: 2706-6495

doi.org/10.52132/Ajrsp.e.2022.35

Email: editor@ajrsp.com

Dedication

It is our pleasure and great privilege to present the thirty-fifth issue of the Academic Journal of Research and Scientific Publishing to all researchers and doctors who published their research in the issue, and we thanks and appreciate to all contributors and supporters of the academic journal and those involved in the production of this scientific knowledge edifice.

Academic Journal of Research and Scientific Publishing

Editorial Board

Chief Editor:

Prof. Dr. Khetam Ahmed Al-Najdi

Advisory Members:

Dr. Aicha abdelhamid eltteli abdelhamid

Prof. Dr. Riad Said Ali Al-Mutairi

Editorial Members:

Dr. Azab Alaziz Alhashemi

Prof. Dr. Saleh Bashir Bin Sulaiman Bouchelaghem

Prof. Dr. Khaled Ibrahim Khalil Hijazi Abu Alqumsan

Dr. Abu Obida Taha Gebreel Ali

Dr. Badreddine Berahlia,

Dr. Zainab Ridha Hammoodi Aljwaid,

Dr. Basma Mortada Mohamed Foda

Dr. Wisal Ali Al-hommada

Dr. Bilal Khalaf Ali Alzboun

Dr. Tameem Mosa Alkrad,

Dr. Walaa Al-Kurdi

Prof. Dr. Khaled Mohamed Abdel-Fattah Abu Shaira

Dr. Badir Mohamed

Dr. Abdulameer Abbas Al-khamees Ali

Dr. Nawal Hussein Siddig

Table of Content:

No	Paper title	Author Name	Country	Field	Page No
1	Empowering Women in the Arab World between the Requirements of Law and the Requirements of Reality	Dr. Mohammad Hadie Al Najdawi	United Arab Emirates	General Education	5-29
2	The Implementation of Battery Swapping Stations for the Electric Vehicles in Saudi Arabia (Study the Role of These Stations to Increase the Economic Indicators and comparing it with the Battery Charging Stations)	Mohammad Muteab D AL-Mutiri, Sulatan Abdullah A AL-Sahow	Saudi Arabia	Electrical Engineering	30-57
3	The Digital Forensic Tools Accuracy and Specifications	Jasir Adel Altheyabi	Saudi Arabia	Cyber Security	58-65
4	Geoinformatics Technology Distributed Geospatial Database Development for Economic Crisis Management and Natural Disasters in Sudan	Dr. Taha Alfadul Taha Ali	Sudan	Computer Sciences	66-76

Empowering Women in the Arab World between the Requirements of Law and the Requirements of Reality

Dr. Mohammad Hadie Al Najdawi

Assistant Professor, General Education, City University College of Ajman, United Arab Emirates

M.najdawi@cuca.ae

Abstract:

Women and their issues have become the focus of most researchers in the social, legal, political and economic fields, in addition to the official and unofficial institutions of the country. Being a major and influential actor in the lives of societies due to the main roles it plays on the one hand, and on the other hand, given that the issue of women and their empowerment is not a national issue, but rather has become an issue of international dimensions resulting from global interest in it; In addition to adopting her cause in all international forums, conventions and treaties concerned with human rights, not to mention the international conferences supporting the principle of empowering women, given that eliminating all forms of discrimination against women is not only a basic human right, but also a factor critical to accelerating the achievement of sustainable development, It has been proven that empowering women has a multiplier effect, especially by driving economic growth and development in society. Hence, this study sheds light on the concept of women's empowerment and its importance in order to create comprehensive development, in which the latter is based on the principle of providing opportunities and equality based on the legal requirements that guarantee this, and on the basis of what is stated in international charters and treaties related to this matter, as this study attempts Monitoring the efforts undertaken by the Arab countries to recognize and enforce the human rights of women, and to reveal the problems that hinder the achievement of the empowerment process in the Arab world.

Keywords: Empowerment, Women, the Arab world, Legal requirements, International conventions, Obstacles to empowerment.

ملخص الدراسة:

أضحت المرأة وقضاياها محل اهتمام جُلِّ الباحثين في الحقل الاجتماعي والقانوني والسياسي والاقتصادي، إلى جانب اهتمام المؤسسات الرسمية للدولة وغير الرسمية فيها؛ لكونها تمثل فاعلاً رئيسياً ومؤثراً في حياة المجتمعات نظراً للأدوار الرئيسية التي تقوم بها من جهة، ومن جهة أخرى على اعتبار أن قضية المرأة وتمكينها ليست بالقضية الوطنية، بل أصبحت قضية ذات أبعاد دولية ناتجة عن الاهتمام العالمي بها؛ إلى جانب تبني قضيتها في كافة المحافل والاتفاقيات والمعاهدات الدولية التي تعنى بشأن حقوق الإنسان، ناهيك عن المؤتمرات الدولية الداعمة لمبدأ تمكين المرأة، وذلك بالنظر إلى أن القضاء على كافة أشكال التمييز ضد المرأة لا يمثل حقاً أساسياً من حقوق الإنسان فحسب، بل هو أيضاً عامل حاسم يجعل من تحقيق التنمية المستدامة، حيث ثبت أن تمكين المرأة له أثر مضاعف، خاصة بالدفع نحو النمو الاقتصادي والتنمية في المجتمع. من ثم تأتي هذه الدراسة لتسلط الضوء على مفهوم تمكين المرأة وأهميته قصد خلق التنمية الشاملة، تبني فيه هذه الأخيرة على مبدأ إتاحة الفرص والمساواة انطلاقاً من المقتضيات القانونية التي تكفل ذلك، وانطلاقاً مما جاءت به المواثيق والمعاهدات الدولية المتعلقة بهذا الشأن، كما تحاول هذه الدراسة رصد الجهود التي قامت وتقوم بها الدول العربية لإقرار وتنزيل الحقوق الإنسانية للمرأة، والكشف عن الإشكالات التي تعيق تحقيق عملية التمكين في الوطن العربي.

الكلمات المفتاحية: تمكين، المرأة، الوطن العربي، المقتضيات القانونية، المواثيق الدولية، معوقات التمكين.

1. Introduction:

Full respect for human rights, with their different generations and their various ramifications, is among the strong and indicative indicators of the level of the flow of modernity, the degree of democracy sovereignty and the achievement of development. Accordingly, the dialectical relationship between democracy and development is getting stronger when it comes to women's rights and the extent of their presence in managing public affairs. The explanation for this is due to two considerations: the first is related to the reality of neglect, marginalization, and long-term exclusion that befell women, not only from a human rights perspective, but from an empowerment perspective as well. The second consideration is linked to the extent of commitment to the democratic option and to achieving development, not by the international community, which includes international organizations only, but by countries through their legislative and legal systems, strategies and internal public policies.

Statistically, women constitute more than half of the population in the Arab world, but the issue of empowering them did not begin to emerge until the late nineties.

Where the issue of involving women in the development process was a major requirement, and with the increase in global awareness, women's issues became among the international and national priorities, especially after it was proven to everyone that putting women on the sidelines results in disruption and obstruction of development policies and development.

This made the issue of women's empowerment one of the central topics and issues in the eighties of the last century, and today it remains a priority for study and research, as the World Bank considered it one of the basic elements in the development process and the fight against poverty. It was also considered as one of the development goals due to its connection to achieving the goal of social justice and its link also to other goals such as fighting poverty, where full access to resources is a strong indicator of women's empowerment, and achieving this indicator undoubtedly leads to the achievement of sustainable development goals (carrying out reforms that grant women equal rights to economic resources The right to own and dispose of land and other property, financial services, inheritance and natural resources in accordance with national laws.

Eliminating all discrimination against women and girls is not only a fundamental human right, but also a critical factor in accelerating sustainable development. It has been proven that empowering women has a multiplier effect, especially by pushing towards economic growth and development in all fields.

However, women in the Arab region face significant barriers to entering the labor market and are at much greater risk of unemployment compared to men. Although the unemployment rate among women has been slowly declining over the past fifteen years, the unemployment rate among women is more than double that of men in the region. Sexual violence and exploitation, the unequal burden of domestic and unpaid care work, and discrimination in public office remain huge barriers to achieving gender equality.

1.1. Study problem:

The challenges that women face are rooted in the social, political, economic and cultural structure in the Arab world, which ultimately leads to tightening the siege around them and limiting the opportunities available to them compared to men. It prevents the achievement of gender equality and the enjoyment of their human rights, and the opportunity to empower them is reduced, which affects the general societal environment. In this regard, the problem of the study is the following:

- To what extent have legislative and legal requirements empowered Arab women with their human rights?

1.2. Study questions:

Based on the problem posed, several sub-questions appear, which can be summarized as follows:

1. What is the theoretical concept of empowerment, and how did it move from its general dimension to a concept that translates support for women's access to their rights?
2. What are the paths taken by the international community to recognize women's rights and ensure their empowerment?
3. What are the legal requirements adopted to approve the empowerment of women in the Arab countries?
4. Can we say that the legislative system and the national strategies adopted by the Arab countries have been able to empower Arab women?

1.3. Research Importance

The importance of this research can be determined at several levels:

1. Revealing the general conceptual framework of the concept of empowerment and the empowerment of women in particular, its indicators and dimensions.

2. Learn about the international efforts exerted to establish effective empowerment of women at the international and national levels.
3. Revealing the path of some Arab experiences in approving women's rights and downloading the concept of empowerment constitutionally, legally and through national strategies and plans.
4. Monitoring the problems and obstacles that prevent the actual empowerment of women.

1.4. Research Aims:

This research aims to achieve:

1. Knowing the theoretical and conceptual framework of the concept of empowerment.
2. Uncovering the path crystallization of the concept of empowerment and the international orientation for its approval as one of the sustainable development goals.
3. Learn about some Arab experiences to empower women and guarantee their human rights
4. Identifying the problems that hinder the realization of the human rights of women in the Arab world.

1.5. The method adopted in the research:

Based on the research problem and the related sub-questions, the analytical approach was relied upon, by analyzing and dismantling the basic elements of the research topic and its problematic, and working to study these elements in depth, which enabled us to derive judgments about the status of women's empowerment in the Arab world, and to reveal The outcomes of the efforts made by Arab countries to achieve empowerment.

1.6. Search Plan:

The first topic: Empowering women from the theoretical concept to international and national procedures

The first requirement: the conceptual framework for empowerment; Dimensions and indicators.

The first paragraph: What is empowerment from the public to the particular?

The second paragraph: Dimensions and indicators of women's empowerment

The second requirement: tracks of international and Arab efforts to empower women

Paragraph one: International efforts to endorse the principle of women's empowerment

The second paragraph: Arab countries and the problem of downloading the principle of empowering women

The second topic: What are the legal and constitutional dimensions for empowering women in the Arab world?

The first requirement: the constitutional and legal references, i.e. a role for empowering women in the Arab world

The first paragraph: the constitutional and legal foundations that embody the principle of women's empowerment

The second paragraph: Examples of Arab strategies to implement the principle of women's empowerment

The second requirement: the constraints of achieving women's empowerment in the Arab world

The first paragraph: the limitations of public policies directed at empowering women

The second paragraph: the dominance of inequality values in the Arab sociocultural dimension

The First topic: empowering women from the theoretical concept to international and national procedures

Taking real and effective measures on the path to empowering women is an important entry point to address major political, social and economic problems and dilemmas. The empowerment of women refers to all measures, procedures and legislation that support the integration of women into society, develop their competencies and enhance their participation in various fields and fields,

Making them aware of their capabilities in a way that leads to their integration into society and effectively contribute to its development [1].

The inclusion of women and ensuring their participation in the development process remains, not as a recipient or consumer, but as a basic active member, which is related to the extent to which they are enabled to achieve equality between them and men. This topic will address the conceptual framework of empowerment with its dimensions and indicators, as a process that allows building a balance between everyone and ensuring everyone's contribution to development (the first requirement), It will also discuss the efforts made at the international level as well as at the level of the Arab world to empower women (the second requirement).

The First requirement: the conceptual framework for empowerment; Dimensions and indicators

The interest in the principle of empowerment and the roles it can play in favor of the less fortunate and the most vulnerable groups, has moved it from its public domain to the field of approaches concerned with the advancement of women. Consequently, the principle of empowering women as a concept and strategies has become one of the most prominent principles that are relied upon to achieve societal balance and equity for women. What is the nature of empowerment? What are the dimensions and indicators of women's empowerment?

The first paragraph: What is empowerment from the public to the particular?

Empowerment is defined as “the process of transforming existing power relations and acquiring greater control over sources of power. It is the process of strengthening the capabilities of individuals or groups to make choices and transforming those choices into actions and desired results.”

The concept of empowerment as a general concept refers to those strategies that increase the capabilities of individuals to deal with obstacles related to problems, develop their standard role, and increase their abilities to make societal decisions and decisions related to their private lives, and thus refers to strategies by which individuals and groups can be helped alike. From controlling her circumstances and achieving her goals, where she is able to work to help herself and others and increase her standard of living [2].

Moving from the general concept of empowerment to its concept specific to women, we find that this concept associated with Women's Empowerment emerged in the eighties of the last century, as a concept that refers to women's ability to use available resources and make strategic decisions that affect their lives, enabling them to determine their destiny and achieve their interests [3]. Consequently, many definitions of the concept of women's empowerment have been adopted, all of which embody the extent to which women can contribute to making decisions and influence the course of matters that are important to them. Among these definitions are those who consider empowerment "support for women's ability and ability to influence the social institutions that affect their lives" and here came the definition of **Naila** Empowerment is significant in "increasing women's ability to make crucial decisions in their lives, which requires changing the entire social system, that is, bringing about a radical change in it, and reformulating it anew so as to divide roles, responsibilities and rights on a more balanced and equal basis" [4].

On the other hand, the empowerment of women has been linked to the process through which women become individually and collectively aware of the way in which signs of strength affect their lives, gaining self-confidence and the ability to address inequality between them and men, which is focused on addressing discrimination against women through programs and strategies. It aims to increase their capabilities and opportunities, and work to strengthen their capabilities with regard to their human rights, as well as to give priority to initiatives that seek to create conditions that make women responsible for their own development and empowerment.

If this is the case, then the process of empowerment here is based on the sufficient capacity for change in development initiatives, and thus highlights the ways in which women can create on their own a new space for work and movement [5], which is thus a dynamic process aimed at eliminating all forms of discrimination and inequality. Reaching the goal of this process requires the removal of all legal, social, political and economic obstacles, and other stereotypical behaviors that place vulnerable and marginalized groups, and then the development of legislation and the establishment of institutions that undertake the task of empowering [6].

The second paragraph: Dimensions and indicators of women's empowerment

Empowerment as a process involves a positive development and transition from one state (differentiation or inequality) to another (equality),

as it mainly aims to “bring a positive change in power relations in society with the aim of eliminating the obstacles that limit women’s choices and independence and have an impact negative impact on her life”, provided that achieving this change will be through the presence of the woman as a positive active factor in the process of empowerment, and not only as a recipient [7], which makes this process include three basic data:

1. Resources: such as education, training and work as enabling elements, and their presence is necessary;
2. The human factor: in this case, the woman is the focus of the empowerment process, through which the selection and decision-making process takes place;
3. Results and achievements: which are represented in the political, economic and social gains made by women, and they are indicators on the basis of which it is possible to measure the extent of the success of the empowerment process [3].

Empowerment is a multi-dimensional process, and without it, women are not considered a fair participant in the development process, as knowledge of the factors and circumstances that cause women’s dependence, whether at the macro or micro level in life, remains one of the most important pillars that enable critical review of women’s experiences to observe and identify patterns of behavior leading to accreditation and support Dependency, so the cognitive dimension calls for knowing and understanding the need to make choices that may conflict with cultural and social expectations on the one hand, and on the other hand, the cognitive dimension seeks to understand male control over females, including the sexual aspect and physical abuse, and aims to understand and know the legal rights of women as a focus His attention and focus.

On the other hand, and since women can work to improve their individual and societal reality in which they live, the psychological dimension, given that this dimension is concerned with feelings and the extent to which women believe in the possibility of making a change in the course of their lives themselves, also confirms that women are brought up to submit to men and to allow Men make all decisions that affect them [8].

As empowerment is a process with data and elements, this process is integrated, with dimensions that cannot be separated from each other. Empowerment is economic as well as social/cultural empowerment, family/personal empowerment, legal empowerment, political empowerment,

And psychological empowerment, and these dimensions are linked between them. The elements are at three levels: the family level, the community level, and the national level [8]. We can not only talk about the success of this process by achieving its indicators, which can be summarized in the following form:

Economic Empowerment	Political empowerment	Social Empowerment
<ul style="list-style-type: none"> • Change in employment rates. • Involvement of family members in household chores and childcare. • The difference in salaries and wages between women and men. • Percentage of ownership. • Percentage of expenditures on health and education. • The percentage of opportunities available to women to develop their technical capabilities, such as technical services provided by the government or non-governmental sources. 	<ul style="list-style-type: none"> • Percentage of women in local councils and decision-making centers. • The proportion of women in the civil service. • Percentage of women who registered to vote and be elected. • The proportion of women entitled to vote of both sexes. • Percentage of women in parliaments and notables. 	<ul style="list-style-type: none"> • Number of women in civil society organizations. • Comparing women in decision-making positions with the total number of individuals in formal and informal projects and departments. • Freedom of decision-making with regard to reproduction. • Freedom of movement internally and externally compared to men

Accordingly, the achievement of women's empowerment at all levels is linked to the achievement of its indicators, as reaching social empowerment is reflected in the extent to which there are procedures, measures and institutional interactions that are capable of achieving not only the social welfare of women and the eradication of poverty, but also the extent to which there are structures that help women build their capacities and engage effectively. and actual in civil society, their actual participation in decision-making, and the extent of their presence in decision-making positions. Achieving economic empowerment is mainly related to the percentage of women's presence in jobs and the availability of the appropriate environment to help women work,

As well as the extent to which the state has adopted a policy of equal pay between men and women, thus reducing the gender gap and removing barriers that impede women's advancement, from discriminatory laws to unfair participation in bearing the burdens of home and family care [9].

