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On Hamiltonian-Connected Graphs

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Abstract

A graph G is Hamiltonian connected if there is a u-v path in every vertices u,v of G and G is Critical Hamiltonian connected if G-edge makes G not Hamiltonian connected graph. In this study, we present and prove conditions on Hamiltonian connected bipartite graphs, maximal Hamiltonian – connected bipartite graphs and critical Hamiltonian connected bipartite graphs. We have shown the following results: A *k*-regular CHC graph is bipartite if and only if $k = 2$ and of even order for $n \geq 4$.

Keywords: Hamiltonian graph, Hamiltonian – connected graph, critical Hamiltonian connected graph, bipartite graph, maximal.

RESULTS AND DISCUSSION

A graph G, is consist of a pair V, E, where V are the vertices and E are the edges. A graph G is Hamiltonian if it has Hamiltonian cycle in it. Ore (1960) gave condition for a graph to be Hamiltonian, that is for a simple graph G = (V, E) where $|V| = n \geq 3$ and if for every two vertices $u, w \in V$ implies that $(u,w)E, \deg(u) + \deg(w) \geq n$ then graph G is Hamiltonian. [1] stated that a simple graph G to be Hamiltonian having n vertices and for each $v \in V$ must satisfy the inequality $\deg(v) \geq \frac{n}{2}$. A Hamiltonian graph G is said to be Hamiltonian - Connected, if there is a Hamiltonian path between every pair of vertices in it. [2] derived conditions for a graph G to be Hamiltonian – connected graphs, which states that, a graph G of order $n \geq 3$ is Hamiltonian – connected if it satisfies the inequality $\deg(u) + \deg(v) \geq n + 1$. While [1] condition for Hamiltonian - connected graph states that, a graph G of order $n \geq 3$ is Hamiltonian connected if $\delta(G) \geq (n+1)/2$.

A graph G is called a bipartite graph if V can be partitioned into two disjoint subsets V_1 and V_2 such that every edge of G joins a vertex of V_1 to a vertex of V_2 and (V_1, V_2) is called a bipartition of G. [3] Sum of degrees $\sum_{v \in V(G)} \deg(v) = 2e$. A graph *G* is bipartite if and only if it contains no odd cycles.

A Hamiltonian connected is called critical Hamiltonian-connected (CHC) if the removal of edge *e* in *G*, results in a graph *G–e* that is not Hamiltonian-connected. A graph *G* of order $n \le 4$ is a CHC if and only if $G = k_n$. Hence, if *u* and *v* are two adjacent vertices in *G*, then $d(u) + d(v) \le n + 2$.

The next theorem I presented and prove a k- regular critical Hamiltonian connected graphs.

Theorem 1: A *k*-regular CHC graph is bipartite if and only if $k = 2$ and of even order for $n \ge 4$.

Illustration:

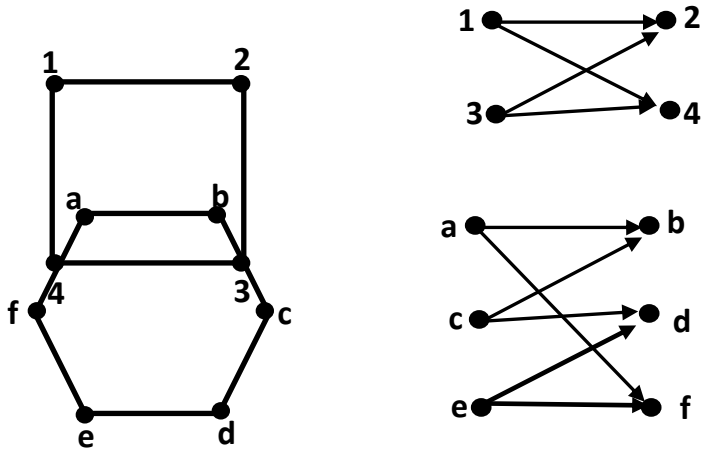

Figure 3.1: A 2-regular graphs of order $n \ge 4$ and their corresponding bipartite graph.

Proof:

To show that a *k*-regular CHC graph with $k = 2$ and even order is bipartite, we let *G* be a *k*-regular CHC graph of even order for $k = 2$ and $n \ge 4$. Let $V(G) = \{x_1, x_2, \cdots x_n, x_{2n}\}$ and since *G* is a 2-regular graph the edges can be represented by $(x_1, x_2), (x_2, x_3), \cdots (x_n, x_{2n}) and \ (x_{2n}, x_1)$. We can partition $V(G)$ into V_1, V_2 such that $V_1 = \{x_1, x_3, \cdots x_n\}$, $V_2 = \{x_2, x_4, \cdots x_{2n}\}$ and $(x_1, x_2, x_3, \cdots, x_{2n}, x_1)$ is a cycle in G. Then *G* is bipartite since the cycle is even by [3].

To show that a *k* – regular CHC bipartite graph has $k = 2$ and an even order n. Let *G* be a *k*-regular CHC bipartite graph. By contradiction, if the order n of graph *G* is odd, then it is not bipartite. If $k \ne 2$, it contradicts being CHC since removal of an edge may still result to a Hamiltonian–connected graph. Therefore, a *k* – regular CHC bipartite graph has k=2 and has an even order n. ■

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UX Design Process Strategies for Website Success

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Abstract

In the modern era of massive information release, influx of technological devices and magnanimous increase in number of businesses going online, the importance of having an effective e-commerce or information website has become increasingly important. Businesses today are competing online to tab maximum consumers and meet their expectations to retain and improve their number of users. This competition has led to the importance of provision of higher user satisfaction levels and the need for improved user experiences. This documentary research focuses on factors and processes that can ultimately lead to the success of website translated as: an increase in effectivity level of the websites (website meets its goals) along with improvements in the experience of its users (improved user satisfaction levels). Persona Development has been seen as a major component for website success which serves as an input for all design decisions and processes. Careful planning and execution of Information Architecture, Visual and Interaction Design processes along with Usability Engineering can ultimately lead to website success. Businesses can formulate an effective website success strategy from our established framework at the end of study. Recommendation for implementation of this study on executive, managerial and operational level have also been discussed along with practical and valuable recommendations for other businesses and industries.

Keywords: UX Design, UX Process, UX Strategy, User Experience, Successful Website

1. Introduction

1.1 Research Background

Visual symbols play a vital role in our daily lives and the importance of visual communication cannot be ignored. Every form of visible expression on the screen is said to possess the power of communication. As soon as a visual clue is made, a word is typed, an image has appeared, a color has emerged, or any other form of expression has made its mark on the screen, its power to unleash a message is released to the world. The dilemma to this fact is that whether the visual expression or effect produced is deliberate/intentional or

unintentional, visual communication has already occurred (no matter whatever the case). For the very reasons discussed we need to understand the importance of the fact that the visual communication requires to be structured and planned in order to avoid the element of surprise or unintentional communication so that the right message can be delivered through the website (Pennington, Chapman, Fry, Deschenes, & McDonald, 2016).

Web sites today are increasingly becoming the preferred choice of media for a common man who is in search for information, social contact building, education, entertainment and shopping (Thorlacius, 2007). The number of interfaces a user interacts with today on daily basis has also increased due to the massive increase in the number of computational devices each person possesses (Blair-Early, & Zender, 2008). The advent of technological devices such as smart phones and tablets, which possess a lot of variation in their interface sizes, has given rise to varying requirements from a single website. Now the website has to fit into varying sizes without appearing unappealing, unattractive or challenging to the end user (Nielsen, & Budiu, 2013). With information also being produced in geometrically increasing amounts, man has now become a primary bottleneck through whom this information needs to be squeezed inn. This massive production and squeeze of information has also contributed to making the interface design process very important and has given birth to the concepts and studies relating to usability, user experience and User Centered Designs (Bias, Moon, & Hoffman, 2015)

Communicating the right message to the audience and creating the best Experience for the user to decode that message has become increasingly important which has led to User Experience (UX) studies. Application of UX, being a set of strategies, help us in understanding the needs and behaviors of the users and then putting this understanding to the designing of useful, usable, and aesthetically pleasing systems and services (Pennington, Chapman, Fry, Deschenes, & McDonald, 2016). These strategies can help to deliver the right intended message to make any website effective allowing it to achieve the purpose of its creation. Processes to enhance experience of user can help create a massive increase in customer base and loyalty advocacy, while improving user productivity and efficiency whereas a non-effective/poor website created without the implementation of these processes and principals will have the tendency to destroy any business, for it being a simple fact that if people are unable to understand the message given they won't act in the way expected and required of them (Preston, 2003). This has given rise to the field of creating best User Experiences for the clients which ultimately lead to increase in user satisfaction levels.

1.2 Research Problem

An effective website has the potential to work as a great Marketing as well as a sales tool. It can build brand images, impressions and personalities for a business. They offer important marketing vehicles fitting into one of the two broad categories including: a. Websites building relationships with prospective customers through informing them about different business brand or services, b. Websites featuring products and allowing consumers to purchase online (serving as direct selling platforms) (Chingching, 2012). Website success calculation or derivation of an exact ROI figure for a website can be considered as an inexact science but effectiveness of only two types of websites a. Ecommerce websites (by calculating sales). b. intranets (by comparing and calculating increased employee productivity) can still be calculated. Still in the competitive world of today organizations are thriving to creating best user experiences for their users to improve user's satisfaction levels and to compete with competitors and simultaneously reach their goals while keeping the user the center of their design. (Preston, 2003).

The problem at hand is to study and learn how different processes can improve the experience of website users and also translate into the production of an effective website. UX design processes can help us formulate a strategy through the implementation of which we can reach website goals as well as enhance user satisfaction level (user experience). We can divide our research problem into various sub problems and then approach the overall picture and develop a framework later on how these processes effect each other in the process of achieving our goals: Goals: a. Improve User Experience b. Improve Website Effectivity

Main Problem Statement: Identifying UX Design Processes that can help us improve: a. User Experience b. Website Effectivity

Sub Problem Approach: a. Role/Effect of Personas in the design process for the achievement of goals b. Role/Effect of Information Architecture Process in the achievement of goals c. Role/Effect of Interaction Design in the achievement of goals d. Role/Effect of Visual Design in the achievement of goals e. Role/Effect of Usability Engineering in the achievement of goals

1.3 Research Objective

The main objective of this research is to identify necessary design processes that can be implemented to form a strategy for ensuring success of a website. Website success being an

unquantifiable or unmeasurable variable cannot be calculated absolutely and for this reason we associate the measurement of a success as a combined effect of these two factors:

a. How Effective the Website is? b. How satisfied are users of a website from the website?

The Objective of research is therefore to study: a. Processes that can improve Effectivity of a website b. Processes than can Enhance the level of User Experience

1.4 Research Scope

In the era of instant communication and online competition, users instantly withdraw from services that are not effective or do not provide them with a certain expected level of satisfaction. All web sites in the world, regardless of differences in linguistics, effects, aesthetics and functionality, are required to meet the criteria of a. effectiveness b. provision of best user experience. This study focuses on processes that can help websites in the achievement of these two major aspects of website success. For this study I have reviewed literature from 46 published papers and studies in the Ebsco Database and selected around 30 studies, referenced at the end of my work, for building up my research points, conclusions from the study, establishing of my framework and then suggesting recommendations for practical implementation in this area. The method of documentary research was carried out on the processes that can lead to the improvement in the areas of website effectivity and user experience, ultimately leading to website success and formulation of strategies for website success.

1.5 Research Significance

Implementation of processes to improve the users experience or to create an effective website have become crucial in the fast-paced world of today where the new century has led to the requirement of instant communication. It is believed that if users cannot instantly or easily figure out how a website works they are viable to conclude that it is not worth their time. This conclusion translates into frustration and giving up on searching of the required information, leading to non-achievement of the website goals (Wilkie, Romance, & Rosendale, 2012). Also, the fact that the number of computational devices has massively increased over the years (Blair-Early, & Zender, 2008) the improvement of user experience has become crucial. Modern devices such as smart phones and tablets which vary widely in screen sizes and Designs have led to an increased demand for optimal small screen designs, more structured content, small displays, simple navigational options and optimization of

design (Nielsen, & Budiu, 2013) resulting in an increase in the requirements of websites to fit into varying sizes without appearing unappealing or becoming challenging for the end user.

An Effective websites design Is highly recommendable as an inaccurate design can lead to production of a negative impression on the consumer mind whereas a high-quality professional website can help to create the feelings of initial trust on the source of information, thus making the content seem more credible (Karimov, Brengman, &Van Hove, 2011). Effective processes for the creation of user experience help to reduce the cognitive load on the users by delivering the most quality content and features in the most structured way (Pennington, Chapman, Fry, Deschenes, & McDonald, 2016). Companies believe that is due to the results in the investment on user experience that their websites are becoming more exceptional, more compelling and more complete resource services for the customer (Schiller, 2011). Effective designs both visual and functional of a website connect strongly with each other to meet and to serve higher levels of user satisfaction (Lee, 2013). Satisfaction status achieved when a user achieves his/her goals from the website when a website works smoothly, responds positively, fulfills expectations thus bringing pleasure to the user (Wilkie, Romance, & Rosendale, 2012).

The earlier focus of development in which the statement: ‘developer knows the best’ was true has been transformed towards the fact that ‘the user knows the best’ (Massanari, 2009). User experience does not only put greater impact on brand perception but also imparts a direct impact on an e-commerce website. Studies in this area have also revealed that superior user experience has the tendency to translate into as much as a 400% increase in sales lead conversions (Schiller, 2011).

This topic of study is significant due to the fact that effective websites can help in the achievement of several objectives such as: Improvement in user satisfaction level, Reduction in Cognitive Load, Improvement in User Trust Level, Reduction in Switching to Competitor Website and Help in Coping with Increased Technology and Device Usage.

2. Literature Review

2.1 User Experience/UX

User Experience or the term UX can be defined as a set of strategies that are developed and designed to understand the requirements and behaviors of the users of the product/website and then practically implement these strategies to the development of aesthetically pleasing, useful and usable designs for the website (Preston, 2003).

Psychology theory of Gestalt proposes the fact that a human mind is programmed to cope up with visual chaos, which leads to its ability to strive and works hard to make sense out of even the most chaotic scenarios. Also, the fact that a human mind is processed to process an object as a whole rather than processing it into individual parts. It instantly and automatically tries to fill in the missing gaps and seek for ways to avoid uncertainty. These all results in increasing the cognitive load, increasing the chances of a user displeasure, at the users end (Pennington, Chapman, Fry, Deschenes, & McDonald, 2016). This calls for the importance of work in the field of user experience that can help in assistance to provide clear visual paths and direct flow of the user's attention in required direction. Combination of visual and functional attributes of a website serve to provide the highest level of user satisfaction (Lee, 2013).