The second requirement: tracks of international and Arab efforts to empower women

Gender justice has become an indicator of human development and good governance, and the international interest in social justice, especially the aspect related to the gender approach, has had a significant impact on Arab societies, as awareness has gradually increased in various Arab societies of the importance of women's participation in development. The need for the development process itself to revolve around women as a goal in itself, as well as a participant in the entire development process at all levels and fields [10], and because achieving gender justice is linked to the process of empowerment. Taken by some Arab countries to solve the problem of exclusion and marginalization and to download the principle of women's empowerment.

Paragraph One: International efforts to endorse the principle of women's empowerment

International law in the field of women's rights moved from viewing them as in need of special protection and preferential treatment, to the idea of demanding equality between men and women, complete equality on the basis of the law, and the protection of women in international human rights law moved to other issues, such as violence against women and trafficking in women. and their economic and sexual exploitation [11].

Equality in rights and duties between the sexes has been established since 1945, when states have adopted a basic principle of the United Nations Charter, which is "equality in rights between men and women" [12], as well as the universality of human rights without discrimination or differentiation between women and men [13]. A legal norm that is binding on all member states of the United Nations, and in the same regard the High Commissioner for Human Rights pledged to be an important factor in gender equality with her commitment to support gender equality in the Office of the High Commissioner for Human Rights and international forums [14].

A decent life for women and their liberation from discrimination, whether in jobs or in all other rights, or through the abolition of the slave trade regardless of color and origin [15].

The international conventions that protect the rights of the sexes and establish gender equality have continued. The provisions of the two international covenants of 1966 [16] affirm the right to equality between men and women in all fields and in some stipulated provisions stressing the obligation of states to ensure this equality. The Convention on Economic, Social and Cultural Rights: “The states parties to the present agreement undertake to ensure the equal rights of men and women to the enjoyment of all economic, social and cultural rights” [17].

The United Nations has made unremitting efforts to find special legal documents through which to address the existing case of discrimination against women, and the beginning was with the adoption by the United Nations of the first international document dealing exclusively with international women’s rights and the right of implementation of the 19/12/19 Treaty. 1954, which stipulates that women have the right on equal terms with men to exercise their right to vote in elections and to hold public office and exercise all functions [18], and the General Assembly issued its resolution No. 2763 of Decree No. 22 of 1967 To eliminate the policy of gender discrimination. The General Assembly also declared 1975 the International Year of Women and issued Resolution No. (3010-D27 on December 18, 1975) [19].

Thus, international agreements worked to clarify and confirm the important role that women play in society at all levels and their right to enjoy all rights equally with men, and this was confirmed by the Convention on the Elimination of Discrimination against Women of 1967 and the Convention on the Elimination of All Forms of Discrimination against Women of 1979, which worked On collecting all forms of discrimination and all kinds of rights of women and men, and taking into account the status and capabilities of women in the service of society [20]. In addition to several agreements that concern the establishment of women's human rights [21].

The matter did not stop there, but went beyond it to the development of special organs for women in the United Nations. In July of the year 2010, the General Assembly established the United Nations Women, which is an entity concerned with gender equality and the empowerment of women. This body was established to speed up meeting the needs of women throughout the scientist.

The United Nations General Assembly adopted the Convention on the Elimination of All Forms of Discrimination against Women in 1979 [22], through which it proceeded to endorse the principle of prohibition of discrimination against women, and to include the principle in the International Bill, and expressly stipulate it, as well as recognizing the need to establish national programs to end discrimination [23]. All signatory states to the Convention are obligated to work towards achieving equality between women and men in all political, economic, social and cultural fields (...), as well as working to empower women through the enactment of national legislation prohibiting discrimination, and taking temporary special measures to accelerate the achievement of equality. The truth between a man and a woman [24].

For its part, the International Labor Organization (ILO) works to support women's economic empowerment and gender equality as two main development goals, and given that women's empowerment will contribute to increasing economic growth and can affect poverty reduction [25]. The ILO also seeks to overcome the constraints that limit women's economic empowerment, by including the gender dimension in all programs and policies; And through women-specific interventions to address inequalities, and in this regard, the Organization issued a resolution on gender equality in access to decent work, adopted by the International Labor Conference at its 98th session in June 2009, which promotes gender equality in all strategic objectives The ILO's four, namely: Fundamental Principles and Rights at Work; employment; social protection; Social dialogue and the tripartite structure [25]. The push for the promotion of gender equality at work is characterized by several ILO conventions, as four conventions are of particular interest [26]. It also adopted international programs and curricula to empower women. We also find the Beijing Platform of Action for the year 1995, which included an agenda for empowering women with the aim of overcoming various obstacles.

The second paragraph: Arab countries and the problem of downloading the principle of empowering women

From a comparative anthropological and historical point of view, it turns out that the major transformations in the course of humanity, especially the path of wealth, energy and production, and the path of thought, theorizing and mental creativity, gave greater opportunities for men to be in the forefront,

which led to the distribution of work and sources of economic and political power in favor of women. The transition from the matrilineal family system in origin to the patriarchal system was linked to the need to preserve the descendants of the tribe and clan and its honor by preventing women from leaving for work, internal marriage, preventing them from their right to inheritance, and thus obligating them to perform domestic and maternal work (the reproductive function), in exchange for the man responsible for Protection and provision of livelihood, and the path of thought and mental production had to reflect this division, and thus reduce the presence of women in the public field and limit their presence to the private field. The values and customs related to the role of women in society represent a major obstacle to improving the status of women and empowering them, as the culture of man's domination over women and the subordination of the latter, the preference of males over females, early marriage, and the belief that the place of women is the home [27].

The cultural framework in Arab societies, or what is called the collective mind, remains one of the most important factors and reasons that impede the downloading of the principle of women's empowerment and the strategies associated with it,

as the inherited mating with the acquired at various levels and returning it to produce the same cultural framework through social institutions, i.e. reproducing it for the same The values and norms that entrench inequality between men and women, and stereotyped images of each gender, lead either to the absence or weakness of the legislative and legal structure that would endorse the principle of women's empowerment, or to the absence of an actual and proper implementation of this structure at the level of policies and strategies, or to the rejection of this evidence altogether On the part of the components of society, including women, as the lack of weakness of political and societal will leads to the continuation of violence, exclusion, marginalization and inequality against women.

The second topic: the legal and constitutional dimensions of women's empowerment in the Arab world

There is no doubt that the establishment of a state of truth and law requires the adoption of actual equality between all segments of society and its groups, that equality that does justice to the less fortunate and the most vulnerable groups.

Public policies that translate the will of the constitutional legislator, and thus the will of the people / nation on the ground, are the bet that guarantees the adoption of human rights, including the human rights of women, and the achievement of equality and social justice through mechanisms, the most important of which is empowerment.

The Arab countries have worked to endorse the principles of human rights as they are universally recognized in their national legislation, on top of which is the principle of equality and non-discrimination between citizens, whether on the basis of sex, color, race or language (...), and some of them have also approved requirements that they saw as capable of advancing the status of citizens. Women and the reduction of the exclusion from which they have suffered for a long time, however, despite what is approved by the legal code and what is included in strategies and plans, the empowerment of women in the Arab world is still difficult to achieve in the required manner. Through it, we aim to achieve the principle of equality through empowerment processes (the first requirement), and we will also try to monitor some of the constraints and obstacles that prevent the actual empowerment of women (the second requirement).

The first paragraph: the constitutional and legal foundations that embody the principle of women's empowerment

The obligations within each country are based on the constitutional principles and legal rules contained in its constitution and national legislation. The constitutions of most Arab countries have included principles that establish the constitutionality of women's human rights. Some Arab legislations have tended to constitutionally recognize the principle of empowerment and emphasize the need to download it through national strategies and public policies. and sectoral. The UAE constitution has adopted some articles supporting the empowerment of women, as it guarantees them equal rights with men, and put them in an equal legal position with him, not in terms of opportunities for education and the pursuit of professions, or employment and holding high positions in the state, candidacy and election, and health care, as the constitution stipulates in Article 25 of Chapter Three states: "All individuals are equal before the law, and there is no discrimination among the citizens of the Union because of origin, domicile, religious belief, or social status" [28].

Personality and guarantees to protect citizens' security and equality, as Article 14 of the Constitution stipulates the basic components on which the Union is based, which are equality, social justice, security and tranquility, equal opportunities for all citizens, solidarity and compassion.

For its part, the Egyptian Constitution of 2014 included provisions that were considered a good opportunity to enhance the presence of women in the public scene, enhance their participation, especially political ones, and ensure their access to decision-making positions. Opportunities between all citizens, and the offense of discrimination of all kinds in Article 53, as well as incitement to hatred, and any discriminatory practice has become a crime that requires punishment. Accordingly, I must be obligated to review the laws that contain discriminatory texts, and work to amend them, and the same article stipulates the establishment of a commission to combat all forms of discrimination. Article 11 also stipulates the need for the state to take measures and measures to address the discrimination that women are subjected to regarding holding leadership positions and public positions and assuming positions in judicial bodies [29].

For its part, Morocco, after the 2011 constitutional review, adopted guarantees to protect human rights as they are universally recognized, with the prohibition of all forms of discrimination between individuals. It also stressed, through Chapter 6, the need to activate the principle of gender equality, while urging the state to strive towards achieving The principle of parity between men and women, which reflects a political will to advance the conditions of women and fortify them in various fields [30], based on a general principle that stipulates the necessity of empowering women legally, politically, economically and socially in order to achieve actual equality between women and men.

Morocco is also one of the few countries in the world that explicitly stipulates the principle of parity in the constitution, in addition to the principle of equal opportunities for both sexes, as Article 19 of the 2011 constitution stipulates that "...the state seeks to achieve the principle of parity between men and women, and it occurs for this purpose. An authority for parity and the fight against all forms of discrimination. This constitutional requirement translates the desire of the Moroccan legislator to work on empowering women and achieving real equality between them and men and granting women their right to participate alongside men in managing public

affairs and achieving development. On the other hand, and in order to establish the principle of equality as well as the empowerment of women, the Moroccan constitution, in Chapter 31, obligates the state, public institutions and territorial communities to work on mobilizing all available means to facilitate the reasons for the equal benefit of female and male citizens from the right to access public jobs according to entitlement.

In an attempt to achieve harmony between the legislative and regulatory texts with the constitution, the principle of parity and equal opportunities has been included in the regulatory laws regulating the appointment procedure for senior positions in which appointments are discussed in the Government Council, which are requirements that support and empower women to reach decision-making positions. For example, but not limited to, the organizational law of the House of Councilors included the requirements of parity in the electoral regulations for the election of members of the House [31].

The second paragraph: Examples of Arab strategies to implement the principle of women's empowerment

Most governments in the Arab world have developed plans, strategies and created institutions charged with advancing the gender equality scheme. These institutions play an important role in developing policies, programs and tools that enable greater gender equality, whether in the public or private sectors.

[32]. Public and sectoral policies have also been adopted with the aim of integrating women and empowering them politically, economically, socially and culturally and increasing their participation in managing public affairs, as well as their presence in decision-making positions.

1. The National Strategy for Women Empowerment and Entrepreneurship in the United Arab Emirates

The United Arab Emirates launched a national project to empower women in 2005, which had very important results at all levels. Women in the UAE held high positions, and occupied approximately 66% of government positions and jobs in the country, including 3% in senior and related leadership positions. Decision making [33].

The National Strategy for Women's Empowerment 2015-2021, launched in 2015, also allowed the provision of a framework for the government and private sectors, as well as civil society institutions, to develop plans and work programs, which contribute to making the UAE among the most advanced countries in the field of women's empowerment and leadership. This national strategy included four basic priorities, namely maintaining the sustainability of the achievements of Emirati women, and preserving the social fabric and its cohesion through the integration of roles between men and women, to build a strong and cohesive society capable of keeping pace with emerging changes, as well as providing the ingredients for a decent, safe and well-being. Social foundations of high-quality foundations for women capable of developing the spirit of responsibility and leadership and enhancing their position [34].

According to the Human Development Indicators issued by the United Nations Development Program 2007-2008, the United Arab Emirates was able to rank 39 [35] in the field of women's empowerment, as women assumed ministerial and political positions through their entry into the Federal National Council, and their work in representing the state through Its embassies in the world in addition to entering the field of justice, and the field of the financial and banking sector, as women constituted 69% of the workforce and citizenship in this sector [36].

2. West Empowerment; The National Integrated Program for the Economic Empowerment of Women and Girls

Morocco is among the first countries that paid special attention to issues of combating violence against women with the participation of all actors, from government sectors, parliament, civil bodies and the media [37]. rights and duties and strive to achieve parity. These reforms began with the state's adoption of a reform approach for the benefit of women in 1998, in order to eliminate violence directed against them, considering its effects on various fields and institutions [38], and casting a shadow over women's contribution to the sustainable development that Morocco seeks, in addition to keeping pace with and coordinating with International commitments that Morocco has committed internationally.

After the constitutional review of 2011, Morocco established new concepts in order to achieve de facto equality between women and men, by approving several requirements that fall into this framework,

Such as approving the principle of equal opportunities and downloading the principle of parity. A national plan for equality (Ikram 1 and Ikram 2) was developed, and work was done to download the national program for economic empowerment of women and girls by 2030 with the aim of strengthening women's economic integration and empowerment in the development field in line with constitutional requirements and sustainable development goals [39].

3. Tunisia: National Strategy for the Economic and Social Empowerment of Women and Girls in Rural Areas 2017-2020

The issue of women's empowerment in the Tunisian experience was linked to a strategy that focused on the state's investment in education and health, and its keenness to adopt social policies based on gender equality in a way that enabled women to benefit from them, develop their capabilities, and achieve equality.

The Tunisian experience highlights that the empowerment of women can be achieved through superior reforms that create the appropriate environment for the work of women's organizations for more empowerment and equality. On the other hand, the post-revolution political context allowed for women's political participation more, as the development in Tunisia is a cumulative development that reflects the link between economic, social, political and legal change in a way that reflects on a better situation for women and gives them the ability to mobilize and mobilize in order to change qualitative power relations prevalent in society [40].

The second requirement: the constraints of achieving women's empowerment in the Arab world

The international interest in empowering women has echoed in national trends, as many countries have developed national strategies and plans to work towards achieving gender equality, as well as working to empower women at various levels, but the gap still widens between what these strategies approve and what has been implemented on the reality is reflected in the reality of women [40].

The first paragraph: the limitations of public policies directed at empowering women

Public policies are the best way to implement constitutional and legal requirements on the ground, and these policies are considered an actual translation of the national strategies developed, and in the issues of women's empowerment, public policies seem to know limitations in translating the legislative and legal momentum, whether included in the constitutional texts or lower legislation, because despite the fact that despite National plans and strategies developed aimed at empowering women at the economic, political, social and cultural levels, but women still suffer from exclusion, marginalization and systematic violence in all its forms, and despite some progress in the issue of economic empowerment of women, some practices still undermine not only the achievement of Economic empowerment, but rather from women's access to their economic rights on an equal basis with men, for example, but not limited to, Arab women face gender-based obstacles in the workplace, where employment policy and employment practice are still based on the principle of discriminatory wages [41]. Also, despite the adoption of public policies in social fields,

such as improving the conditions of females in the field of literacy and higher education, and achieving more equality in the field of education, there are still obstacles facing women in areas such as technical education, and the improvement in Arab women's education levels did not contribute as required. diversifying its economic activity, increasing its participation in the labor market, or reducing the wage gap between it and men [42].

The second paragraph: the dominance of inequality values in the sociocultural dimension

Socially, the unequal division of family and family responsibilities between women and men is still considered one of the obstacles that limit the empowerment of women, as women are expected, to varying degrees, to take upon themselves the bulk of childcare and family responsibilities, which they do. A recent World Bank study found that women actually take full care of their children and, on average, do three-quarters of household tasks. On the other hand, the socially dominant patriarchal system further reduces the margin of women's empowerment. Because of the complex network of interpersonal relationships in which the man occupies the dominant position, women are given limited options at best or can be limited by the most influential man in society.

Conclusion:

The Sustainable Development Goals and the empowerment of all women and girls cannot be achieved without ensuring equal rights to resources, or without ensuring equal access to human rights for all. Achieving a new social contract requires establishing non-violence-free work environments and safe public places as prerequisites for improving women's productivity, as well as addressing conscious/unconscious biases. It works as a technology to promote equal opportunities for both sexes on the ground, which contributes to providing opportunities for real participation of women in public life, and to the advancement of leadership positions through which they contribute to making decisions affecting their daily lives. It also seeks to advance and encourage the plans and programs of government agencies. To take measures and measures that give women greater opportunities to obtain their rights, and works to give a great impetus to the institutional efforts made to activate equality and ensure equal presence, presence and participation at the level of decision-making bodies for both men and women in a manner that guarantees parity.

Empowerment of women is largely related to the readiness of the legal framework and the consequences of its absence or weakness, because the constitutional text is not sufficient, and it is also linked to the readiness of institutional structures at their various social levels, despite the presence of a greater number of women in public positions today than any other In the past, more gender equality could not be achieved without strengthening policies and legislation that encourage women to take up leadership positions.

References

- [1] Lakrini, I. (2013). The quota and its role in empowering women. Masalek Magazine, P. 49.
- [2] Empowerment of women, European Institute for Gender Equality, eige.europa.eu.
- [3] Gender and Dimensions of Women Empowerment in the Arab World, Publications of the Arab Women Organization, 2010 edition, p. 80
- [4] Malhotra, A., Schuler, S., Boender, C. (2002). Measuring Women's Empowerment as a Variable in International Development, Gender and Development Group of the World

Bank, P. 6.