The earlier technique that focused on the developers usually failed because it was hard to envision and identify the uses, needs, and the problems of the end user (Massanari, 2009). User Experience is a continuous process and it is noted that user experience increases gradually and tends to change periodically (Ain, Aslam, Muhammad, Awan, Parvez, Naveed, & Qadri, 2016). An effective site today may not be considered as effective or it may become an average site for the user after some time with advancements in technology. Studies reveal that 41% of users immediately abandon websites that appears outdated to them (Schiller, 2011).

UX Enhances Website Effectivity: User experience not only produces a great impact on brand perception and value, but it also has the capability to put a direct impact on sales, particularly on e-commerce websites. Studies have revealed that provision of superior user experience have translated into as much as a 400% increase in sales lead conversion (Schiller, 2011). Today a lot of research is put in developing effective websites because studies reveal that only effective websites can lead to increased user satisfaction (Wilkie, Romance, & Rosendale, 2012) which is very important in the competitive world of today when all organizations are competing and putting emphasis on creating best user experiences that can result in increasing user satisfaction levels from the website.

Key to creating a good user experiences that ultimately translate into successful website is to dynamically adapt the site to meet the needs of the individual users rather than having a strategy to create a one-size-fits-all solution. A study conducted on various award-winning websites showed the fact that before the start of their design process, their proposed experiences were tailored (both the navigation and the intelligence) which means their user

experience were designed. Today leading organizations like IBM are making the use of predictive analytics for the purpose of analyzing data or patterns on how users navigate sites and what are the information they are most interested and thus implementing strategies to make that data readily available to them (Schiller, 2011).

2.2 What is Website Effectivity

An effective Website, depending on its purpose, can work as a great Marketing as well as a sales tool by building brand images or personalities. Websites majorly fit into one of the two broad categories that include: a. Websites that builds relationships with prospective customers by informing them about the brand or services b. Websites featuring products and allowing consumers to purchase online thus serving as direct selling platforms towards the users (Chingching, 2012).

Effectivity of a website is a term that cannot be universal as It is highly dependent on the functioning and purpose of the website therefore different websites are rated differently for their effectivity level. To be true, gauging effectivity is not an exact science as there is no solid way to determine if the website is effective or not. Website success calculation or derivation of an exact ROI figure for the website, an inexact science or procedure, is possible only among two types of websites: a. By calculating sales on an Ecommerce website b. By comparing and calculating increased employee productivity on intranets (Preston, 2003).

2.3 Study on Processes

User Experience cannot be graded as a measurable task in fact it is said to be developed from a combined set of elements (Deaton, 2003). Similarly, it cannot be achieved or determined by a single process but is perceived as a set of layered processes or a process that consists of set of sequenced activities (Zantjer, & Gonzales, 2015). These processes or activities are said to arise from a set of developed planes that include strategy, structure, skeleton, scope and surface of the development process. Each of these planes mentioned are said to contain elements that are ultimately said to lead to the creation of a greater user experience. Surface plane amongst all the above is of most importance as all the elements gather at the surface plane (interface) to give life to creation of overall user experience (Deaton, 2003).

It can be safely inferred that there is no single characteristic that has the capability to fully encompass experience of the user which leads to the fact that skills and expertise that

are required for effective implementation of user experience cannot be combined in a nutshell. In fact, they can be considered as a set of processes and skills that are required to define the job or skill set that will be required by a user experience manager to implement the techniques and produce the best use experience (Zantjer, & Gonzales, 2015).

I. Persona Development:

Personas can be defined as prototypical users with names, interests, faces and preferences. They serve as a standard or conceptual image of the end user and help in the process for making important design decisions (Massanari, 2009). Personas serve as an emotional bridge between website producers/ team member and the end users. They provide a level of familiarity or empathy related to what the user might experience when they will traverse your Web site. A persona is a narrative for describing the flow of someone's schedule, skills, attitudes, environment and goals instead of being a description or list of tasks or duties which were taken as standard for design and development in the earlier years. Personas have the capability to connect the design and development teams to a user who is tangible rather than just being a vague idea or a set of specific requirements (Guenther, 2006).

Personas cannot be defined as real people but are hypothetical archetypes of actual users. Although they are imaginary still they are defined with significant rigor and precision and are used to represent the end user throughout the design process and are very important (Massanari, 2009). Personas help us in recognizing the fact that even within a customer base there will always be various discrete user groups that will have similar needs and goals. Steps on a simple Persona Development include: Research: Research and gather data about the users - Data Analyzing and Findings: Once the information has been gathered, observe repetitive patterns in behaviors and attitudes of the user and cluster data into consistent themes - Persona Writing: Assign characteristics to the persona such as: a name, some demographic data such as age and educational background and a picture/image to make the persona more real. A broader insight in order to connect product development with a tangible user can go as far as a precise fictitious name, personality, schedule, occupation and lifestyle etc. (Guenther, 2006).

Persona and User Experience: Personas generally are highly valued in the design process. They can be clearly identified as an important basis of creating a website that will have the ability to provide the users with positive emotions and higher levels of satisfaction

resulting in enhancement of user's experience (Massanari, 2009). Personas serve as a solid platform through which different project teams and designers are able to sync their work with user goals and needs. This synchronization with user goals results in enhancement user experience (Guenther, 2006). As a need for a clear format that has the capability to take into account all realities of life and still have room for future evolution, Personas can be clearly stated as user experience design tools (Idoughi, Seffah, & Kolski, 2012).

Persona and Website Effectivity: Considering Personas from a marketing point of view, personas have proven to be beneficial for both internal and external marketing efforts. They are considered as a source of providing tangible means for kicking off a project thus leading to the success of a website. The idea held by designers and technical people, assuming that they already know their users wants and needs, can lead to website that might work for the users who resemble the development team of the Web site only. Such a site may not address the complete and nonobvious needs of the user (Guenther, 2006) thus giving rise to the fact that personas can help development teams to understand the user and create websites that have higher capacity to match the requirement of the user thus giving rise to success chances or effectivity of the website.

Persona in Information Architecture: Value of a persona therefore becomes critical to the design process in this situation as they are said to possess thematic elements which help the architecture practitioners to perceive users in the best possible way (Massanari, 2009)

Persona in Visual Design: Aesthetic designs and content of a website can be carefully planned and executed by making decisions after considering the details mentioned in the persona about the user. This leading to success of a visual design (Guenther, 2006).

Persona in Interaction Design: Interaction design personals greatly use personas to perceive user interaction for the design processes as they themselves do not have any direct way to assess the potential user of the website (Massanari, 2009).

Persona in Usability Engineering: Data-driven personas, serving as a resource for UCD's (user-centered designs), can help to improve the design process and make assessments about usability of the site. Personas are highly helpful for usability designing professionals to make important evaluations (Friesse, 2015).

II. Information Architecture:

The general process of Information architecture leads to the designing of information environments along with its management (Deaton, 2003). Information Architecture can be

defined best as a dissection of a Project into Manageable Bits and pieces. An Information architects work is somewhat similar to a person solving a complex jigsaw puzzle, involves going through painstaking processes while keeping in focus the big picture, to ensure that the completed image in the end is worth the efforts that have been put in.

A candidate for performing Information architecture must have great eye for detail and good problem-solving skills as these are fundamental for the success of an information architect role or position. An information architect breaks down a large project into manageable chunks and delegates responsibilities and determines the workflow (Hartley, 2009).

Information Architecture and User Experience of a Website: The roots of Information architecture are found in multiple fields including visual design, information design and engineering psychology which can all be summed up as human factors and are very important factors for designing of human experiences (Deaton, 2003). Therefore, the work of an Information Architect usually involves structuring organization, search and the navigation systems that can lead to shaping up the best user experience.

Information Architecture and Effectivity of Website: IA contributes to website success by answering three findability questions: a. Can users find the web site? b. Can users find their way around your web site? c. Can users find products and content on the web site?

IA helps in findability which is the major problem to which information architecture is the answer. IA is not only about findability but in fact it is essential to designing websites that are useful, accessible, usable, desirable and credible. The role information architecture plays in shaping up a company's brand through a website cannot be ignored (Marcos, 2007).

III. Interaction Design:

Interaction design is concerned with facilitating interactions; interactions with artifacts or interaction between humans through artifacts. The discipline of interaction design is said to be related to behaviors, functions and information. This type of design work can be clearly characterized as a conversation between the designer and the situation (Karlgren, Ramberg, & Artman, 2016).

The interactions between users and products can be characterized based upon product properties, tasks, user characteristics and other contextual features and users tend to instantly form impressions of a website. Investigation of attitude formation upon interaction with a website is a very important aspect and can help us shape up the interaction of the user with

the site thus resulting in the intended behaviors we require and avoidance of user switching to another alternative or competitive website (Jiang, Wang, Tan, &Yu, 2016).

The complex that design interaction plays made it difficult to separate presentation layer from behavioral or interaction layer as interaction is more about behavioral aesthetics. To understand this point let us consider the aesthetics of an iPhone. The aesthetics are not only visible from its visual appearance but are also evident from its touchable interface or by the fact how or what type of experienced it gives to its users. This leads to the fact that beauty of a design does not exist as a whole in a visual design only. It heavily relies on user interaction and behavior. Giving rise to the existence of a behavioral level of aesthetics, where people perceive aesthetics through their actions/operations or interactions to be exact. (Jiang, Wang, Tan, &Yu, 2016)

Interaction Design and User Experience of a Website: To understand product and user interaction it is important to first examine the relationships between user perceptions of usability/aesthetics and emotional responses. The interactions between the users and a product/website can be characterized based upon product properties, task at hand, user characteristics and other contextual features. These interaction characteristics have a great connection to creation of user experience which is largely connected with human emotions. Emotional reactions, feelings, motor expressions are all parameters that can be used to design interaction (Seo, Lee, & Chung, 2016).

Interaction Design and Effectivity of Website: First impression of a website on a user is of utmost importance. This leads to the fact that Investigation of attitude formation upon the first interaction with a website is crucial as these initial impressions are said to impart larger impacts on attitudes and behavior of the user. If the user's interaction with the website is not impressive this may lead the user to easily switch or another alternative or competitor website thus resulting in non-achievement of website purpose or decrease in website effectivity (Jiang, Wang, Tan, &Yu, 2016).

IV. Visual Design:

Visual design can be defined as the attention-grabbing aesthetic as well as visual quality of a Web page. Elements of a visual design are said to be dealing with balance, aesthetics, uniformity and emotional appeal of the overall graphical look and are said to be the most effective attributes of a website. Visual design can be defined into two sub-dimensions:

a. Graphic Design: Graphic design usually refers to the look and feel of a website or the features that usually determine the first impressions of a visitor/consumer. Including elements such as the use and size of images, display of colors, use of animation, the size and number of characters and symbols. Research suggests that well-designed graphics have the tendency to improve the overall online shopping experience of a consumer.
b. Structure Design: Structure design' that is said to be the other dimension of visual design involves the overall organization and accessibility of the displayed information on website. This Structure design includes the organization of the different pages into an understandable and desirable whole and is also known as the website architecture (Karimov, Brengman, &Van Hove, 2011).

Kimball defines that as the design principles can't be quantified they can only be - Generalizable (applied to many situations) - Heuristic (help in decisions and determine the path of action) - Grounded (should be more than simple preference and should be based on organized experience through practice or research - Meaningful (should help designers to communicate ideas in an effective ways) - Contingent (its application should be dependent on local conditions) (Kimball, 2013).

Determinants of a Website Aesthetics:

Unity: Unity can be regarded as an aspect of a visual display, referring to congruity among elements of a design in such a way that they look as if though they belong together. Website unity is subject to visual characteristics of a website such as: visual balance of website structure, consistency of the color scheming and the layout of images and text.

Complexity: Complexity can be determined by various design elements such as: - Number of elements on a web interface - Variety of presentation formats - Different layers of navigation structure A website perceived to be too complex, results in difficult processing of information and cues resulting in uncertainty. Whereas a very simple Website (or zero complexity) may result in boredom.

Intensity: intensity of an artwork enables it to escape "aesthetic blandness," and thus fosters the perception of aesthetics. A very low or high intensity in a design may result in the in less attractiveness to visual stimuli resulting in less aesthetic preference toward the stimuli.

Novelty: Novelty of a design provides a chance for people to have varying experiences thus making a website more interesting as compared to others and influencing a viewer's aesthetic preference (Jiang, Wang, Tan, &Yu, 2016)

Visual Design and User Experience of a Website: Gestalt Theory explains how humans behave or respond to visual chaos and explains how the mind constantly strives to make sense out of even visual chaos leading to increase in cognitive load and feeling of displeasure that ultimately leads to the feelings of dissatisfaction (Pennington, Chapman, Fry, Deschenes, & McDonald, 2016). This theory leads to the importance of visual design in creating user experience. And also stresses on the fact based on reports that the beauty of a website is crucial for creating the best online experience for the users (Jiang, Wang, Tan, &Yu, 2016).

Visual Design and Effectivity of Website: Website's visual design has become increasingly important as it encourages prospective consumers to seek information as well as positively effects the purchase intention of a user as today almost 60% of the overall consumers search for information about products or services online. (Chingching, 2012). Web designers today perceive the fact that the elements of a visual design tend to be the most effective attributes of a website (especially a B2C websites). The look and feel or the visual design of a website is said to be a great in building up the first impressions (Karimov, Brengman, &Van Hove, 2011). And studies on this subject of first impression have revealed that 41% of users immediately abandon websites if the visual design or outlook of the website appears outdated to them (Schiller, 2011).

Well-designed graphics possess the tendency to hook the users to the website that is the reason that visual attractiveness is said to be positively associated with quality perceptions. Users usually associate visual appeal of a website with trustworthiness on the retailer thus making visual design as one of the most important among all element leading to the effectivity of a website. Researches also demonstrates that well designed graphics, optimal text display and the appeal of interface to the users in general improves the online shopping experiences of consumers (Karimov, Brengman, &Van Hove, 2011).

An aesthetically pleasing e-commerce website is generally more liked and valued by consumers, leading to more sales and ROI. Studies suggest that the visual appeal of an e-commerce website greatly affects how a consumer's shops and leads into a trend or urge for impulsive buying online (Jiang, Wang, Tan, &Yu, 2016).

V. Usability Engineering:

A key aspect of a website is its usability. Usability can be defined as the ability of the target audience of the website to carry out tasks in the most safe, efficient, effective or in the most joyfully manner. The International Standards Organization ISO has defined usability as

the “extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use” (Bias, Moon, & Hoffman, 2015). Usability can also be defined as a measurement of a products adoption level by the user with contentment, competence and worth (Ain, Aslam, Muhammad, Awan, Parvez, Naveed, & Qadri, 2016).