- [5] Rahman, A. (2013), "Women's Empowerment: Concept and Beyond", Global Journal of Human Social Science , Issue 6, Folder 13, P. 10,11.
- [6] Bebha, I. (2012). Small and Medium Enterprises as a Tool for Women's Economic Empowerment in Algeria, Master's thesis, Kasdi Merbah University, P. 8.
- [7] Ismail, H.G., A Future Vision for the Economic Empowerment of Egyptian Women in Cairo Governorate, Sixth Conference of the National Council for Women, Cairo March 28.
- [8] Adly, H., (2018). Economic and Social Empowerment and its Impact on Women's Political Participation: International Experiences, Friedrich-Ebert-Stiftung Publications, P. 89.
- [9] Kiwan, F., Challenges of Political Development and Gender Relationships, Gender and Dimensions of Women Empowerment, Arab Women Organization, P. 209.
- [10] Al-Nimri, N.F., (2014). International and legal mechanisms for protecting women's rights in light of globalization, a thesis for obtaining a master's degree in public law, Faculty of Law - Middle East University, P. 36.
- [11] U. N. United Nations charter (full text). United Nations. <https://www.un.org/en/about-us/un-charter/full-text>
- [12] Bachelet, M. (2021, March 8). Women's rights and gender section (WRGS). OHCHR. <https://www.ohchr.org/EN/Issues/Women/WRGS/P.s/WRGSIndex.aspx>
- [13] Abdel-Ghanim, M. (1991). Women's Rights in Public International Law and Islamic Law, Dar Al-Nahda Al-Arabiya, Cairo, first edition, P.. 6.
- [14] Human Rights, (n.d.). International Covenant on Economic, Social and Cultural Rights. <https://www.ohchr.org/en/professionalinterest/p.s/cescr.aspx>
- [15] Nouredine, K. (2015-2016). Women's Rights and Protection in International Human Rights Law, memorandum for obtaining a master's degree in international law and international relations, Tahar Moulay University - Faculty of Law and Political Sciences -

Saida - Algeria, p. 18.

- [16] Ibn Rajab, H. (2012). Women in Private Life and Political Charters, "Arab Women in Public and Political Life", Publications of the Arab Organization for Administrative Development, p. 125.
- [17] Al-Ahmad, W. (2001). Protecting Women's Rights in the Light of Peace and International Agreements, Al-Halabi Human Rights Publications, Beirut, first edition, p. 82.
- [18] Nouredine, K. (2015-2016). Women's Rights and Protection in International Human Rights Law, *ibid.*, p. 20.
- [19] Convention on Conflict of National Laws Relating to Marriage, Divorce, Separation and Guardianship of Minors, 1912.
- [20] Convention on the Elimination of All Forms of Discrimination against Women, pursuant to United Nations General Assembly Resolution 34/180 of December 18, 1979.
- [21] See a group of articles that stress the need to include in national laws to protect women "Articles 1 to 7".
- [22] Article 3 of the Convention on the Elimination of All Forms of Discrimination against Women International Labor Organization, 12th African Regional Meeting Johannesburg, South Africa, 11-14 October 2011 Document: AF
- [23] Chiefly the Equal Remuneration Convention of 1951 No. 100; the Discrimination in Employment and Occupation Convention of 1958 No. 111; Also, Workers with Family Responsibilities Convention No. 156 of 1981; Maternity Protection Convention 2000 No. 183.
- [24] Muhammad, D.R. The Reality of Egyptian Women and their Participatory Role in the Development Process, 34th Annual Conference on Population and Development Issues, Demographic Center, Cairo.
- [25] Ezzat, M. (2018). Women in Decision-Making Positions in State Institutions and Civil Society Organizations, Friedrich Ebert Foundation, p. 28.

-
- [26] Belmaleh, S. (2013). Women's Rights and the Democratic Issue in Islamic Countries at the Present, Masalek magazine under the title "Women in the Constitution from the demand for inclusion to the right to download" double issue, p. 18
- [27] Fatima Al-Zahra Baba Ahmed: The principle of parity
- [28] Women's Economic Empowerment Forum in the Middle East and North Africa, OECD Initiative, October 2017.
- [29] Abdel Hamid, A. (2016). Emirati women making qualitative gains and achievements in various fields, www.Alkhaleej.Ae/Alkhaleej/P./4c6dd855-6ebd-42fa-Bd7e-F7148b1fd031/02/2016.
- [30] The official portal of the UAE government <https://u.ae/ar-ae/information-and-services/social-affairs/women>
- [31] Karkari Company, (2007). United Nations Development Program Human Development Report 2007/2008, Fighting Climate Change: Human Solidarity in a Divided World, p. 217.
- [32] Al-Derby, A. (2011). Obligations arising from international conventions, human rights, a comparative study, the National Center for Legal Publications, p. 446.
- [33] Governmental Plan for Equality "Honor on the Horizon of Equality" - 2016-2020, Publications of the Ministry of Solidarity, Women, Family and Social Development, 2013, p. 25.
- [34] Spring of Dignity: Memorandum for a Law Eliminating Violence against Women, January 2014, New Knowledge Press - Rabat, p. 4.
- [35] The official website of the Ministry of Solidarity, Social Development, Equality and the Family, <https://social.gov.ma/>
- [36] Adly, H. (2018). Women's Political Participation, Friedrich Ebert Foundation, Egypt Office, also contributed to the preparation: Mona Ezzat, Ahmed Fawzy, Reham Bahy, Marwa Nazir.

-
- [37] International Labor Organization: Twelfth African Regional Meeting Johannesburg, South Africa, 11-14 October 2011 (Document: AF)
- [38] Al-Shamsi, F., Aly, H. Y., (2010). Chapter Five: Globalization and Women's Status in the Arab World: Blessing or Curse?
- [39] Korany, B., Sholkamy, H., Morsy, M., Women in the Concept and Issues of Human Security Arab and International Perspectives-Proceedings of the Second Conference of the Arab Women Organization.

Copyright © 2022 Dr. Mohammad Hadie Al Najdawi, AJRSP. This is an Open-Access Article Distributed under the Terms of the Creative Commons Attribution License (CC BY NC)

Doi: <https://doi.org/10.52132/Ajrsp.e.2022.35.1>

The Implementation of Battery Swapping Stations for the Electric Vehicles in Saudi Arabia (Study the Role of These Stations to Increase the Economic Indicators and comparing it with the Battery Charging Stations)

Mohammad Muteab D AL-Mutiri

Electrical Engineering Department, College of Engineering, Majmaah University, Kingdom of Saudi Arabia

Sulatan Abdullah A AL-Sahow

Electrical Engineering Department, College of Engineering, Majmaah University, Kingdom of Saudi Arabia

Abstract:

The Kingdom of Saudi Arabia consume huge measure of vehicles fuel in a yearly way which hurt the monetary express, the worth of fuel utilization in Saudi Arabia, "petroleum and diesel", during the year 2019, including all areas, barring all, fuel utilization, added up to around 382 million barrels, contrasted with 377.2 million barrels in 2018, recorded at 100, 100 million barrels. Because of that it is liked to as be opposed to utilizing petroleum is to supplant it with Battery Swapping Stations.

Battery trading is another innovation permitting super-quick charging for electric vehicles, it permits Electric Vetches (EV) proprietors to supplant the released batteries with charged ones at the trade stations. At the point when the battery is released, the proprietor can transform it with a completely energized one. This will resolve the issue of setting up charging stations and furthermore diminish range uneasiness of drivers. Further, battery renting can assist EV proprietors with saving the expense of buying a battery. The assistance is less tedious and requires a couple of moments contrasted with charging at a battery station which could require hours. It additionally requires least framework. The principal objective of this undertaking is to sit a procedure that permits battery trading stations in Saudi Arabia to diminish the pointless abundance utilization and ascend with the monetary markers.

Keywords: Battery Swapping Station, Electric Vehicle, Charging, Fuel

1. Introduction

1.1 Motivations:

Saudi Arabia is a private vehicle arranged society and has one of the world's most noteworthy per capita fuel utilization in the transportation area. The nation is seeing a raising interest on its homegrown energy needs, and policymakers genuinely must devise approaches for the preservation of energy assets and decrease of GHGs outflows in the transportation area. Energy force in Saudi Arabia has set high records mirroring the development of the economy and the expanding request on fossil energy in homegrown use and weighty ventures activities. Energy force in the Kingdom was double the world normal in 2010 and with lopsided development between energy use and economy, this should ring the ringer for the Saudi government to take on a firecracker arrangement that reduce the expanding development of energy request domestics (EcoMENA). The pointers in Figure 1 exhibit the information for Saudi Arabia from 2011 to 2018. The normal incentive for Saudi Arabia during that period was 280.7 thousand barrels each day with at least 95.2 thousand barrels each day.

The most recent worth from 2018 is 534.92 thousand barrels each day. For correlation, the world normal in 2018 considering 191 nations is 136.55 thousand barrels each day (theglobaleconomy).

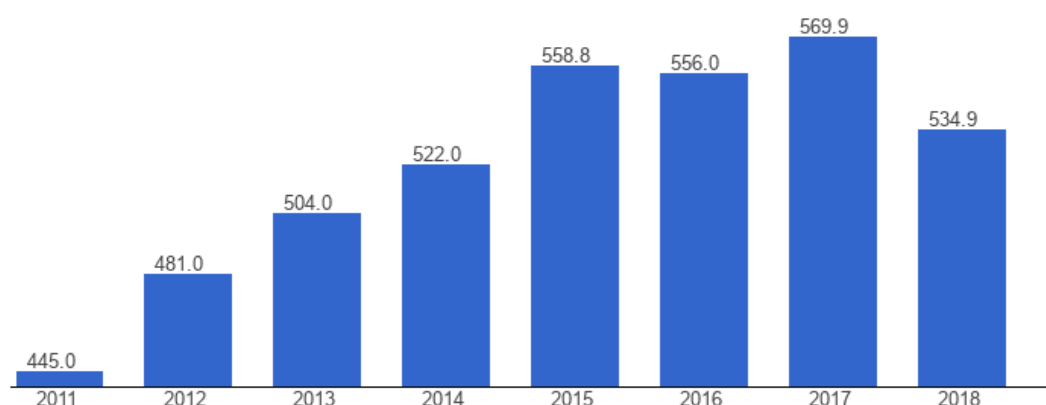


Figure (1) Gasoline consumption (thousand barrels per day) in Saudi Arabia 2011 - 2018

These quantities of fuel requests will influence the homegrown economy during the time in a damaged way, for that the battery trading station is the best substitute because of the saving of energy as well as expanding in monetary markers. Battery trading then again is a cycle to recharge the battery charge expected for an electric vehicle by trading a released battery with a completely energized one. Any rider or driver of an electric vehicle with a battery running out of charge can go to a battery trading station where the released battery of the EV is removed from the vehicle and traded with a completely energized battery of a similar setup. This strategy empowers battery trading as an assistant as opposed to selling the batteries as an item. As per the EV charging framework handbook, which was delivered by the NITI Aayog, a research organization of the Government of India (electricvehicles). There are two types of EV battery swapping stations Figure (2, which are:

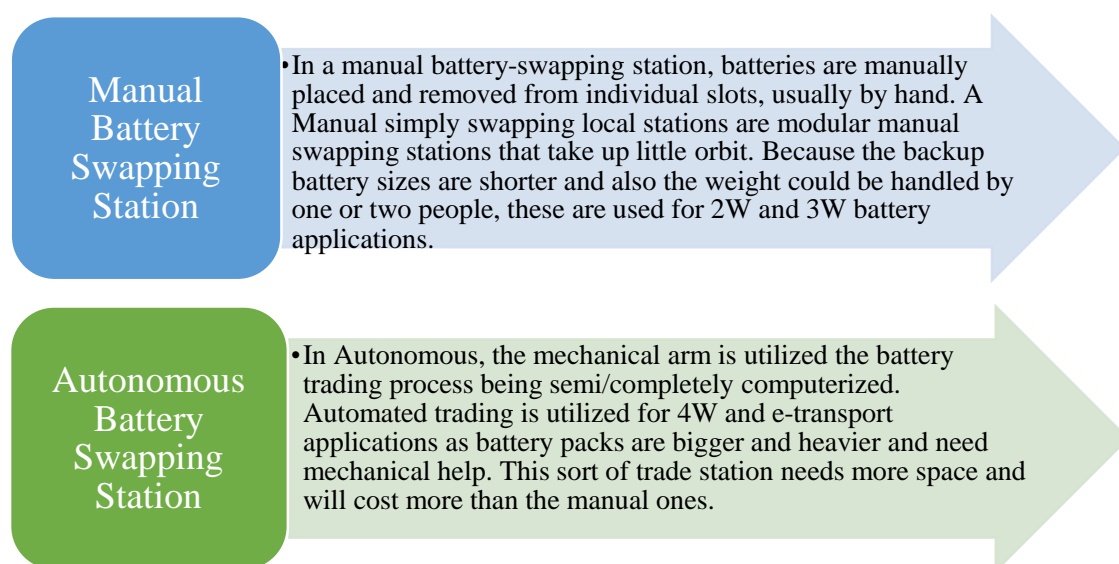


Figure (2) Types of Battery Swapping Stations

The possibility of a battery trading station in a wide reach is to help the monetary state particularly that the Kingdom of Saudi Arabia in activity of the vision of 2030 which center principally around maintainability of energy notwithstanding not relying upon fuel any longer.

Due to that the nation need something effective and Battery charging time is viewed as difficult for EV clients as this outcome in critical personal time for them, as the normal charging time for an EV battery is around four hours. If there should arise an occurrence of battery trading the client can just go to the trading station and trade their released battery with a completely energized one.

The vacation for this situation is only a couple of moments. It is particularly valuable for EV clients working in the traveler or products transportation area as it wipes out the apprehension about lengthy re-energizing times. Numerous makers are likewise searching for the option for charging stations, for example, battery trading. It is the best choice to re-energize your battery without anything to do trusting that the EV will charge. With the battery trading choices, the exhausted EV battery can be taken out from the vehicle and supplanted with a completely energized one inside couple of moments. Particularly nowadays there are a lot of electrical vehicles that go for a far distance to individuals as of late uses these vehicles to go far places. See Figure (3).

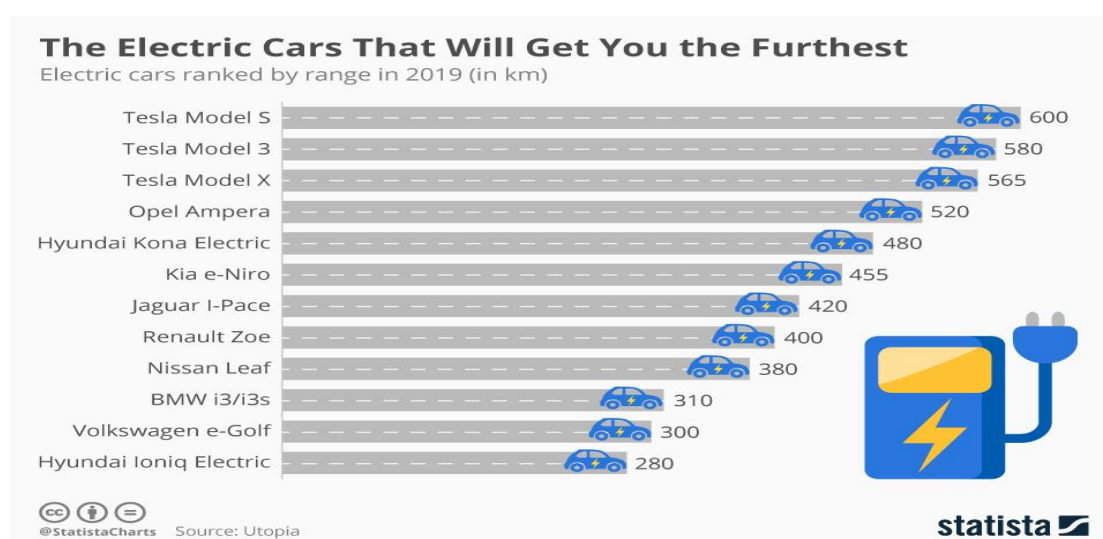


Figure (3) the Electric Cars That Will Get You the Furthest

electric vehicle pushed by electric engines and utilizations electrical energy put away in batteries dissimilar to vehicle with ignition motors electrical vehicle doesn't create exhaust gases during activity this by itself makes electrical vehicle more harmless to the ecosystem than vehicle portion should be created from sustainable sources eg from wind sun oriented hydroelectric or biogas power plants by consolidating different drive types the general productivity of the vehicle can be improved and fuel utilization can be diminished thus in view of that individuals need likewise while they go far spots to take to them the fill of the vehicle maturing and what amount of time it will require the normal charging a customary vehicle battery with a commonplace charge amp of around 4-8 amperes will take around 10-24 hours to charge it completely to support your battery enough to have the option to turn over the motor it would take around 2-4 hours.

This shows that battery trading is greatly improved, because of when somebody need to go far distances, The additional battery will be there and can supplant it effectively without a colossal measure of time and exertion that can cause an issue either to the actual driver or the vehicle, so the activity is agreeable and in addition to that there are various contrasts between battery trading and battery charging station (afdc.energy). As it demonstrated in

Table (1).