Usability studies are used to determine the experiences of the end-users while they interact with a website, in order to identify the important factors that help us in taking website design decisions (Wilkie, Romance, & Rosendale, 2012). Website usability can be measured by the adaptive level of its users, satisfaction, learnability and screen reading level. Usability is a very important feature as irrelevant images/textures on the websites lead to cognitive burden which can ultimately lead to negative emotions and user disturbance. (Ain, Aslam, Muhammad, Awan, Parvez, Naveed, & Qadri, 2016). Usability studies to determine the experiences of the end-users while they interact with the website. These studies include the consideration of true emotional value of the experience. The emotional value of an experience defined as -worthy goal of a design, takes into consideration the type of emotions a user experiences and leads to the importance of understanding about why that person feels in that certain way to yield even more valuable information for the website designers (Wilkie, Romance, & Rosendale, 2012).

Usability Engineering and User Experience of a Website: Usability of a website determines whether the design of a websites enables users to accomplish the desired tasks, expected from the user, effectively, efficiently and while attaining satisfaction giving rise to a great user experience. Usability studies, determining the experiences of the end-users while they interact with a website, leads to the identification of important factors that can help with website design decisions to enhance the overall user experience (Wilkie, Romance, & Rosendale, 2012).

Usability Engineering Improves Effectivity of Website: Deriving an exact ROI figure for web site usability is an inexact science but the fact is that usability engineering weighs highly when it comes to planning a return on investment for ecommerce websites. A study conveyed on 42 web projects that were redesigned for usability showed a: -100 % improvement in sales conversion - 150% improvement in traffic visitor counts - 161% increase in user performance or productivity along - 202% improvement in the use of specific features (Preston, 2003).

Usability of a website evolves majorly around human factors, thus helping in validation of effectiveness of the interface and improvements in the ability to carry out their desired tasks with the website (Bias, Moon, & Hoffman, 2015

3.0 Findings

Findings from the study about the processes that lead to success of website can be summed up as:

1. User Personas is the most important process contributor. It enhances the processes of Information Architecture, Interaction Design, Visual Design and Usability Engineering and directly also influences website effectivity and experience of the users
2. The processes of Information Architecture, Interaction Design, Visual Design and Usability Engineering positively contribute to the enhancement to user Experience
3. The processes of Information Architecture, Interaction Design, Visual Design and Usability Engineering also enhance and improve the effectivity of a website

Established Framework

Figure 3.0 A framework established based on the findings in Table 3.0

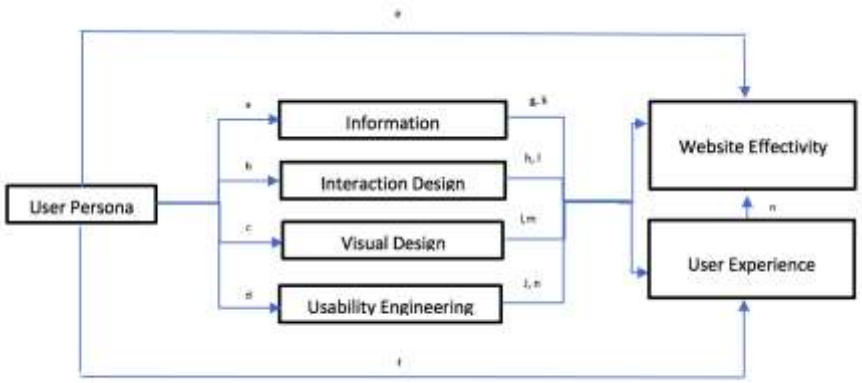

Figure 3.0 UX Design Process Strategies for Website Improvement

Explanation of Figure 3.0:

a. User Personas enhances the processes of Information Architecture b. User Personas enhances the processes of Interaction Design c. User Personas enhances the processes of Visual Design d. User Personas enhances the processes of Usability Engineering e. User Personas enhances the processes of leads to effectivity of a website f. User Personas enhances the processes of leads to greater user experience g. The processes of Information Architecture lead to Effectivity of a Website h. The processes of Interaction Design lead to Effectivity of a Website i. The processes of Visual Design lead to Effectivity of a Website j. The processes of Usability Engineering leads to Effectivity of a Website k. The processes of Information Architecture lead to provision of User Experience l. The processes of Interaction Design lead to provision of User Experiencem. The processes of Visual Design lead to provision of User Experience n. The processes of Usability Engineering leads to provision of User Experience o. Improved User Experience enhances Website Effectivity

4.0 Recommendations

4.1 Recommendations for Executive Level

- Create a Creative Organizational Culture: Creativity is crucial for any organization. As leaders, executives must thrive to build a culture that allows free expression of ideas. This free expression of thoughts and ideas ultimately helps an organization to build an organizational culture that promotes creativity (Stroklund, 2007). At the most visible level, culture of an organization consists of artifacts which are the physical manifestations of an organizational culture (Kinicki, &Fugate, 2018). New York: McGraw-Hill Education, p 548) so Create an office environment with artifacts and office design layout which have visible clues to show appreciation for creativity.

- Encourage Cross Communication among Individuals and Teams: Researches suggests that teams and individuals possess the power to influences each other which leads to shaping up of individual beliefs and behaviors. Executives must encourage and endorse an environment of trust, open communication and knowledge sharing (Magni, Angst, &Agarwal, 2012). Strategies to promote communication among employees can stimulate information sharing and help the company benefit from employees who work hand in hand to achieve a shared goal (Stroklund, 2007). An environment of team ship focused on constant interaction between teams and different roles will allow team members to work together towards the same goal of achieving website success.

- Emphasize on Importance of Interaction Designs Features for the Future: Executives must be farsighted and should have the capability to evaluate trends of market and future. In the fast-paced world of today, solid grounds of success for an organization rely on actions taken by it to develop and support innovation. Organizations must look at their current and future projects to evaluate what better could be done with more efficiency for a successful future (Stroklund, 2007). This leads to the importance of Interaction Design for it being the future and the most wanted skill for website development in the recent ages due to due influx of smart devices in the market.

- Encourage Teams to Create Websites with a Competitive Edge: Executives must motivate teams to work hard and create a competitive edge from their competitors. With businesses becoming more and more competitive each day, organizations must seek ways to set themselves apart from others in the industry. With growing speed of businesses going international and global, organizations must ensure differentiation to ensure that their products stand out (Stroklund, 2007). Non-effective and non-attractive website can result in

loosing potential and existing users who can instantly be compelled to move towards a competitor.

4.2 Recommendations for Managerial Level

Introduce Personas as Real Characters: User Personas, having the capability to serve as a solid platform through which different project teams and designers can sync their work with user goals and needs and for being a process that is used as an input for all other design processes, requires to be as realistic as possible in order to lead a website to success (Guenther, 2006). Managers must work on building personalities of their Persona character in the minds of your teams to allow them to think more realistically about them rather than taking them as fiction characters.

- Encourage Graphic Designers to Create Novelty: Novelty allows designs to become more attractive. A thorough process for developing and expressing of novel ideas, can be a key to the success for any organization (Stroklund, 2007) therefore Managers must encourage novelty in designs and encourage graphic designers to create something that hasn't been created before to improve interest of users and attract the user on first interaction with the website.

- Create a Balanced Approach Towards Design: - A website perceived to be too complex -> results in uncertainty - Website with no/zero complexity -> results in boredom. Very low or high intensity - results in website that is less attractive for the users (Jiang, Wang, Tan, &Yu, 2016). Managers must ensure that the design elements of a website unite and are not too complex and offer a balanced blend of complexity and intensity.