Comparing Materials	Time	Reliability	Predictability of battery lifetime	Cost
Battery Swapping Station	10 minutes to Swap batteries	High reliability	Accurate	Low initial cost
Battery Charging Station	30 minutes to 8 hours to charge batteries	Less reliability	Not Accurate	High initial cost

Table (1) Compression between Battery Swapping Station and Battery Charging Station

in addition to providing another more pleasant economic state a vehicle swapping station there might be another option that replenish the source of energy of evs than battery bank right away manually swap exhausted charges for fully loaded battery systems of theory the filling station or cell firm should own all of these rechargeable batteries with the electric vehicles (EVs) motorist acting as a cell borrower its depleted batteries will be replenished either at the service station or at a central location the technique of battery switching is also referred to as physical refueling or mechanical recharging so it requires manual substitution and battery charging. these electric vehicle charging stations combine the advantages of both slow and high recharging gently recharging EVs batteries during the off hours as swiftly replenishing cars in such a short period of time the battery pack switching operation may be completed in a couple of moments using automated gear which is exactly applicable to the existing refueling technique on traditional automobiles (sciencedirect.).

1.2. Research Objectives

- Construct a Battery Swapping Stations to match the Kingdom vision 2030 in Saudi Arabia.
- Investigate how to accurate design strategies and energy-efficient batteries systems to improve the economic performance and reduce energy consumption.
- Develop an energy management indicator which considers the features of battery swapping stations, including batteries, energy storage systems, and the option of exchanging power with the grid.
- Investigate how to reduce the fuel, petrol consumptions for vehicles needs and achieve a high-performance while maintaining healthy indoor environments.

1.3. Report Outline

A next is said to be the rest of the report: Following chapter 2 examines potential solutions related research offered in this project, while Chapter 3 provides a quick explanation of the technique and mathematical equations which show that with an electric vehicle charging station in terms of improving economic and environmental conditions.

2. Background and Literature Review

2.1 Battery Swapping Station

Lately, because of the undeniably critical deficiency of non-sustainable assets, like oil and coal, inordinate utilization, and the resulting climate contamination, electric vehicles (EVs) stand out enough to be noticed and become inclined toward as a kind of clean energy vehicle (Yabe, 2012). The central point of contention for the compelling activity of EVs is energy renewal. It is realized that there are two primary ways of tackling this issue: EV charging and battery trading (Zhang X. a., 2016) (Zhang C. a., 2016). By and large, EV charging requires a long charging process. Hitherto, because of strategy and cash limitations, the charging stations, charging heaps, and other charging foundations are not broadly conveyed. The previously mentioned reasons make it plausible that EV clients will be compelled to pause and stand by, which brings about holding up anxiety. In expansion, EV clients compromise between the leftover battery energy, the area dissemination of charging offices,

and their itinerary items, which effectively brings about range tension (Shao, A mobile battery swapping service for electric vehicles based on a battery swapping van, 2017) (Franke, 2012) .

Subsequently, more analysts and EV administrators are directing their concentration toward battery trading (Jamian, 2014) (Rogowsky, 6) . Battery trading can give another completely energized battery, which doesn't need draining the energy of the old battery. Range uneasiness is facilitated, and somewhat boundless mileage is acquired. Since battery trading just requires a couple of moments, holding up tension is essentially facilitated (Shao, A mobile battery swapping service for electric vehicles based on a battery swapping van, 2017).

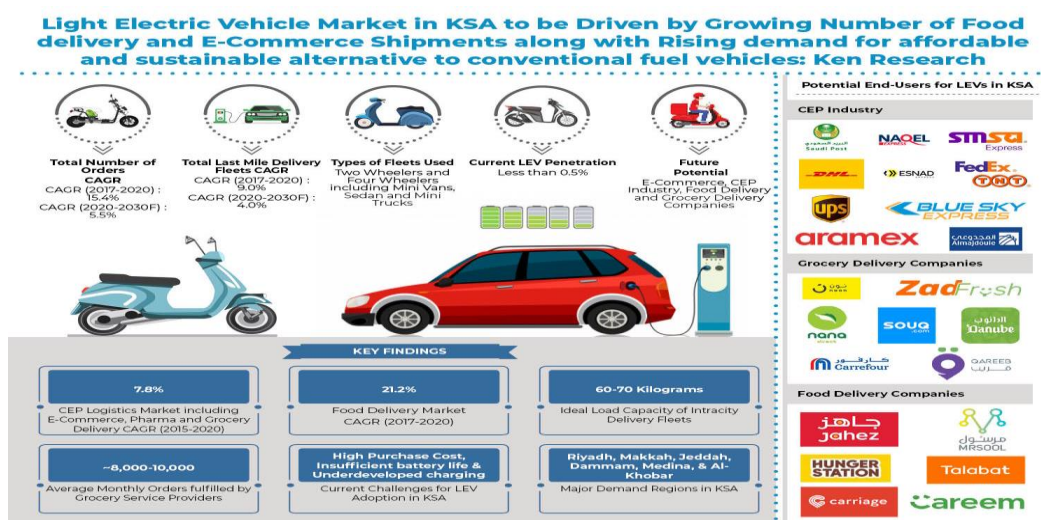


Figure (4) future potential of Light Electric Vehicle industry in KSA.

Battery Swapping Stations Generally, as a suburbanite instrument, an EV is the primary method of everyday transportation. An EV is utilized to drive to work in the first part of the day and return home around evening time, with infrequent utilizations for heading to buy dinner and different objections during the day. During the pinnacle drive hours, energy utilization is moderately high, and thusly, the battery trading request is high. Accordingly, to just recharge the completely energized battery stockpiling utilizing the battery coordinated operations framework might be insufficient on account of the restricted limit of the completely energized battery stockpiling in the battery trading station. To ensure battery recharging and mitigate the transportation strain of the battery planned operations framework, a viable arrangement is to send a battery charging framework at the battery trading station. This battery charging framework is simply used to charge the batteries that are traded out and it isn't available to EV clients.

This further develops the completely energized battery stockpiling as well as assumes a significant part in adjusting the top burden in the brilliant matrix.

Now, the battery trading station has two methodologies for recharging its battery stockpiling: from a battery accusing the industrial facility of a battery coordinated factors framework and from its own battery charging framework. Likewise, the battery trading station has two principle capacities: to give a battery trading administration to the EV clients straightforwardly and to renew the completely energized batteries for the battery trading van to give a battery trading administration to the EV clients indirectly (Shao, A mobile battery swapping service for electric vehicles based on a battery swapping van, 2017) . Tesla revealed a method for switching power packs into hybrid cars among us patented products 10513247B2.

A frame with a base and a rack for holding the battery pack, as well as a hoist for raising and lowering the frame, are included in this system. On the frame are also two sets of four air bearings apiece. The first pair is on top of the frame and allows for relative movement between the frame and the lift, while the second set is on the bottom side of the frame and allows for relative movement between the frame and the battery pack. The rack can also be moved in relation to the frame's base. A car travels over a ramp supported by pillars and parks as near to the battery pack lift mechanism as possible for swapping to take place. The use of vehicle guides aids in optimum positioning. This is crucial to the procedure's success. Through the use of pressure springs, the frame is then matched towards the driver's charging station. A fixed-to-the-frame modification of such alignments pin further includes adequate coordination among the car and the switching gear. "Co - ordination" occurs when the perceived where the gear contacts its rear fenders of the vehicle's power bank but each of the engine power mechanisms the nut runners positioned just on gear are exactly aligned also with specific bolts that secure its power pack to the car body. Fastener patterns, or connection or hole shapes specific for car models, are frequently included to configure engine power devices. Consequently, for overtighten a power pack, enough pressure was provided utilizing bolt rollers. For aid in the unfastening operation, each unit is shifted at minimum diagonally. It's worth noting how aligning all the screws in the very same way can streamline the process of fastening and unstrapping the car batteries. Finally, each unattached load was moved off another shelf and lowered/removed again from surface of the car.

It may be difficult to precisely park a massive EV adjacent toward the power exchange machine. The distance is believed to be around 400 meters. (sciencedirect.)

2.1.1 Battery Charging Factory:

The majority most rechargeable batteries were centralized-charged in a quick charge factory before being dispatched to battery switching stations through the battery logistics system. Some battery switching vans may be able to acquire completely charged battery replenishment at the battery charging factory on occasion. The centralized charging procedure demands a considerable quantity and electric power; therefore, renewable energies are an ideal solution to share part of energy load to balance the peak energy load in a smart grid and may be handle depending upon the request of the demanding of the swapping batteries. See Figure (5).

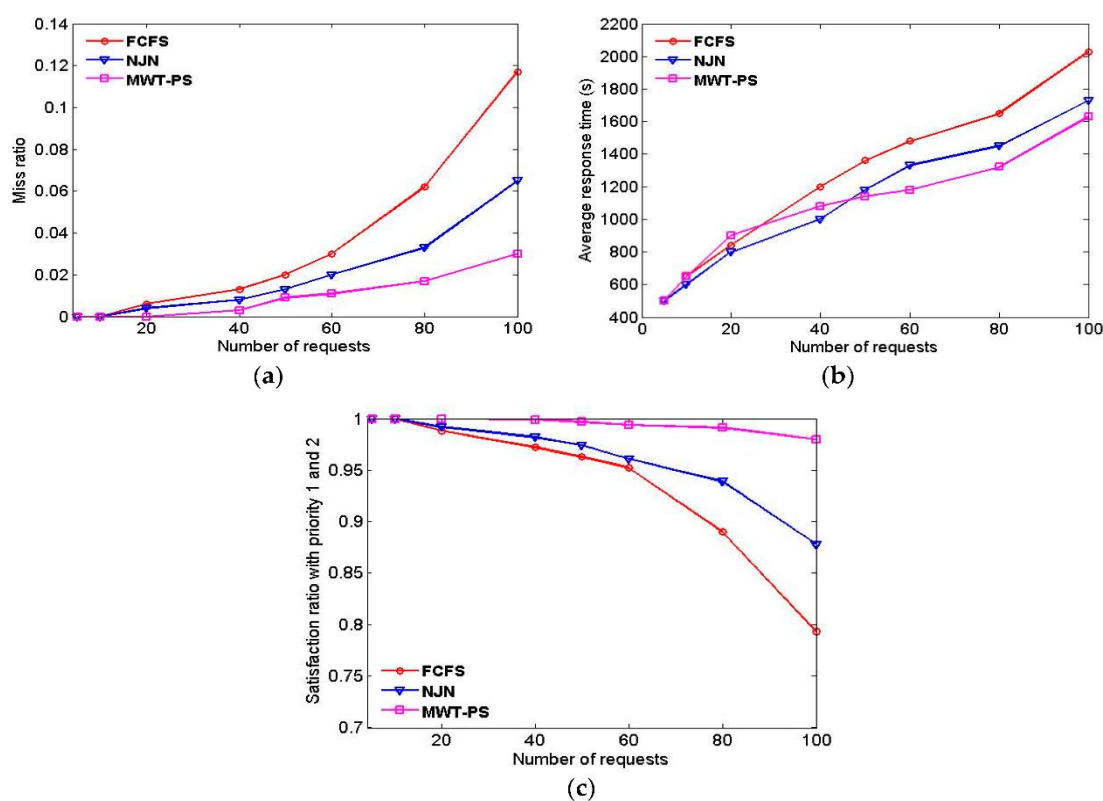


Figure (5) Performance evaluation of battery swapping with respect to number of requests.

what's more from the battery charging industrial facility administrators perspective of organization the potential power assets can save an extensive expense of buying energy from the savvy lattice and increment the activity pay since they don't have to buy energy from the brilliant

network assuming that the energy given by sustainable power assets is adequate (Shao, A mobile battery swapping service for electric vehicles based on a battery swapping van, 2017) .

2.1.2. Electric Vehicles in Saudi Arabia:

Saudi Arabia anticipates inner flammable motors (ICE) vehicles to make up most vehicles driven in the Kingdom for the following 15-20 years. The Middle East/North Africa (MENA) district is developing at an expected 36% with Saudi Arabia as the main local market. Saudi Arabia represented practically 52% of the vehicles sold in the Gulf Cooperation Council (GCC) and 35% in the MENA district in 2020. Absolute vehicles sold in Saudi Arabia in 2019 and 2020 were 556,000 and 436,000, individually. Deals are projected to arrive at 543,000 units by 2025 with electric vehicles (EVs) making up just 32,000 units. In spite of worldwide patterns and approaches supporting EVs, Saudi Arabia anticipates interior flammable motors (ICE) vehicles to make up most vehicles driven in the Kingdom for the following 15-20 years, as indicated by nearby industry specialists. Toyota controls 30% of the Saudi market followed by Hyundai and KIA by 26% and Renault-Nissan-Mitsubishi by 9%. General Motors, Ford, and Fiat Chrysler Automobiles make up the excess offer. It is guage that 62,000 EV units would be sold in the GCC locale and very nearly 91,000 EVs in the MENA district by 2025. Regardless, there are just four get-together plants for business vehicles, and these have a low volume yield. As per the Kingdom's vision 2030 objectives, the National Industrial Development Center (NIDC) intends to draw in 3-4 Original Equipment Manufacturers across the ICE and EV esteem chain, determined to deliver 300,000 vehicles every year with a 40% nearby substance by 2030. NIDC gives motivations to empower industrialization through credits, charge impetuses, and levy exceptions. Vehicle bodyboards, wheel parts, tires, seats, fuel siphons, safety belts, back pointer light covers, headlights, guards, and motor covers are popular and present market section or extension open doors for t U.S. organizations looking for joint endeavor associations in the Kingdom. Subsequently, will guarantee greater improvement as the Figure (6) bellow shows.

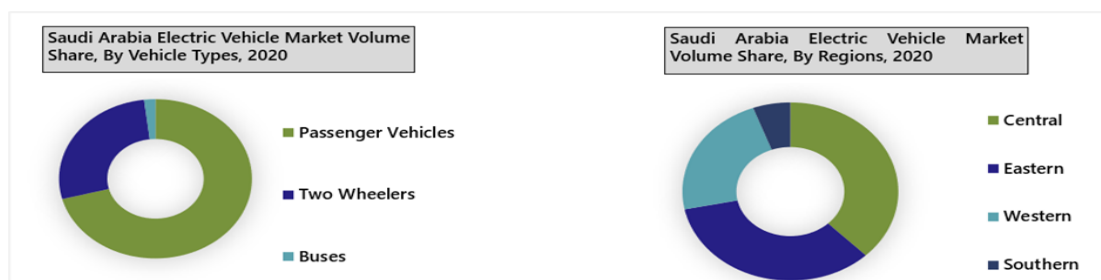


Figure (6) Saudi Arabia Electric Vehicle Volume Share Market 2020

Inside vehicle types, traveler vehicles gained over 60% of the portion of the overall industry as far as income. They are projected to show huge development during the figure time frame inferable from the developing populace that proposes a drawn-out potential in the electric vehicle fragment ascribed to the rising discretionary cashflow of families and lower emanations targets set by the public authority. The nation has chosen to control GHG outflow by 130 million metric huge loads of CO₂ comparable by 2030 under the Paris objective and INDC. Which moreover will have a few monetary impacts additionally in various loads or places like:

- 1- Business Side Potential for EVs in KSA dispatch express bundle administrations (CEP) Industry:

Homegrown express messenger overwhelms the market and is relied upon to enroll income development at a CAGR of 4.4% and development in shipments at a CAGR of 8.6% during the determined year 2020-2030. CEP Shipments incorporate E-Commerce, Pharma, and Grocery conveyances. The express organizations, for example, UPS, DHL, and Saudi Post utilize four-wheelers especially little vans, to convey bundles/bundles in Saudi Arabia. Internet business conveyance vans generally make 45-50 conveyances in a day, with a normal outing length of 100 km in Tier 1 urban communities and 50 km in Tier 2/3 urban communities. During forecast, the messenger express bundle administrations in Saidi Arabia will increment. Look to Figure (7).

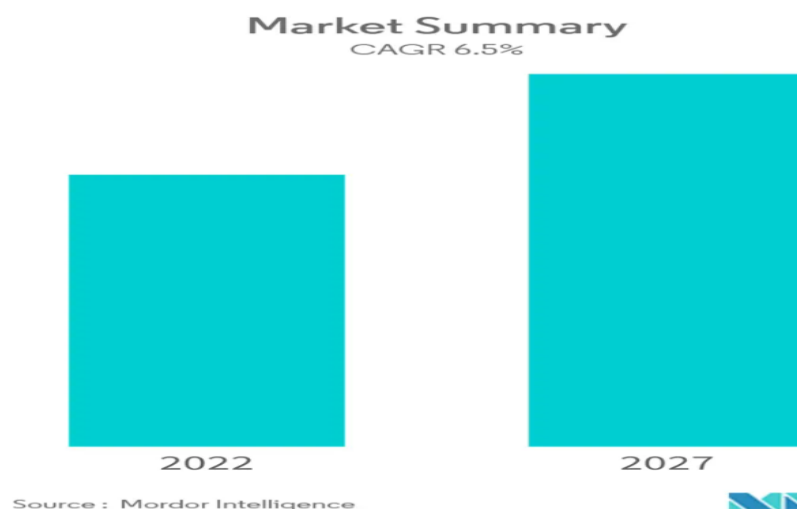


Figure (7) SAUDI ARABIA COURIER, EXPRESS- GROWTH (2022 - 2027).

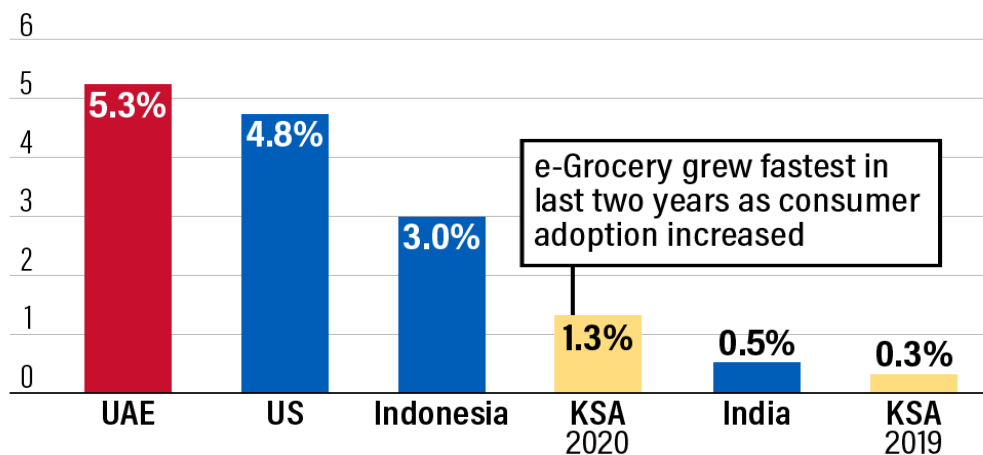
Central parts in this classification incorporate Saudi Post, Raquel Express, SMSA Express, DHL, Aramex, and UPS. As of now, LEVs don't guarantee a high reception potential ascribed to both a significant expense uniqueness and an absence of a vehicle. In any case, little organization EVs might acquire force soon, given their lower fuel and support costs. They are likewise less reliant upon charging foundation, since their power necessities are lower, and they are bound to come in models that permit battery trading.