4.3 Recommendation for Operational Level

- Allocate/Shift Budget Towards Website Creation and Enhancement as a Choice for Marketing Appeal: Tailoring a website to appeal a particular target audience is monitored to be as effective as personalizing print and television advertising messages. In fact, websites prove to be more cost efficient and therefor more feasible (Chingching, 2012). Therefore, it is wise for the operational level managers to allocate good budget for creation and maintenance of a professional website for businesses.

4.4 Recommendations for Other Industries

- Recommendations for Businesses - Corporate Image Creation: Websites play an important role in shaping up brand personalities. These Brand Personalities influence relationships between the consumer and the brand (Chingching, 2012). Businesses must focus

on building and maintaining brand images as a non-effective website/nonprofessional website can damage your already established brand image

- Recommendations for Business - Ensure Delivery of Right/Productive Message: Any form of expression (deliberate or unintentional) on the screen has the power to communicate. Ensure that visual communication is structured to convey the right and effective message across the website (Thorlacius, 2007). Businesses therefore must invest in a proper and professional website as impression of a professional, timely, and high-quality website causes a consumer to infer positive beliefs, which in turn induce initial trust on your business

- Recommendations for Online Businesses - Trust Building: The fact that an initial experience with an inaccurate website can cause a consumer to infer negative beliefs about the e-retailer emphasizes on the fact that businesses need a professional, timely and high in quality website in order to ensure that the consumer infers a positive belief about the retailer which leads to trust (Karimov, Brengman, &Van Hove, 2011).

- Recommendations for Recruitment Agencies:

This research can help recruiters establish better job descriptions for the UX Managers and help organizations create a pool of individual/performers with special skillset for the success of websites

As this study shows that Information architecture professional requires great problem-solving ability. Recruiters can now develop testing mechanism for potential candidate for assessment of the problem-solving ability

5.0 Research Limitations

In the competitive world of today when all organizations are competing and putting emphasis on improving effectivity of a website or increase chances of success for a website, the fact is that there is no solid way to determine if the website is effective or not. Website success calculation or derivation of an exact ROI figure for the website can be considered as an inexact science except for Ecommerce websites and intranets (Preston, 2003).

The above stated fact that ‘website success cannot be measured exactly’ limits our research parameters and assessment techniques and leads us to prove our topic of discussion through already established assumptions, trends and literatures. For this reason, we cannot relate our complete study to any one whole/consistent study reference/source that could prove our point or prove the fact that our stated processes are ‘the only’ or ‘whole /absolute’ factors that contribute to website success. For the same reason we are unable to establish an exact or calculated ratio of each process for its contribution level in the website success formula.

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Potential Sustainable Energy for Future Generation in South Sulawesi-Indonesia

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Abstract

The aim of this study is trying to identify the energy problems faced the human being, encourage new ideas for alternative energies and developing new energy according to Islam, and promote potential new energy based on environment, culture and community based in South Sulawesi-Indonesia. Data is collected through observation, interviews and documentation. Data is then analyzed using data display techniques, data verification and conclusion. The study result showed that energy systems are changing fundamentally and fast. These challenges require cutting-edge products and services covering the entire energy value chain. Specifically, it calls for a comprehensive portfolio of physical and digital technologies, products and solutions that allow us to actively build our new energy for the future. Meanwhile, Islamic Holy Book, the Koran clearly mentions renewable energy. This renewable energy is at least discussed in Surah Yaasiin verse 80, Surah Al-Waqi'ah verses 71 -72, and Surah An-Nuur verse 35. In the Surah Yaasiin and Al-Waaqi'ah the indication of the energy source was from the tree, while in the Surah An-Nuur, the indication was from the fruit. However, in South Sulawesi is noted to utilize was a pioneer in renewable energy because, it's processing palm trees to be mixed into gasoline. Moreover, energy of water also developed for the electricity sector in 2017 by 28 percent in South Sulawesi, and has exceeded the national target of 23 percent by 2025. Currently, four large dams and weirs are also temporarily built, and all of them can be used for energy electricity. This potential energy in South Sulawesi will be the province most prepared with electricity infrastructure. So far, South Sulawesi is also increasing the number of Bayu Power Plants (PLTB) in Sidrap and Jeneponto Regencies. The use of wind as a source of electricity in South Sulawesi is very adequate, because in general the wind speed in this area ranges from 2-4 m/sec.

Key words: Potential Sustainable Energy-Future Generation-In South Sulawesi

Preliminary

Developed nations are turning away from fossil fuels, developing nations still rely heavily on coal, oil, and natural gas for its energy. Fossil fuels are non-renewable, that is, they draw on finite resources that will eventually dwindle, becoming too expensive or too environmentally damaging to retrieve. It is our responsibility to conserve energy and save the environment for the generations yet unborn. Energy needs to be conserved to protect our environment from drastic changes, to save the depleting resources for the future generations. The rate at which energy is being produced and consumed can damage the world in many

ways. In contrast, many types of renewable energy resources-such as wind and solar energy-are constantly replenished and will never run out. They are available in plenty and by far most the cleanest sources of energy available on this planet. For example energy that we receive from the sun can be used to generate electricity. Similarly, energy from wind, geothermal, biomass from plants, tides can be used to fulfill our daily energy demands. (https:// constructionreviewonline.com/2017).

Valentin Yu. Doluda, et.al., (2017) stated the experimental results showed that the classical two-step methanol to gasoline (MTG) process nowadays remains the most effective for gasoline-range hydrocarbons production, while one-step and cascade schemes require further investigation and the development of reactor systems as well as the operating conditions. Meanwhile, Reza Lotfi, et.al., (2017), found that the growing awareness about the adverse effects of fossil fuels and the ensuing pollution has encouraged and promoted the use of renewable energies throughout the world. This in turn has encouraged governments and investors to show more interest in generation of renewable energy through construction of facilities such as wind farms.

Briefing journalists at a world press conference on some of the decisions reached by ministers of science and technology from more than 100 member-countries of the International Renewable Agency (IRENA), at Abu Dhabi, United Arab Emirates (UAE), in Abuja, the Minister of Science and Technology, Dr Ogbonnaya Onu, disclosed that more than 100 countries including Nigeria, spent $300 billion on renewable energy because of the need to preserve the environment for future generations yet unborn. He said it was agreed that countries should move away from using fossil fuel because of its negative impact on the environment and climate. Onu said the production of carbon dioxide through fossil fuel is known to be responsible for climate change, adding there was need to preserve the environment and hand over the planet to future generations so that the planet would be habitable for them. “For the first time since 2016, the world spent $300 billion in promoting renewable energy and so many countries are increasing the percentage contribution of renewable to their energy mix. “This platform is being supported and encouraged by rich countries in crude oil and they are doing this for economic reasons because it is important to make sure that you diversify your own source of energy. “If in the future, solar energy is competitive through utilization of science and technology in research and innovation and if you don’t play a role it means you may regret in future,” he said. (https:// constructionreviewonline.com/2017).