2- Business Side Potential for EVs in Grocery Delivery Industry:

The business is at an early stage enlisting a twofold digit development rate between 30-40% in income terms. Online basic food item infiltration as far as clients are relied upon to increment from 3.7% in 2019 to 20% by 2025 owing change in client inclination from disconnected to online shopping for food. Espattiaaly that this side turns out to be an ever-increasing number of products and the most recent two years it became gigantic trying for different business sectors. See Figure (8).

KSA E-GROCERY PENETRATION

% of Grocery Retail, 2020



Source: redseer

Figure (8) Saudi Arabia Grocery grew Penetration

Basic food item organizations, for example, Danube and Carrefour have their own in-house armada while others normally cooperate with outsider administrators to satisfy client orders.

Riyadh, Medina, and Makkah are perceived as areas with the most extreme interest and supply of online staple administrations where LEVs could be at first sent. and Makkah have been identified as places with the greatest demand for and supply of online grocery services, where LEVs could be deployed first. Providers can save expenses and gain a competitive edge in the industry by growing the in-house delivery capacity or partnering utilizing vehicle industry players on a contractual basis. Princess Straight, Zadfresh, Danube, Qareeb, and Carrefour are all major players in this market.

3- Business Side Potential for EVs in Food Delivery Industry:

For the past few years, the online meal delivery business in Saudi Arabia has seen remarkable expansion. During the forecaster year, the industry is predicted to rise by 7.2 percent in sales while satisfying over 200 million orders. Through the selling of solid infrastructure solutions and appealing commission rates for restaurants, aggregator platforms such as Hungrstation, Careem, and Jahez have expanded throughout the kingdom.

The businesses use a pay-per-delivery model, in which freelancers who possess a car or a two-wheeler are hired and compensated based on the number of orders they deliver. Hungerstation, interpreted, Careem, Jahez, and Mrsool are all significant players in this market. And for possible deployment for battery storage for EVs, partnerships with restaurants, malls, real estate developers, and other commercial hubs should be considered. Popular markets and pick-up stations for food and beverages are perfect charging / swapping hubs for keeping an EV fleet ready for both last-mile products and food delivery. The market for online grocery purchase and delivery in Saudi Arabia were estimated at Usd 511.21 million in 2020, and it is expected to increase at a 10.05 percent CAGR from 2021 to 2026. Even after the pandemic threat in 2020, the market continued to rise steadily. During the next five years, global Saudi Arabian food and accommodation business are likely to be driven by digitalization and the advent more innovative internet platforms. This same comfort of saving time is a major component with in huge trend of Saudi Arabia's mobile nutrition purchasing as well as transportation market. The new gen lives a stressful schedule, and comfort of time saved becomes a large determinant and in rise of Saudi Arabia's internet food shopping as well as shipment business . See Figure (9) .

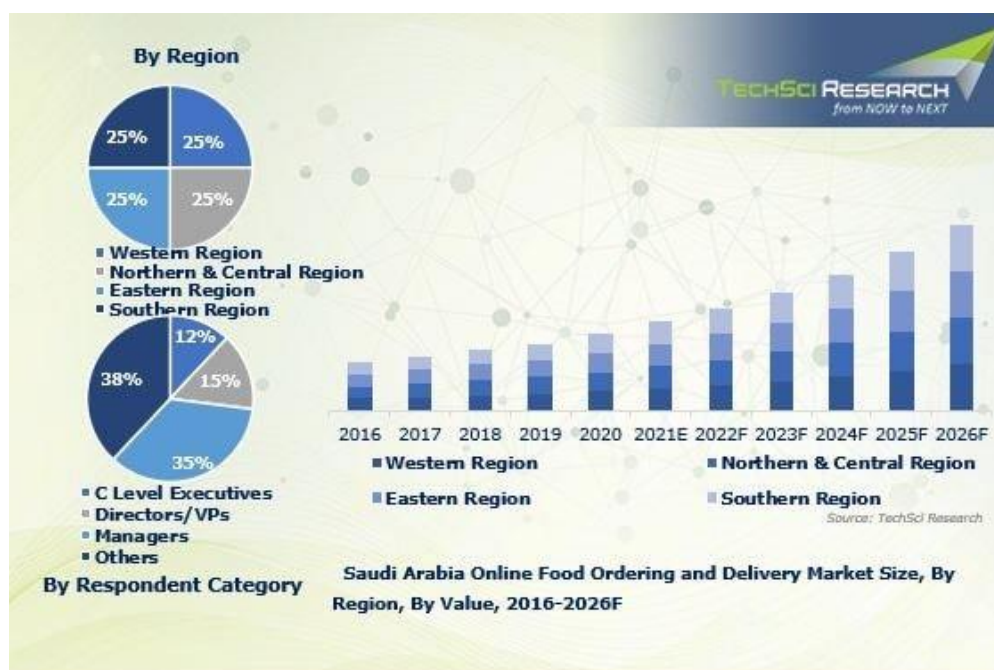


Figure (9) Saudi Arabia Food ordering and Deliver Market size by region, by value 2016-2026.

From the above figure, the utilizing of Evs will be expensive and longer an ideal opportunity to accuse yet of swa[[ing battery method it will be more productive.

The internet-based food conveyance administrations offer more prominent accommodation to the clients as the clients can rearrange through a few cafés, food things, and various cooking styles at a solitary touchpoint, sitting in their home, office, or some other spot of comfort. Also, the clients can get top to bottom data with respect to their food, can analyze the food and value choices, access criticism from past purchasers, profit different limited-time plans/offers, track the conveyance individual, make installment through different choices like web-based installment, e-wallet installment, Cash on Delivery (CoD), and appreciate different advantages through web-based food requesting. In particular, the internet-based food conveyance administrations empower the clients to appreciate bother-free food, assisting them with saving time and energy, which goes about as a significant driver for the market. Saudi Arabia's internet-based food requesting and conveyance market is sectioned by activity type, source, installment, and district. In light of activity type, the market is bifurcated into food aggregators and cafés.

Food aggregators drove the market in 2020 and the pattern is probably going to go on until 2026 because of accommodation and a wide scope of choices to look over.

2.2. Existing of battery swapping station:

The general production of electric is still reliant on road projects. Include the installation of battery storage, as well as identifying a terminal and recharging your charge in less time. All-electric vehicles (EVs), and also hybrid electric vehicles (HEVs) and connector hybrids, have seen a surge in popularity. Electric vehicles lessen society's dependence on oil and its impact to global warming. They're fun to drive, as per some. Nevertheless, public projects still are required for widespread adoption of evs. Those include installation of charging stations, and also finding a car charger and lessening recharge time.(O'shea, 2016) .

As per Goldman Sachs Research, engines recorded only for than 3% all international car purchases during 2016. Around 2025, rechargeable autos would represent in about 20% of all vehicles sold. Electric car market is growing from 2.6 million to 17 million in 10 years if 85 million light vehicles are produced each year.

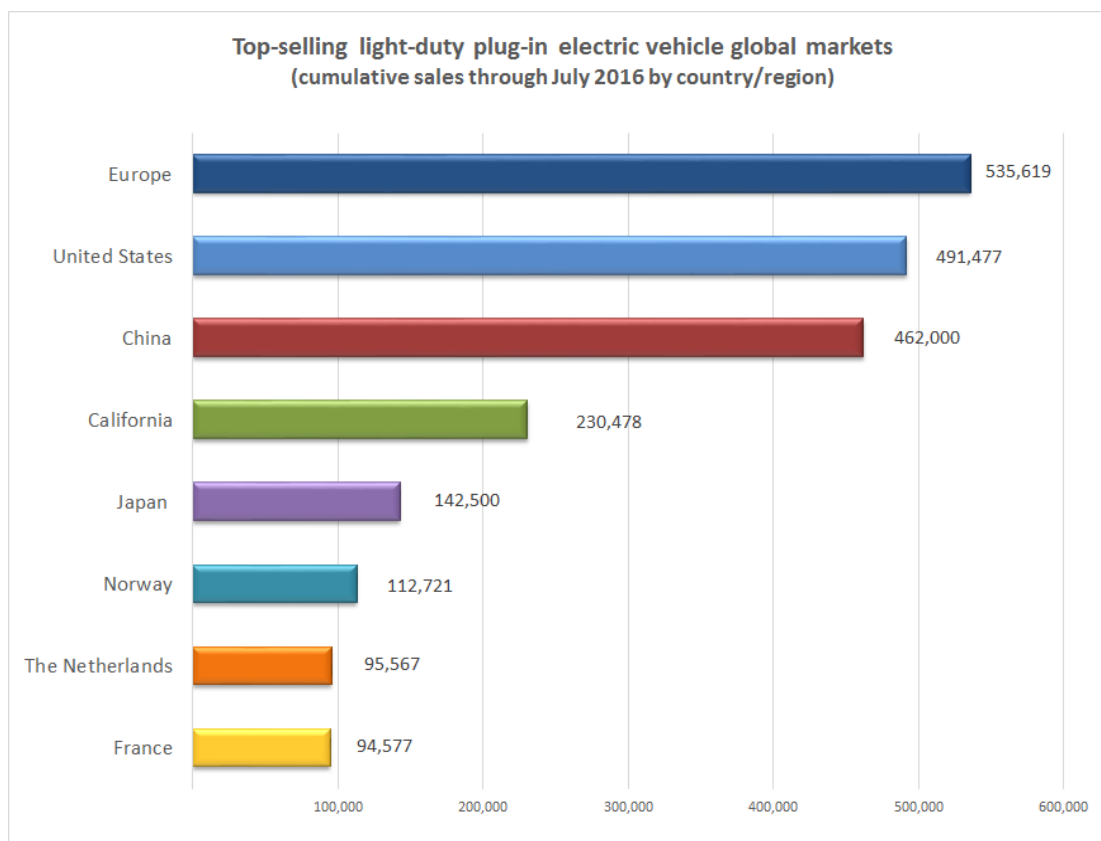


Figure (10) Top PEV global markets 2016

1- Battery Swapping Stations in China:

EV behemoths in China are all on board on super capacitor. A Chinese startup Nio (their packs are manufactured either by Chinese energy behemoth CATL) isolates overall cost of both the charger as from car's sales price. People who buy the Nio ES8, ES6, or EC6 models without the need for a battery can now lease one rather than, thanks to the new 'Battery as a Service' offer. Throughout China, Nio has 143 rechargeable batteries terminals so motorists may swap used car batteries with fully loaded ones. The BaaS is currently available in 64 Chinese cities, and Nio claiming to have done around 800,000 power exchanges. Nio was creating a new rechargeable batteries unit each week in China, as according to Li, and plans to install 300 additional stations next year. (Hampel, 2021).



Figure 11 A CGTN reporter is filming the process of battery-swapping in a NIO battery-swap station in Beijing, China, August 3, 2020. Wang Tianyu/CGTN

2- battery Swapping Stations in USA:

Ample, based in San Francisco, is introduced battery technology battery switching towards the United States. Before debuting with 5 exchanging locations with in Bay Area, this business was in lockdown mode over 7 years. Ample's initial consumers are Über workers in the area. The idea isn't brand new. Following raising \$850 million in funding, Nicer Place created a electric car and batteries exchange firm, but still it went into bankruptcy in 2013. In 2013, Tesla also demonstrated charge switching, and only opened one unit for a year.

Vehicle owners, as per Elon Musk, aren't interested. For China, battery changing is already commonplace. Nio, an electric vehicle manufacturer, wants to expand its system for switching station through 500 this year, including stations opening in Norway as part of its European expansion. (Pettitt, 2021) .



Figure (12) a modular battery architecture that allows for any EV to use Ample's stations
(Source: Ample)

Ample's technology has two major components:

- A completely independent trading station that eliminates exhausted battery modules from the vehicle and replaces them with completely energized ones. The exhausted battery modules are then put on racks where they are re-energized.
- An modular storage design that enables any ev to use Ample's fast chargers. The batteries are constructed from lego-like pieces which can fit any vehicle, independent the size or design. The entire process takes less than 10 minutes.(Emilio, 2021) .



Figure (13) Ample Station (Source: Ample)

2.3.1. Pros of Battery Swapping:

There are four fundamental obstructions with regards to mass EV reception, to be specific, the high forthcoming expense, range tension, long charging time and nonattendance of the solid steady

framework. How about we perceive how battery trading can assist with beating these detours and proposition different benefits too (Battery Swapping - A Pragmatic Complement to EV Charging, 2019) :

1. Decrease in EV Acquisition cost

- The battery represents 40-half of the absolute expense of an Electric vehicle. On account of a trade framework, we can isolate the vehicle business from the energy business. the responsibility for batteries might lie with the BSS and not with the vehicle proprietor. In this manner, the battery turns into a variable expense, decreasing the securing cost drastically.

2. Disposing of Long Charging Time

- AC charging and, surprisingly, quick DC charging times are horrendously lengthy when contrasted with refueling an ICE vehicle. This is particularly valid for business vehicles with high use rates where time spent in re-energizing the batteries straightforwardly converts into lost time out and about and lower compensation for the driver. Battery trading gives a choice that is pretty much as quick as refueling an ordinary vehicle.

3. Easing Range Anxiety

- a broad organization of bss can actually display a limitless reach to electric vehicles accordingly facilitating range anxiety

4. Identical Infrastructure-

- A massive resting area is needed for a power outlet. However, because battery trading is quick (as little as 3 minutes), only a small amount of area is required to set up charging terminals again for cells, and no elaborate public infrastructure is expected.

5. Longer Battery Life

- Quick filling, and also billing at high temperatures, leads the power to degrade over time. Slow recharging in a contained way is being used to improve the battery life of traded units.

6. Framework Load Management

- Battery charging timetable can be figured out how to take into consideration greatest changing to be done at evening or during off-top hours. As trading stations will have many charged batteries at all times, there likewise exists a chance for the BSS to give capacity to the framework during top burden hours.

7. Battery Recycling and Disposal

- Coordinated trading tasks take into account orderly removal and reusing of spent batteries.

2.3.2. Challenges with Battery Swapping:

Charger switching entails a combination of technology and commercial obstacles. Force people to look at the key concerns with carrying out a Battery Swapping plan:

1. Normalization of Battery Packs

- Battery loads that accompany different Electric Vehicles are not normalized. Most automakers safeguard the plan and data about their battery packs as their center innovation. For a huge scope trading activity, interoperability between battery packs will be required that can be accomplished by normalization. Nonetheless, simultaneously normalization of the battery stashes takes from automakers' opportunity of the plan and may confine development in the field.

2. Unwavering quality of Leased Battery Pack

- It will be a test to guarantee the EV driver/proprietor that the battery pack being placed into their vehicle is solid and works couple with their vehicle.

3. Monetarily Viable Business Model

- In India, we have yet to see a successful proof of concept for running a swapping station. Tesla and Better Place have both tried their hands on a global scale, yet both have failed. Gogoro, which began selling scooters with swappable batteries in Taiwan in 2015 and has already moved to Japan, France, and Germany, is one successful example. Every day, Gogoro riders swap 86,000 batteries all around the world.

2.4.1. Impact of Battery Swapping Stations in Power Grid

Public Grid in Saudi Arabia consider an auxiliary of the Saudi Electricity Company, has said that the power matrix covers all pieces of the Kingdom of Saudi Arabia to serve its endorsers more

than 13,000 urban areas and towns, focusing on its nonstop undertakings to foster transmission organizations to upgrade the assistance and arrive at all supporters as indicated by best global norms. Energy in Saudi Arabia includes petrol and flammable gas creation, utilization, commodities, and power creation. Saudi Arabia is the world's driving oil maker and exporter. Saudi Arabia's economy is petrol-based; oil represents 90% of the nation's commodities and almost 75% of government income. Towards the finish of 1998, the power area set out upon a significant rebuilding program. One of its points was to accomplish economical execution. In spite of the fact that headway has been made, outstanding difficulties, incorporate appeal development, low age limit save edges, wasteful energy use, nonappearance of season of-utilization rate changes, and the requirement for huge capital speculations to subsidize extension. Momentum practical arrangements, especially those reassuring energy preservation, prompted top burden reserve funds of in excess of 871 MW in 2001, basically due to a joint effort between the Ministry of Water and Electricity and the Saudi Electricity Company. Arrangements and projects are being produced for public mindfulness, energy guideline and regulation, and energy data and programming. In the event that energy preservation is fruitful, requests can be diminished by 5-10%. This is comparable to 3-6 GW of extra limit, which addresses a potential \$1.5-3.0 billion saving north of 20 years.

Regularly, interest in energy productivity is 1% of utility deals incomes, which for a nation like Saudi Arabia could be \$15-60 million yearly. If by some stroke of good luck reserve funds on cooling are thought of, the profit from the venture is identical to 400-500 MW creating a limit saving of up to \$0.25 billion. See Figure (14).

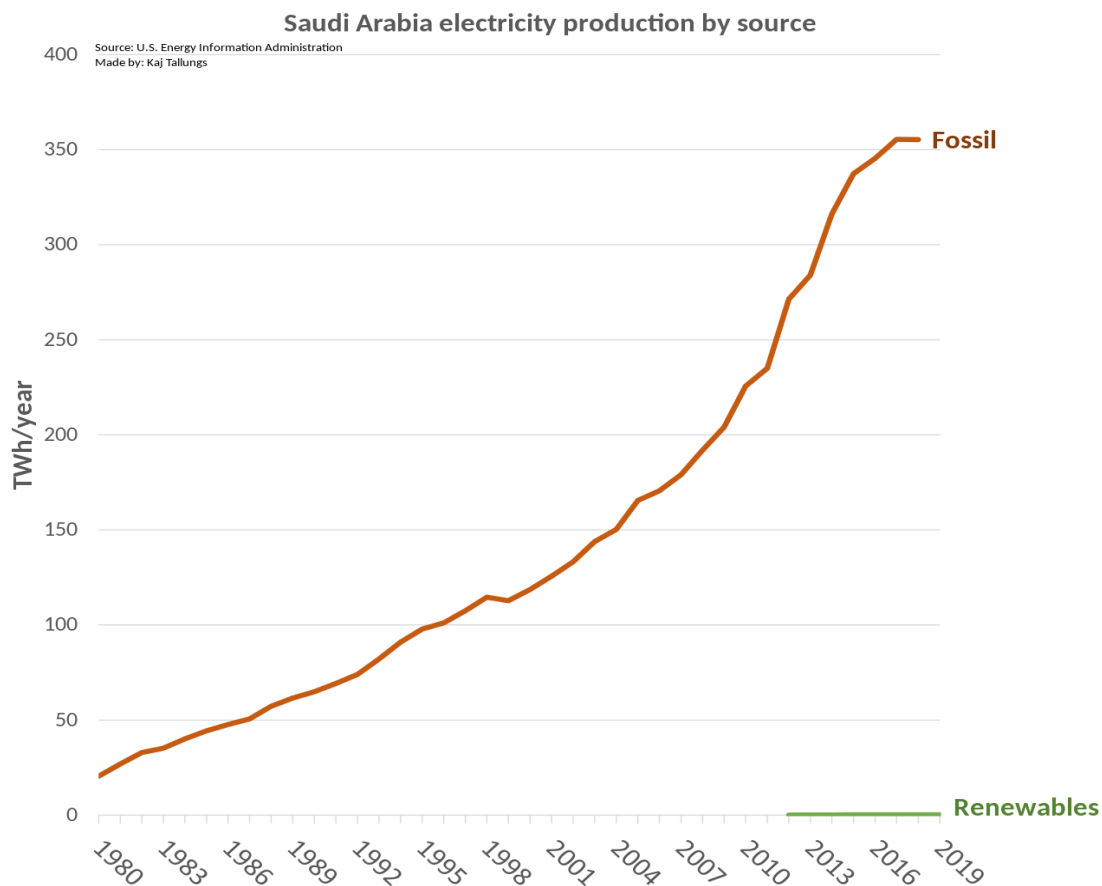


Figure (14) the consumption of Fossil Fuel in Saudi Arabia

As shown in the chart above, after the 2030 vision, Kingdom has changed its strategy to focus on resiliency, sustainability, but, most importantly, renewables so that the country does not rely on petroleum as its main source of power. As a result, the grid of Saudi Arabia's Kingdom can handle the additional station demand. An ev car efficiency can be measured in kwh of electricity (kWh) every 100 kilometers. The price (is used per kWh) and the performance of a car (how much power was utilized for go hundred miles) should be known in order to compute the fuel savings of an EV. The cost per mile is around \$0.04 if power is \$0.13 per kWh and the car uses 33 kWh to drive 100 miles. Recharging an EV with a 200 nautical miles trip (assuming a totally exhausted 66 kWh pack) may cost around \$9 if power costs \$0.13 per kilowatt-hour.

To evaluate the expenses of refuelling conventional and plug-in vehicle models. This battery swapping process might happen in a variety of ways. (company). See Figure (15).

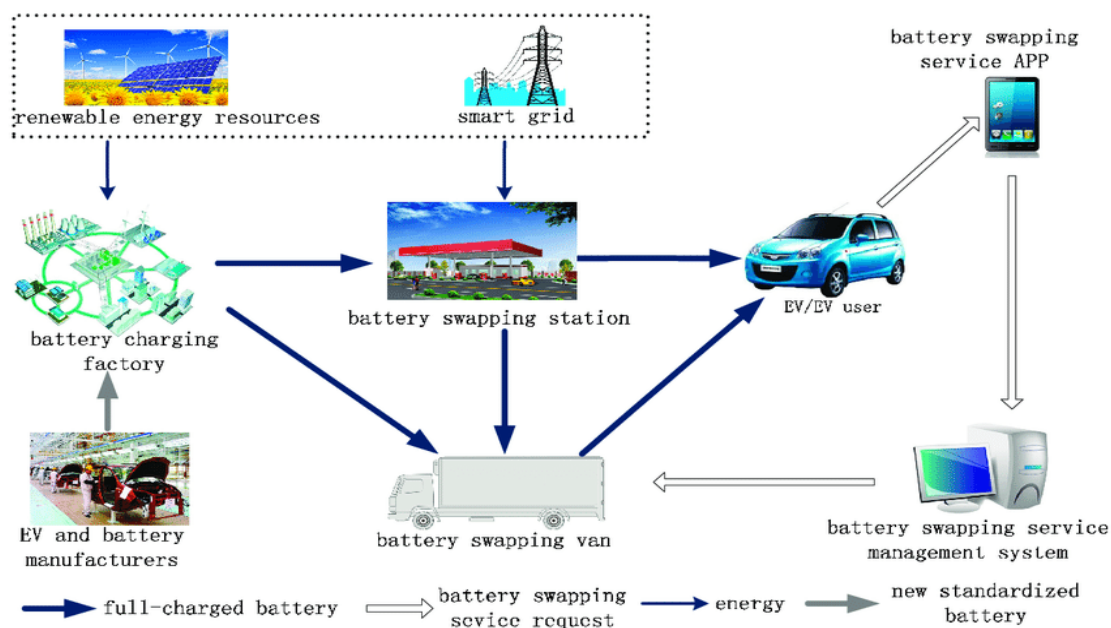


Figure (15) Several Ways of battery Swapping

the swapping additionally can happen by utilization of a battery trading van carries an unmistakable change to the EV battery trading the elements of every member and the jobs they played will be subsequently different to diminish the effect of these progressions and give a viable and proficient EV cell trading administration the capacity and job of every still up in the air particularly their changes the course of battery creation stuffing transportation stockpiling and trading and correspondence are portrayed the connection between every member (researchgate).

2.4.2 The Electric Vehicle Storage Battery

whereas gas-powered vehicles obtain stocked energy gasoline or diesel an electric automobile gets its hydropower from a significant number of batteries ev batteries go through release patterns while driving and charging patterns whenever the vehicle was connected the amount of charge that cell may hold is influenced by continuing the cycle throughout time this reduces the distance and time required to charge across each excursion the majority of manufacturers offer a five- to eight-year warranty on their batteries regardless it is expected that such a fully electric cell can last 10 to 20 years before something needs to be change the way it works is stonishingly simple it consists of a cell connected to at least one electric engine that drives the wheels.

whenever you press the gas pedal the car in a flash feeds capacity to the engine which bit by bit consumes the energy put away in the batteries electric engines likewise fill in as generators so when you take your foot off the choke the car starts to dial back by changing over its forward movement back into power this happens all the more firmly assuming you hit the brakes this regenerative slowing down recuperates energy that would somehow be lost putting away it in the battery again thus working on the vehicles reach. See Figure (16) bellow demonstrates the efficiency also if Electric Vehicle batteries

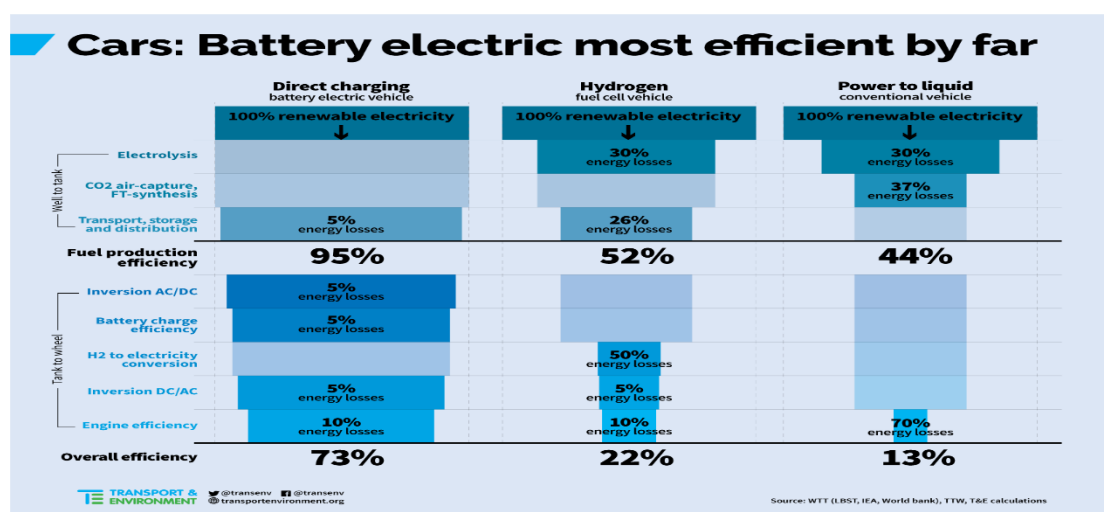


Figure (16) Batter electric most efficient types

the accompanying graph clearly shows that the cell productivity of electric car is high than greatest type of these cell however is a lithium-particle li-particle battery is a type of battery that is used in electric car and a variety of other devices they feature a thicker energy layer than traditional lead-corrosive or nickel-cadmium cell as a result battery manufacturers will be able to conserve space reducing the overall size of the battery pack lithium is also the lightest metal on the planet lithium-particle li-particle cell in any event do not contain lithium metal instead they contain particles if youre wondering what a particle is its an iota or an atom with an electric charge caused by the loss or gain of at least one electron lithium-particle cell are likewise more secure than numerous other options and battery makers should guarantee that wellbeing measures are set up to safeguard customers in the improbable case of a battery disappointment for example makers furnish electric car with charging shields to safeguard the cell during rehashed quick charging meetings in a brief timeframe.(edfenergy).

3. Mathematical Optimization Model of Battery Swapping Stations

3.1. Introduction

Including Battery Swapping Stations in distribution grids can offer a wide range of benefits to the power grid, such as peak reduction, congestion relief and capacity deferral. This chapter presents a mathematical optimization model for battery swapping stations, considering interrelationships among battery swapping, Storage of the battery vehicles, and the utility.

3.2. Mathematical Optimization Model

An optimization mathematical model is developed with an objective of minimizing the total cost of the battery swapping stations, as follows

$$\text{Min Cost}^{P\&O} \quad \text{Equation 1}$$

Where $\text{Cost}^{P\&O}$ represents the operational planning cost of the battery swapping stations, that includes the cost of buying power from the grid, peak demand charge, and net of the revenue from selling power to the grid.

The following constraints apply:

Energy Management Constraints of battery swapping stations

- *Energy Management Constraints*

Power Given and Taken by battery swapping stations: This constraint ensures that the power given and taken should be within the energy management balance of the battery swapping stations.

$$\begin{aligned} & \gamma_z^{\text{storage of battery}} P_{z,h}^{\text{storage of battery}} + P_{z,h}^{-ABESS} + P_{z,h}^{-ADR} + P_{z,h}^{-MG} \\ & = P_{z,h}^{+ABESS} + P_{z,h}^{+ADR} + P_{z,h}^{+MG} \end{aligned} \quad \text{Equation 2}$$

The BESS power charging and discharging should be within the BESS power limit, given by:

$$P_{z,h}^{+ABESS} \leq P_{size}^{BESS} \quad \forall z \in N, \forall k \quad \text{Equation 3}$$

$$P_{z,h}^{-ABESS} \leq P_{size}^{BESS} \quad \forall z \in N, \forall h \quad \text{Equation 4}$$

- Constrains of Power Conversion:

$$P_{z,h}^{storage} \leq P^{Invstorage} \quad \forall z \quad \forall h \quad \text{Equation 5}$$

$$P_{z,h}^{-ABESS} \leq P^{InvBESS} \quad \forall z \quad \forall h \quad \text{Equation 6}$$

$$P_{z,h}^{+ABESS} \leq P^{InvBESS} \quad \forall z \quad \forall h \quad \text{Equation 7}$$

- Coordination of Distributed Energy Resources: The following constraints ensure that the charging and discharging of the BESS, and power given and taken by the battery swapping stations, do not occur at the same time, as follows:

$$P_{h,y}^{+ABESS} P_{h,y}^{-ABESS} = 0 \quad \forall z \quad \forall h \quad \text{Equation 8}$$

$$P_{h,y}^{+SH} P_{h,y}^{-SH} = 0 \quad \forall z \quad \forall h \quad \text{Equation 9}$$

- State of Charge of the BESS:

$$SOC_{z,h+1} = SOC_{z,h} + \left(P_{z,h}^{+ABESS} \eta^{in} - \frac{P_{z,h}^{-ABESS}}{\eta^{out}} \right) \Delta t. \quad \forall z, \forall h \quad \text{Equation 10}$$

$$0.2 \gamma_z^{SH} E^{BESS} n_z^{SH} \leq SOC_{z,h} \leq \gamma_z^{SH} E^{BESS} n_z^{SH} \quad \forall z, \forall h \quad \text{Equation 11}$$

4. Summary

In this chapter, a mathematical optimization model was developed for operations planning of the battery swapping station that includes vehicle storages batteries, BESS, and the option of exchanging power with the grid that within the network limitations.

5. References:

afdc.energy. (n.d.). <https://afdc.energy.gov/vehicles/how-do-all-electric-cars-work>.

Battery Swapping - A Pragmatic Complement to EV Charging. (2019, september 29). Retrieved from evreporter.com: <https://evreporter.com/battery-swapping/>

Chowcharia, N. (2021, 20). <https://www.kenresearch.com/>. Retrieved from <https://www.kenresearch.com/: https://www.kenresearch.com/automotive-transportation-and-warehousing/automotive-and-automotive-components/future-potential-market-of-last-mile-leys-in-ksa/412167-100.html#details>

company, u. n. (n.d.). https://www.my.gov.sa/wps/portal/snp/content/news/newsDetails/CONT-news-25082019%202!/ut/p/z1/jZHLboMwEEV_pRuWxGPzKO2OQvpABRcFKPWmgsoBJGIjoLXy97WSqlL6SDK7GZ17NXMHMVQiJqqPrqnmToqq1_0Lc1-jJ8_GPmDqQbqENajxo0UyAOqi5x2Q4CXcYxtTsMktpGHoJ06GI1y4iJ2j_wao5dxoIL6k.

EcoMENA. (n.d.). <https://www.ecomena.org/saudi-arabia-fuel-economy/>.

edfenergy. (n.d.). <https://www.edfenergy.com/electric-cars/batteries>.

electricvehicles. (n.d.). <https://electricvehicles.in/electric-vehicles-battery-swapping-types-advantages-disadvantages/>.

Emilio, M. D. (2021, April 25). *Modular Battery Swapping System for Electric Vehicles*.

Retrieved from powerelectronicsnews.com:

<https://www.powerelectronicsnews.com/modular-battery-swapping-system-for-electric-vehicles/>

Franke, T. a. (2012). Experiencing range in an electric vehicle: Understanding psychological barriers. *Applied Psychology*, 368--391.

Hampel, C. (2021, Jan 24). *SK Innovation battery swapping scales up in China*. Retrieved from electrive.com: <https://www.electrive.com/2021/01/24/sk-innovation-battery-swapping-scales-up-in-china/>

- Jamian, J. a. (2014). Simulation study on optimal placement and sizing of battery switching station units using artificial bee colony algorithm. *International Journal of Electrical Power \& Energy Systems*, 592--601.
- KenResearch. (2021, 3 1). *KenResearch*. Retrieved from KenResearch:
<https://www.kenresearch.com/blog/2021/03/future-growth-of-ksa-light-electric-vehicle-market-outlook-ken-research/>
- O'shea, P. (2016, OCT 27). *Electric vehicle charging stations gain speed with higher voltages and currents*. Retrieved from powerelectronicsnews.com:
<https://www.powerelectronicsnews.com/electric-vehicle-charging-stations-gain-speed-with-higher-voltages-and-currents/>
- Pettitt, J. (2021, May 29). *Why battery swapping may finally become a part of EV charging infrastructure in the U.S*. Retrieved from cnbc.com:
<https://www.cnbc.com/2021/05/29/how-ample-is-bringing-battery-swapping-to-the-us.html>
- researchgate. (n.d.). https://www.researchgate.net/figure/EV-battery-swapping-structure-based-on-battery-swapping-van_fig1_320562860.
- Rogowsky, M. (6). Reasons Tesla's Battery Swapping Could Take it to a 'Better Place', 2013. sciencedirect. (n.d.). <https://www.sciencedirect.com/topics/engineering/battery-swapping-station>.
- Shao, S. a. (2017). A mobile battery swapping service for electric vehicles based on a battery swapping van. *Energies*, 1667.
- Shao, S. a. (2017). A mobile battery swapping service for electric vehicles based on a battery swapping van. *Energies*, 1667.
- theglobaleconomy. (n.d.). https://www.theglobaleconomy.com/Saudi-Arabia/gasoline_consumption/.
- Yabe, K. a. (2012). Market penetration speed and effects on CO2 reduction of electric vehicles and plug-in hybrid electric vehicles in Japan. *Energy Policy*, 529--540.