The minister said Nigeria was elected as one of the 4 vice presidents to set agenda for its 8th meeting in Abu Dhabi, UAE, in January 2018. He reiterated the Federal Government’s commitment to promote renewable energy, saying government through National Agency for Science and Engineering Infrastructure (NASENI) was diversifying its energy mix through production of solar panels at Karshi in FCT which, according to him, are highly being patronized by Nigerians. He further said the ministry had advanced in the generation of two megawatts of electricity from the Dutsima River in Katsina and Osun states. According to him, the Energy Commission, through the Usman Dan Fodio University, Sokoto, has attained about 80 percent completion on an experimental project on solar energy production in different parts of country. He said: “Though, we have not had the level of support that the ministry deserves in pushing the level of research and innovation at the level that we want but

since I came in here, we have had a remarkable improvement even though it is yet not enough. We believe that we will get there. The infrastructure is on for the solar energy. "We also have wind energy that is being utilized and it is almost 80 percent complete in Katsina State, but at the experimental of pilot level at the Usman Dan Fodio University in Sokoto. (https://constructionreviewonline.com/2017).

The Energy Commission of Nigeria (ECN) is also working there. We are not doing any work on ocean energy but in future we will because of our long coastlines. "It is important that Nigeria develops her renewable energy sources like the bio-energy. NABDA is working on bio-energy to flag off the waste to wealth project using waste to produce energy and thus will be replicated in the other 5 geopolitical zones." "The duty of the ministry is to conduct research and innovation and then allow the private sector to take over and commercialize it. We will encourage the private sector to do the commercialization." Highlighting his mission to Ethiopia, the minister said the need to eradicate trypanosomiasis from the country necessitated his visit, where the tsetse fly facility for the production of the male sterile tsetse is being deployed for the eradication of the disease. He, however, said the trypanosomiasis institute in Kaduna, established in 1945 has helped in reducing tsetse flies and eradicating the disease from 3 local government areas in Oyo State. "Researchers in the institute have done a lot of work and most recent was the work in Oyo State, as they have helped in eradicating trypanosomiasis from 3 local government areas out of 9 in the state, where there were wild tsetse flies and rendered the places free through developing the technology to do so. "Here, the cattlemen will be well catered for milk production. Therefore controlling tsetse fly is important for the country because of food security challenge," he stated. While calling on Nigerians to embrace science and technology as the pathway for the country's development, he said provision had been made in the 2017 for the establishment of science and technology television to encourage young Nigerians cultivate interest in science. (https:// constructionreviewonline.com/2017).

Meanwhile, in South Sulawesi holds a large enough potential for renewable energy sources when used for electricity generation, including 2,946.8 MW of hydropower, 70.2 MW of mini hydro, 7.66 MW of micro hydro, 371 MW of geothermal energy, and others from power plants small-scale wind power, solar energy, and bioenergy. This was stated by the Head of Electricity and Energy Utilization of the ESDM Department of South Sulawesi, Bustanuddin, at the Secretariat General / Cross-Sector Public Relations Communication Forum held by the National Energy Council (DEN) in Makassar, October 30, 2011. Bustanuddin explained, the potential that has been used by PLTA is 518 MW, mini hydro is 10.6 MW, and PLTMH is 1,897 kW. For geothermal potential spread in 16 locations, where the average geothermal resources are around 25 MWe. Meanwhile, in general, wind energy in South Sulawesi has a speed of 2-4 m / sec. In some areas such as Takalar, Bulukumba, Sidrap and Selayar can exceed 4 m / sec, so it is sufficient and suitable for small-scale power plants installed in rural areas. Solar energy in South Sulawesi is utilized in the form of Solar Home Systems (SHS) for rural lighting as many as 14,799 units with a capacity of 10 Wp and 50 Wp, while 11 centralized solar power plants have been built. For bioenergy itself, the availability of land in South Sulawesi is sufficient to cultivate bioenergy-producing crops such as biodiesel covering an area of 601,992 Ha, bioethanol covering 40,700 Ha, biogas of 1,190,708 tails, and biobriquette of 1,000,966 tons. Meanwhile in 2010, a PLTBm pilot

project was developed from corn cobs in Biring Bulu District in Gowa Regency with a capacity of 2 x 20 kW with a gasification system**.** (Kompas.com, 2017)

Based on the facts above, the problems and focused of this writing is what the energy problems faced by the human being? How to encourage new ideas for alternative energies and developing new energy according to Islam? and how to promote potential new energy based on environment, culture and community based in South Sulawesi-Indonesia?

1. Energy Problems Faced The Human Being

The problem of not having a purpose in life is probably the biggest one. This stems from either not thinking about the big questions in life, or when people dare to ask, they are never given any real answers because modern society hates all forms of religion and rejects sound philosophy and logic. Questions such as:Who am I? Why am I here? What happens after I die? What's the purpose of life? What's the point of suffering? Why is there right and wrong?These questions cannot be answered by science...only Theology and Philosophy. However, in a world which idolizes "progress" (a very ambiguous term) any form of referring to past tradition and wisdom is shunned. It's no wonder that so many people commit suicide. If there is no purpose to life and to suffering, and if humans have no dignity because there is no God Who loves them unconditionally forever, then it is very understandable that such people would feel that life was impossible to keep living. When children feel that their parents don't love them or each other, and when the only way people relate to each other is with suspicion and selfish intentions, how should anyone be expected to trust anyone else? I think this purposelessness and despair is the greatest problem that humankind faces today...the despair of a world engulfed with feelings but devoid of charity. (https://www.quora.com/2017).

Martin Nicholson (2009) stated that much of our energy today comes from three high-energy resources - oil, coal and gas. These resources took millions of years to form. Over the last couple of centuries we've been avidly consuming them so it's reasonable to suppose that one day they will all be gone. If at all possible, we should be building our future on more sustainable sources. Something that will continue to provide our descendents with the abundant energy that has helped transform the livelihood of human beings throughout the world. Sustainable energy is one of those vague terms that can mean different things to different people. It is often used as a "green" catch-all for things like energy conservation, energy efficiency and renewable energy, all with a positive environmental overtone. A more precise (and more useful) definition of sustainable energy is "sources of energy that provide our energy needs today without jeopardising the needs of future generations".

David MacKay stated that without the hot airconsiders that 1,000 years will about do it. If you consider how technology has changed since the 11th century, then worrying about what our descendants are using for energy in the 31st century is probably futile - as long as we haven't destroyed the planet in the meantime, of course. Others such as the non-profit organisation invest consider that 100 years ought to be enough. Given that we are still using the energy sources that were used 100 years ago this might be too short a period. If these resources had been exhausted by our forebears by the early 20th century then we would be living in a very different world today. Some, of course, would wish that it were so. The