Zhang, C. a. (2016). Research on joint planning model for EVs charging/swapping facilities. *2016 China International Conference on Electricity Distribution (CICED)* (pp. 1--8). IEEE.

Zhang, X. a. (2016). Optimal dispatch of electric vehicle batteries between battery swapping stations and charging stations. *2016 IEEE Power and Energy Society General Meeting (PESGM)* (pp. 1--5). IEEE.

Copyright © 2022 Mohammad Muteab D AL-Mutiri, Sulatan Abdullah A AL-Sahow, AJRSP.

This is an Open-Access Article Distributed under the Terms of the Creative Commons Attribution License (CC BY NC)

Doi: <https://doi.org/10.52132/Ajrsp.e.2022.35.2>

The Digital Forensic Tools Accuracy and Specifications

By: Jasir Adel Altheyabi

Master's in Cyber Security, Cyber Security Department, College of Computer and Information Science, Majmaah University, Kingdom of Saudi Arabia

Email: Eng.Jasir@Gmail.com

Abstract:

The research aims to provide an overview of computer forensics, the history of computer forensics tools, and the accuracy and specifications of these tools. With the great and accelerating technological development, the reliance on the Internet has become greater and stronger than before. The world has become dependent on technology in all production and economic operations. And we talked in the second axis of the search for The Computer Forensic Legal Requirement, and Presentation of the tools used in the criminal investigation and an explanation of each tool.

The digital forensic investigation tools that we will explain in this research are FTK. Forensic Toolkit, Prodiscovery, Autopsy, p2commander, OSForensics.

We conclude that digital investigation tools have outstanding performance on different mediums. It has high accuracy and efficiency in digital investigation, and no single tool is superior to some other tools in all media. With more than one tool on a range of devices, it improves the investigation and testimony capabilities of examinees during exploration.

Keywords: Digital Forensic Tools, Digital Forensic Tools Accuracy, Digital Forensic Tools Specifications

1.1 Introduction

Investigation in its general concept means investigation and scrutiny in the search for something in order to ascertain its existence, or seeking to reveal the ambiguity of a particular fact, and for this should use specific methods and means guaranteed by law to conduct the investigation, and the concept of investigation has long become a tangible reality of a science called forensic science. It is a science that specializes in investigating and researching crimes committed by various members of society (Al-Zanoun, 2001).

Digital forensics is the process of investigating crimes committed using any type of computing device such as computers, servers, laptops, mobile phones, tablets, digital camera, networking devices, Internet of Things (IoT) devices or any type of data storage device.

The digital forensic investigation aims to retrieve computer files and all materials related to the investigation, analyze and save them in a way that helps the investigation authorities to present them as evidence in a court of law and in a manner befitting the judicial system, knowing the main motive behind the crime, the identity of the main offender, the nature and history of the relationship between the offender and the victim, completing and designing procedures at the scene suspected crime, which helps ensure that digital evidence obtained is not corrupted. Data acquisition and copying: Recover deleted files, deleted and encrypted sections of digital media for evidence extraction and validation.

Quickly identify evidence, and allow assessment of the potential impact of malicious activity on the victim, produce a computer forensic report and provide a complete report on the investigation process from start to finish, save all evidence in multiple copies and in secret storage spaces.

1.2. Objectives:

The current research aims to:

- Provide an overview of computer forensics
- History of computer forensics
- Legal requirements for computer forensics
- Presenting the most important digital forensic tools used in computer forensics.

1.3. An Overview of Computer Forensics

Computer forensics is also a scientific process that uses technology to review media and digital devices. Computer forensic practitioners must develop and establish a hypothesis regarding an incident or series of events. Which could be entered as a guide for courts or inquiries.

To prove or refute a hypothesis. The investigator must identify and extract evidence. This evidence includes among other things: documents. internet activity. User and computer activity. In many cases. This guide may be deleted or obfuscated (computer forensic services. No date). So on locate and extract computer evidence. Investigators may use a forensic tool or computer tools.

It is important that when identifying. Extracting. Archiving. And presenting evidence. The tactic must be repeatable. Which the evidence will accommodate relevant laws and acts. The simplest way within which hypotheses are proven is by using digital forensic tools that extract data that the computer forensic investigator interprets. Therefore it's essential that investigators be able to trust the knowledge provided by the tools. The simplest way to verify the knowledge provided by the tools is to use a special tool.

1.4. History of Computer Forensics Tools

Modern computer forensic techniques have their roots in data recovery techniques. Which have been employed in a manner to make the recovered data admissible (Mercuri, 2010). Purpose designed computer forensic tools were originally proprietary tools developed by Guidance Software and Access Data for and available to law enforcement agencies only.

In 1999. The Coroners Toolkit (TCT). an open source digital forensic tool for UNIX systems was presented. TCT was extended to include support for FAT and NTFS file systems by a team lead by Brian Carrier who later developed one of the leading forensic tools; The Sleuth Kit (TSK) (Carrier, 2005).

2. Literature Review

2.1 Computer Forensics and Computer Forensic Tools

Computer forensics is approximately 49 years old. Modern computer forensics strategies have been in the beginning developed out of a want to recover statistics that were by accident erased. These recovery strategies have been first of all used by laptop experts in helping law. Forensic tools persevered to be advanced in response to specific threats. And not because of coordinated efforts. Computers were seemed as inconsequential factors in crime scenes and therefore their fee to deliver essential evidence changed into underestimated. However as the range of cybercrimes increased. The cost of virtual proof became more apparent and appreciated. Ensuing in computers being recognized as assets of vital proof (Storer et al. 2019). As a result. Forensic investigators and researchers identified the requirement for the improvement and standardization of a computer forensic framework. A not unusual virtual forensic format (Digital Forensic Research Workshop. N.D.) and research agenda. Further-more a set of fundamental requirements to which computer forensic tools have to adhere had been identified. To fulfil these requirements. Tools have to be relatively smooth to use. Comprehensively discover all evidence. Be correct and deterministic. And their accuracy ought to be verifiable (malwarehelp.org, 2014).

2.2 Objective of Computer Forensics

The overarching objective of pc forensics is to render binary statistics as electronic evidence. And to collect. Analyze. Preserve and gift that electronic evidence in a manner that makes it admissible in a court docket of law. Inner disciplinary enquiries or different tribunals. Evidence is but no longer restricted to whole files that are intact on digital media. However includes remnants of user sports and deleted facts It is of paramount significance that the authenticity and integrity of the evidence extracted and presented with the aid of computer forensic gear is maintained. Authenticity of evidence is satisfied via demonstrating that the evidence has no longer been altered. One manner of ensuring authenticity is by maintaining the chain of custody by using retaining thorough documentation. The documentation have to be have to every movement and or system carried out in collecting.

Reading and exporting data. Records of conditions beneath which proof is stored in addition to whom the custodians and handlers of the proof were are vital records that need to form part of this documentation. Reliability of proof is installed by way of demonstrating that results can be repeated or tested Integrity of evidence in the digital realm may be tested by the usage of cyclical redundancy checks (CRC) and cryptographic hashes to make certain that copied proof is exactly similar to the original. Preserving the chain of custody is another a part of preserving integrity of proof (Carrier, 2014).

2.3. The Computer Forensic Legal Requirement

From legal aspects. Computer forensic investigators need to make sure that the method that they observe is technically undeniable and able to withstand legal scrutiny. Furthermore. The evidence provided to court wishes to be accurate. Validation of findings through the usage of different pc forensic gear is one manner of making peace of mind that evidence is accurate. Repeating the investigative system with a different tool also lets in an investigator to validate the procedure. Another benefit of validation is that investigators are capable of verify that they did not by accident introduce new evidence or omit existing proof. (Watney, 2009).

Once evidence has been submitted to court docket. It's far in all likelihood that the investigator will be called upon to testify to that evidence. The purpose for this is that proof has little or no evidentiary price unless observed by testimony. Investigators need to stay aware that presiding officers in court proceedings aren't virtual specialists and depend upon the testimony of expert witnesses to give an explanation for their findings. The integrity of a computer generated report is taken into consideration to be intact if it can be shown that the facts it contains is complete and has remained unaltered Nist.

2.4. Digital Forensic Tools

2.4.1. FTK. Forensic Toolkit

In order to create photos. Access Data evolved a unfastened proprietary tool known as FTK Imager. FTK Imager is capable of make pix of each static resources which include di cult drives or reminiscence sticks as well as of unstable resources including reminiscence from RAM physical reminiscence and from video or network cards (Business Wire, 2013).

Using FTK Imager. Practitioners are able to preview or picture quite a few le systems inclusive of FAT, NTFS, EXT, CD, DVD and AFF. FTK Imager is capable of create images in .001, .S01, .E01, .AFF, .ISO and Access Datas proprietary, AD1 format. Previewing media is beneficial in appearing triage as investigators are capable of pick whether or not or no longer they want to image a digital source and if so. Whether or not they need to photo-graph all contents on the supply or most effective specific content material. Furthermore, Investigators are capable of make custom content pics. Which consist of selected content from a digital supply added to one photograph. All photographs may be verified the use of MD5 and SHA1 or each hash calculations. Investigators are capable of use Access Data encryption to encrypt images.

Investigators are capable of use FTK Imager to mount screen shots as drives on a Windows machine. Mounting of photographs permits investigators to view files in photos of their native packages and to copy files from the image. Image mounting also enables investigators to run anti-virus software program on mounted pictures. Thereby gaining advance warning of capacity threats and testing allegations of virus or malware.

2.4.2. Prodiscovery

Effective computer security device that enables regulation enforcement experts to locate all the information on a laptop disk while protective proof and developing evidentiary excellent reviews to be used in criminal proceedings.

ProDiscover is a disk forensics machine which gives a bunch of capabilities to capture and analyses disks. The product supports a wide sort of Windows, Linux and Mac record systems. ProDiscover ensures that both the taking pictures and analysis techniques are completed by way of applying forensically sound methods. The resulting reviews meet evidentiary pleasant requirements.

2.4.3. Autopsy

Autopsy provides a graphical consumer interface that may be used in con-junction with TSK. E01 and dd photos may be analyzed the use of Autopsy that may run on Windows.

Linux and Mac OS X platforms. Aside from its analysis function, Autopsy is ready to perform keyword searches and generate reports (Carrier, 2014).

2.4.4. p2commander

P2 Commander is a court docket proven. Laptop forensic answer for examiners who want affordable. Reliable virtual evaluation for computer investigations. Built to process huge volumes of statistics in a quick and green manner. P2 Commander is understood for its advanced e-mail and chat log evaluation.

2.4.5. OSForensics

OSForensics from PassMark Software is a virtual computer forensic application which lets you extract and examine digital information evidence correctly and with ease. It discovers. Identifies and manages ie uncovers the entirety hidden internal your computer systems and digital garage devices.

OSForensics is a self-capable and standalone toolkit which has almost all the virtual forensics abilities including Data acquisition. Extraction. Analysis. Email analysis. Facts imaging. Image restoration and plenty more.

In this article. We will cover all of the major talents of these forensics tools for virtual forensics investigations.

3. Acknowledgements

To Doctor Talal Alharbi. My supervisor who was always available to guide and encourage me. First Majmaah University support. Resources and time o to complete my studies. Appreciation is also expressed to my colleagues for their encouragement and support.

4. Conclusions:

We conclude that digital investigation tools have outstanding performance on different mediums. It has high accuracy and efficiency in digital investigation, and no single tool is superior to some other tools in all media. With more than one tool on a range of devices, it improves the investigation and testimony capabilities of examinees. During exploration.

The setting of fundamental computer forensic tools requirements adhere had been identified. The Tools have to be relatively smooth to use. Comprehensively discover all evidence. Be correct and deterministic. And their accuracy ought to be verifiable.

5. References:

- Al-Zanoun, Salim (2001) Criminal Investigation: General Principles of Criminal Investigation, The Arab Institute for Studies and Publishing, Beirut, Lebanon.
- Storer T, Glisson W, Buchanan-Wollaston, J. A (2019). Comparison of Forensic Toolkits and Mass Market Data Recovery Applications. In: International Conference on Digital Forensics.
- Carrier, B. (2005). File System Forensic Analysis. Addison Wesley.
- Carrier, B. (2014). Autopsy Analysis Features. <http://www.sleuthkit.org/autopsy/features.php>.
- MalwareHelp, (2014). Free Forensic Software Tools. http://www.malwarehelp.org/forensic_tools.html.
- Mercuri, R. (2010). Criminal Defense Challenges in Computer Forensics. Pages 122138 of: Goel, S. (ed), Institute for Computer Science, Social- Informatics and Telecommunications Engineering.
- Watney, M. (2009). Admissibility of Electronic Evidence in Criminal Proceedings: An Outline of the South African Legal Position. Journal of Information, Law Technology.
- (Watney, 2009)
- Business Wire, (2013). Access Data Introduces Forensic Toolkit (FTK).

Copyright © 2022 Jasir Adel Altheyabi, AJRSP. This is an Open-Access Article Distributed under the Terms of the Creative Commons Attribution License (CC BY NC)

Doi: <https://doi.org/10.52132/Ajrsp.e.2022.35.3>

Geoinformatics Technology Distributed Geospatial Database Development for Economic Crisis Management and Natural Disasters in Sudan

Dr. Taha Alfadul Taha Ali

Geoinformatics Centre, Alzaiem Alazhari University, Khartoum, Sudan

Email: Tahapilot13@gmail.com

Abstract:

Distributing Geodatabase allows organizations to disperse their data as necessary from central servers to regional or local offices, which may be in a connected or disconnected environment. The aim of this study is distributed geospatial database development For Economic Crisis Management and Natural Disasters (ECM-GDB) using Geoinformatics technology. The motivation is deep need to organize the Economic Crisis Management and Natural Disasters in Sudan. The objectives are: Define the crisis & emergency concepts, Design and implementation Economic Crisis Management and Natural Disasters Geodatabase (ECM-GDB) Geodatabase in Sudan, and apply GIS call center Managing Economic Crises and Natural Disasters the GIS call center.

The importances are to support decision maker in Government, Society and Customer. The methodology depends on GIS phases. There are many recommendations of this study: build ECM System. Also There are many future researches: build many mobile applications specific ECM.

Keywords: Geodatabase Replication, Geoinformatics Technology Economic Crisis Management (GTECM), Sustainable development, Environment sector, desktop/web/Mobile application, Geosmart City.

1. Introduction

Distributing Geodatabase allows organizations to disperse their data as necessary from central servers to regional or local offices, which may be in a connected or disconnected environment. This is achieved through replication of the Geodatabase in whole or in part and dispensing these replicas as necessary throughout an organization. As the replicas are updated, changes can be coordinated between the offices through a synchronization process.

Distributing Geodatabase allows organizations to disperse their data as necessary from central servers to regional or local offices, which may be in a connected or disconnected environment. The aim of this study is distributed geospatial database development For Economic Crisis Management and Natural Disasters (ECM-GDB) using Geoinformatics technology. The motivation is deep need to organize the Economic Crisis Management and Natural Disasters in Sudan. The objectives are design Economic Crisis Management and Natural Disasters Geodatabase (ECM-GDB) Geodatabase, Implementation distribution Economic Crisis Management and Natural Disasters (ECM-GDB) in Sudan, and apply GIS call center Managing Economic Crises and Natural Disasters the GIS call center. The objective is to support decision maker in Government, Society and Customer.

GIS-based DSS Data Model Business Tourism in Sudan (Alfadul, 2017): this study discusses to build data model of business tourism using geographic information system, to decision support makers. This study obtained many results Build the Conceptual GIS Model 5A's (Attraction, Accommodation, Access, Amenity, Awareness), and recommended to develop enterprise geospatial database in Sudan. Also there are many research like “modeling a Geo-Spatial Database for Managing Travelers’ Demand” (Singh & Preetvanti, 2014), “Design and Implementation of a User Friendly Geodatabase System for the Texas” (Uppala, 2006), “Database design and development for census mapping in Nigeria” (Akinyemi, 1999). All these researches use the Geodatabase . Also many research related GIS crisis management like THE CRISIS MANAGEMENT USINGGIS (Manouchehr, n.d.), the aim of the paper is using this technology to help for getting the information that needed for planning of crisis management. “The implementation of the GIS tools in crisis management” (Michał, 2017), APPLICATION OF GEOGRAPHIC INFORMATION SYSTEMS IN CRISIS MANAGEMENT (Vasil, 2016),

2. Background

Crisis management is the process by which an organization deals with a disruptive and unexpected event that threatens to harm the organization or its stakeholders (Bundy et al. 2017). The study of crisis management originated with the large-volumes of industrial and environmental disasters in the 1980s (Shrivastava et al. 1988), (ASIS International, 2009). Three elements are common to a crisis: (a) a threat to the organization, (b) the element of surprise, and (c) a short decision time. (eeger, M, 1998) Venette (Venette, 2003), argues that "crisis is a process of transformation where the old system can no longer be maintained". Therefore, the fourth defining quality is the need for change. If change is not needed, the event could more accurately be described as a failure or incident. During the crisis management process, it is important to identify types of crises in that different crises necessitate the use of different crisis management strategies. (Coombs, 1999). Potential crises are enormous, but crises can be clustered (Coombs, 1999), (Lerbinger, 1997) categorized eight types of crises: Natural disaster, Technological crises, Confrontation, Malevolence, Organizational Misdeeds, Workplace Violence, Rumours and Terrorist attacks/man-made disasters. There are many Geodatabase types: file GDB, personal GDB and Multiuser GDB (Desktop, workgroup and ArcSDE/enterprise GDB). single-user GDB. In Economic Crisis Management and Natural Disasters (ECM-GDB) we should use enterprise Geodatabase.

Table (1): Terms definition

	Terms	Definitions
1.	Emergency	An emergency is a deviation from planned or expected behavior or a course of events that endangers or adversely affects people, property, or the environment.
2.	Disaster	Disasters are characterized by the scope of an emergency. An emergency becomes a disaster when it exceeds the capability of the local resources to manage it. Disasters often result in great damage, loss, or destruction.
3.	Risk	Risk is the potential or likelihood of an emergency to occur. For example, the risk of damage to a structure from an earthquake is high if it is built on or adjacent to an active earthquake fault. The

		risk of damage to a structure where no earthquake fault exists is low.
4.	Hazard	Hazard refers generally to physical characteristics that may cause an emergency. For example, earthquake faults, active volcanoes, flood zones, and highly flammable brush fields are all hazards.

Table 2: Emergency Types

	Emergencies Types (Johnson, 2000)	Definitions
1.	Natural Disasters	Natural disasters include those unplanned events that occur as a result of natural processes such as earthquakes, tornadoes, tsunamis, freezes, blizzards, extreme heat or cold, drought, or insect infestation.
2.	Internal Disturbances	Internal disturbances are those events or activities planned by a group or individual to intentionally cause disruption. This includes riots, demonstrations, large-scale prison breaks, and violent strikes.
3.	Energy and Material Shortages	Emergencies as a result of shortages include strikes, price wars, and resource scarcity.
4.	Attack	This includes acts of large-scale terrorism or war using nuclear, conventional, or biological agents.

Table 3: Emergency management phases

	Emergency Management Phases	Definitions
1.	Planning	Activities necessary to analyze and document the possibility of an emergency or disaster and the potential consequences or impacts on life, property, and the environment. This includes assessing the hazards, risks, mitigation, preparedness, response, and recovery needs.

2.	Mitigation	Activities that actually eliminate or reduce the probability of a disaster (for example, arms buildup to deter enemy attack, or legislation that requires stringent building codes in earthquake prone areas). It also includes long-term activities designed to reduce the effects of unavoidable disaster (for example, land use management, establishing comprehensive emergency management programs such as vegetation clearance in high fire danger areas, or building restrictions in potential flood zones).
3.	Preparedness	Activities necessary to the extent that mitigation measures have not, or cannot, prevent disasters. In the preparedness phase, governments, organizations, and individuals develop plans to save lives and minimize disaster damage (for example, compiling state resource inventories, mounting training exercises, installing early warning systems, and preparing predetermined emergency response forces). Preparedness measures also seek to enhance disaster response operations (for example, by stockpiling vital food and medical supplies, through training exercises, and by mobilizing emergency response personnel on standby).
	Response	Activities following an emergency or disaster. These activities are designed to provide emergency assistance for victims (for example, search and rescue, emergency shelter, medical care, and mass feeding). They also seek to stabilize the situation and reduce the probability of secondary damage (for example, shutting off contaminated water supply sources, and securing and patrolling areas prone to looting) and to speed recovery operations (for example, damage assessment).
	Recovery	Activities necessary to return all systems to normal or

		<p>better. They include two sets of activities: (1) short-term recovery activities return vital life support systems to minimum operating standards (for example, cleanup, temporary housing, and access to food and water), and (2) long-term recovery activities may continue for a number of years after a disaster. Their purpose is to return life to normal or improved levels (for example, redevelopment loans, legal assistance, and community planning).</p>
--	--	--

3. Materials and Methods

3.1. Study Area:

The Sudan contains 18 states and 6 sectors, any state contain many crisis economic impact fields.

3.2. Data Source :

We should collect descriptive and spatial data and information for Economic Crisis Management and Natural Disasters from all Sudan country.

3.3. Methods:

We should use hardware (PC, GPS and Network ...others), Software (GIS software, RS software, .others), People (Manager, Administrators, Governments, Society, Customer), In other side, in methods we should divide the trace of data and information.

4. Discussion and Result

Distributed Geospatial Database Development for: We Design Economic Crisis Management and Natural Disasters (ECM-GDB) Geodatabase according Designing and Building a Call Center.

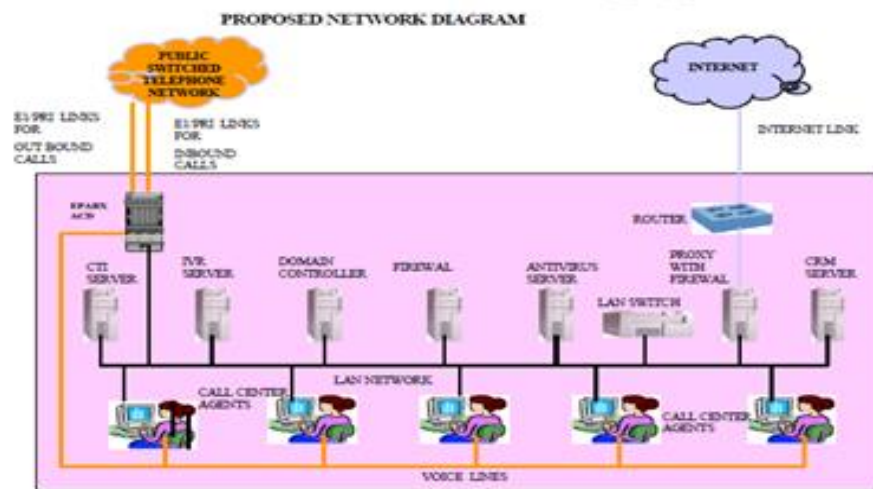


Figure 1: Economic Crisis Management and Natural Disasters (ECM-GDB) network distribution

Distributed Geospatial Database Development for Economic Crisis Management and Natural Disasters (ECM-GDB): Sudan contains 6 Sectors and 18 states: Northern Sector (SN), Khartoum Sector (SKh), Eastern Sector (SE), Center Sector (SR), Kordfan Sector (SR), Darfur Sector (SD).

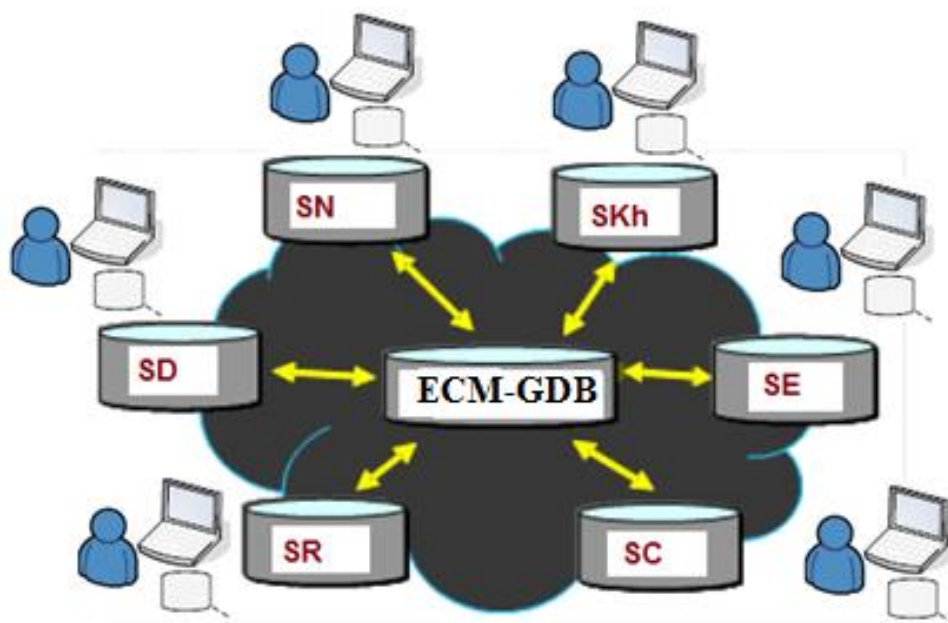
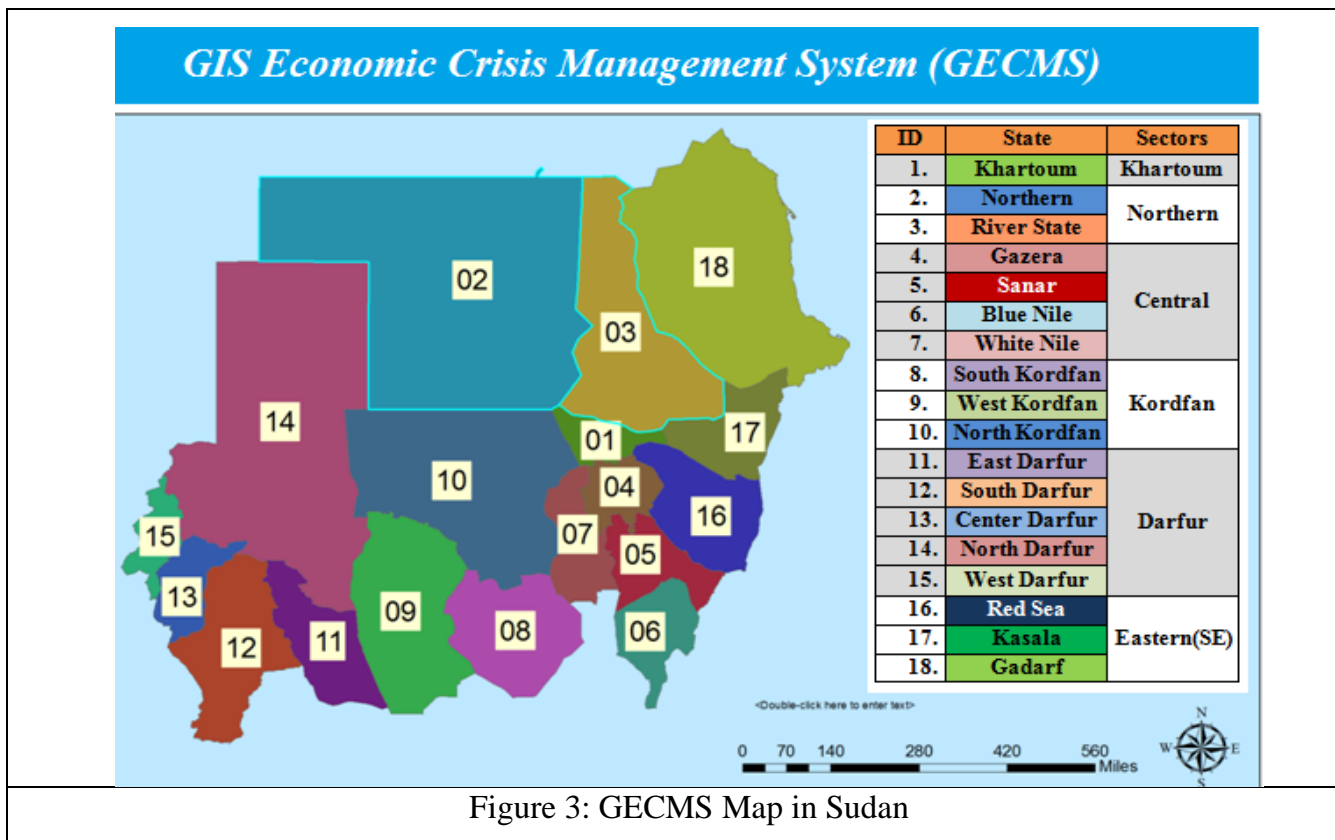


Figure 2: Economic Crisis Management and Natural Disasters (ECM-GDB)



For Distributed Geospatial Database Development for Economic Crisis Management and Natural Disasters (ECM-GDB) in Sudan, We are fragmentation five Geodatabase: Study Area Geodatabase, Economics Geodatabase, Society Geodatabase, Request Geodatabase, and Response Geodatabase. All fragmentation Geodatabase divided at many datasets. A call center is a centralized office used for the purpose of receiving and transmitting a large volume of requests by telephone. Call centers can be a part of or known as: Contact Center, Customer Interaction Center, Customer Service, and Customer Interaction Framework. The main types of call centers: Inbound (Agents receive requests from customers, provide service, and close issues), Outbound and Dispatch centers (Valenzuela, 2008).

According to previous discussions, we build the GECMS Model. and apply GIS call center Managing Economic Crises and Natural Disasters the GIS call center.

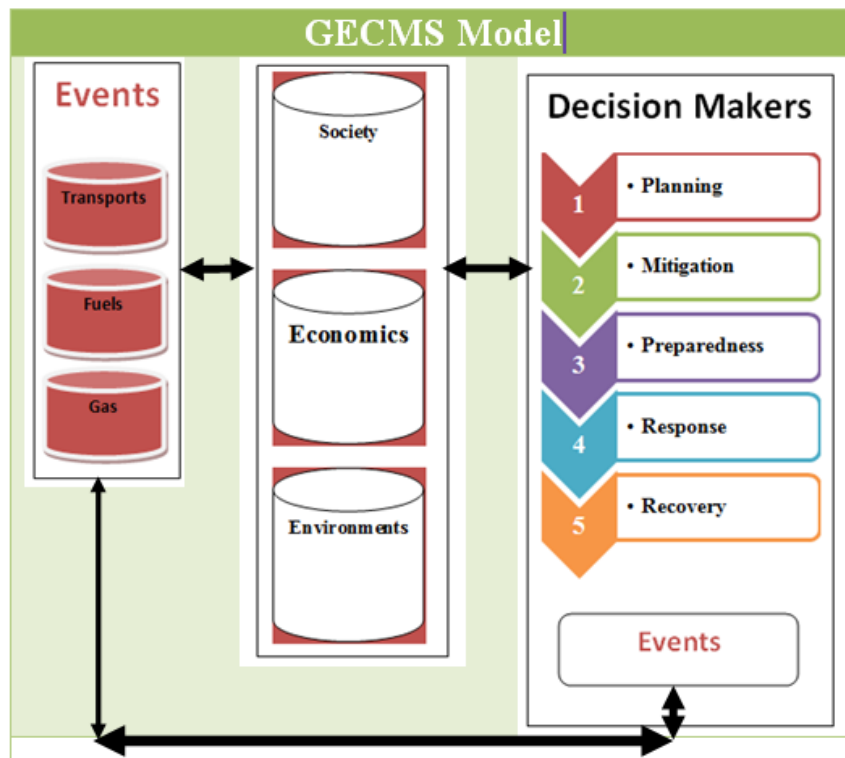


Figure 4 :GECMS Model.

5. Conclusion

The study discussed the potential of geospatial technology, and its role in crisis management, disasters or economic emergencies, by building a geographical database for the sectors and states in Sudan, in addition to building a model that clarifies the role of decision makers and their interaction with events and System. There are many future studies in the field to address economic problems in Sudan in the form of an integrated model, using operations management and scheduling applications

6. References

- Alfadul, Taha (2017). GIS-based DSS Data Model Business Tourism in Sudan, sudanese journal of computing and Geoinformatics, Geoinformatics center, AAU university.
- Singh, Sunil and Singh, Preetvanti (2014). Modeling A Geo-Spatial Database For Managing Travelers' Demand, International Journal of Database Management Systems (IJDMS) Vol.6, No.2, Department of Physics and Computer Science, Faculty of Science, Dayalbagh Educational Institute (Deemed University) Agra, India.

- Uppala, Abhilash (2006). Design and Implementation of a User Friendly Geodatabase System for the Texas, Master of Science in Computer Science, Faculty of the Department of Computing and Mathematical Sciences Texas A&M University-Corpus Christi, Texas.
- Akinyemi, F. O. (1999) "Database design and development for census mapping in Nigeria", in Balogun, O. Y. & S. S. O. Soneye, (Eds.): Cartography in the Service of Government, Nigeria, Lagos: Nigerian Cartographic Association, pp. 191-202.
- Shaghghi K. Manouchehr (n.d.), THE CRISIS MANAGEMENT USING GIS, Műszaki Tudományi Kar, Széchenyi István Egyetem, Győr, Magyarország
- Michał (2017). The implementation of the GIS tools in crisis management, WSN 72, 211-218, <http://www.worldscientificnews.com/>
- Vasil (2016). APPLICATION OF GEOGRAPHIC INFORMATION SYSTEMS IN CRISIS MANAGEMENT, Management and Economics, National Military University, VelikoTarnovo, Bulgaria , REVISTA ACADEMIEI FORȚELOR TERESTRE NR. 2 (82).
- Bundy, J., Pfarrer, M. D., Short, C. E.; Coombs, W. T. (2017). "Crises and crisis management: Integration, interpretation, and research development". Journal of Management.43 (6): 1661–1692. doi:10.1177/0149206316680030.
- Shrivastava, P. Mitroff, I.I., Miller, D. and A. Miglani, (1988)." Understanding industrial crises".Journal of Management Studies, 25, 4, 285-304.
- ASIS International (2009). "Organizational Resilience: Security, Preparedness, and Continuity Management Systems-Requirements with Guidance for Use, ASIS SPC.1-2009, American National Standard".
- Eeger, M. W., Sellnow, T. L., Ulmer, R. R. (1998). "Communication, organization and crisis".Communication Yearbook.21: 231–275.
- Venette, S. J. (2003). Risk communication in a High Reliability Organization: APHIS PPQ's inclusion of risk in decision making. Ann Arbor, MI: UMI Proquest Information and Learning.
- Coombs, W. T. (1999). Ongoing crisis communication: Planning, managing, and responding. Thousand Oaks, CA: Sage.
- Coombs, W. T. (1999). Ongoing crisis communication: Planning, managing, and responding. Thousand Oaks, CA: Sage.

- Lerbinger, O. (1997). The crisis manager: Facing risk and responsibility. Mahwah, NJ: Erlbaum.
- Johnson, Russ (2000). "GIS Technology for Disasters and Emergency Management" An ESRI White Paper,
- Valenzuela, Nora M. (2008). Call center management, Applications Bureau, T.S. Manager, Riverside County Information Technology.

Copyright © 2022 Dr. Taha Alfadul Taha Ali, AJRSP. This is an Open-Access Article Distributed under the Terms of the Creative Commons Attribution License (CC BY NC)

Doi: <https://doi.org/10.52132/Ajrsp.e.2022.35.4>