experts differ on how long coal, oil and gas will last and estimates vary from decades to a few centuries. But it is generally agreed that these fossil fuels will not meet MacKay's 1,000-year test and may fail the 100-year test and so are not considered sustainable. The experts also differ on how long uranium can supply our current generation of nuclear reactors but we will deal with that below. Renewable energy sources are often considered to be sustainable as they use resources such as water, wind and sunlight that are, to all intents and purposes, inexhaustible. Many will say that these are the only truly sustainable energy sources. As we shall see, that view ignores the 1,000-year test as well as some serious technical deficiencies with some renewable energy sources. First, not all so called renewable sources are themselves sustainable. For example, some biofuels such as ethanol made from food crops like corn are no longer considered sustainable because of the competing need for the land on which the feedstock grows. The Australian Greens consider some biomass such as wood waste from old-growth forests to be unsuitable feedstock because of the risk to the big carbon sinks of old-growth forests. Hydropower relying on water flow from a particular river may also not be sustainable - particularly in Australia. Climate change may dry up rivers or change their course and leave the hydro system stranded. Second, some renewable sources such as wind and solar PV are too variable to meet our continuous power demands unless combined with conventional sources (fossil fuels and nuclear) to fill in the gaps. Others, like solar thermal with sufficient heat storage to produce continuous reliable power, are prohibitively expensive. So without further technology developments, such as huge cost effective, sustainable electricity storage systems, our energy system in Australia is not sustainable today with or without renewables. See "Hasten slowly into renewable energy". Geothermal energy is said to be promising but MacKay argues that a geothermal mine would be sustainable only if we are taking the energy out of the ground at the same rate as the earth is replacing it. So we might have to treat geothermal heat more like fossil fuels - a resource to be mined until it runs out. MacKay also seriously questions whether Britain could ever generate enough energy from renewable resources to meet its energy needs even if technology was not an issue. Britain (and possibly Australia) may have to look at other options to find sustainable energy. Are there any other sustainable energy sources on the horizon? According to the World Nuclear Association, today's generation of nuclear reactors use an average of 175 tonnes a year of uranium per GW. These reactors are largely using the uranium in a "once-through" cycle where less than 1 per cent of the uranium is actually used to generate energy. MacKay estimates that the total world recoverable uranium is about 27 million tonnes. This includes resources mineable at less than $130 per kg (the higher-grade resources of around five million tonnes) and lower-grade resources contained in phosphate deposits that will be more expensive to mine. According to the International Energy Agency, because nuclear reactors use relatively little fuel most of the cost in generating nuclear energy is in the planning, construction and decommissioning of the power station not in the fuel. This means that a significant increase in the price of uranium has a much lower impact on the price of electricity. So it is reasonable to suppose that as the cheaper higher-grade resources become depleted the industry will be able to turn to the lower-grade resources. Using all this recoverable uranium, our current nuclear reactors could operate for 400 years so they would fail the 1,000-year test but comfortable satisfy a 100-year test. But the WNA expects the world's reactor numbers to more than double over the next few years so our current once-

through reactors using uranium may not be sustainable depending on your view of sustainability. Thorium can be used as an alternative to uranium. It is three times as abundant in the earth's crust as uranium and is more evenly distributed around the world including Australia. Thorium has the added advantage that, unlike uranium, it can be completely burned up in simple reactors so it creates less long-lived radioactive waste. India already uses thorium in nuclear reactors so the technology is not new, but it will still not be sustainable using current generation reactors. The newer generation fast breeder reactors burn up all the uranium so they can extract much more energy from uranium than traditional once-through reactors. MacKay estimates that fast breeder reactors obtain roughly 60 times as much energy from the same amount of uranium. They can also use all the discarded uranium from existing once-through reactors. This technology is not new either and several experimental reactors have been constructed over the last few decades but the promising Integral Fast Reactor technology might take several decades to become a commercial standard.

Fast breeder nuclear reactors could be the sustainable energy source we are looking for. To the Greens this will all be bad news. First renewable sources will not deliver reliable, sustainable energy on their own - at least not in Australia. But worse news for the Greens is that the most likely source of sustainable energy will actually be nuclear power. James Lovelock knew this all along of course.

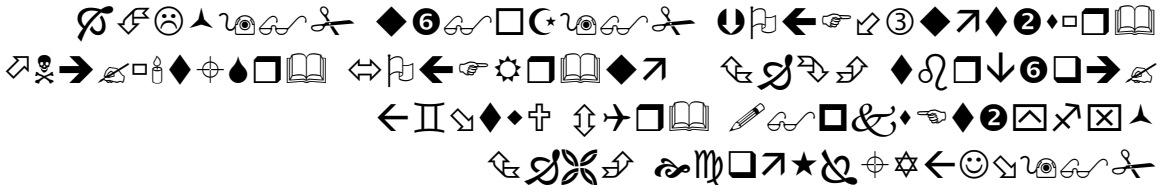
2. Renewable Energy According to Islam

In the Muslim holy book, the Koran clearly mentions renewable energy. This renewable energy is at least discussed in three places, namely the Yaasiin verse 80 as mention below:

The Translation:

"That is the Lord who makes for you fire from green wood, so suddenly you light (fire) from the wood ".

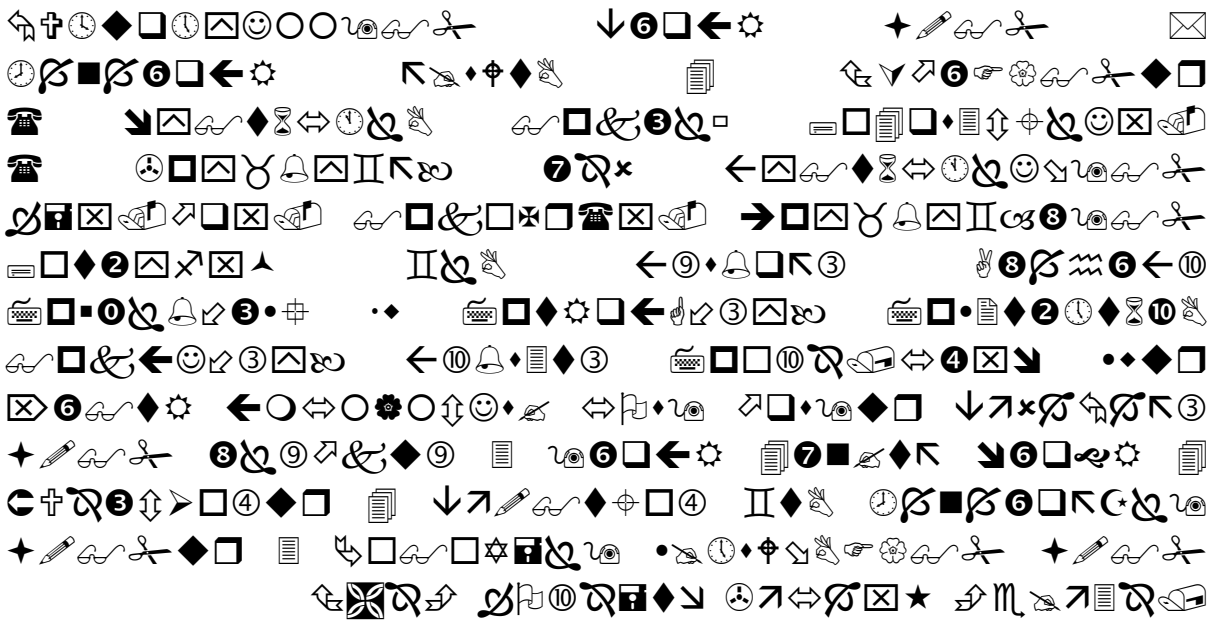
Surat Al-Waqi'ah verses 71 and 72;



The Translation:

71.*Then explain to me about the fire you lit (by rubbing the wood*).72. *Do you make the wood or do you make it*?

In the letter Yaasiin and Al-Waaqi'ah the indication of the energy source was from the tree. The letter An-Nuur verse 35.



The Translation:

Allah (Giver) the light (to) the heavens and the earth. the parable of the light of God, is like an invisibility hole, in which there is a large lamp. the lamp was in the glass (and) glass as if it were a star (a shining) like a pearl, which was lit with oil from the tree whose blessing was, (ie) an olive tree that grew not to the east (something) and neither to the west [its], whose oil (only) Almost illuminates, even though it is not touched by fire. the light above the light (in layers), Allah guides to His light who He wants, and Allah makes parables for humans, and Allah knows all things.

What is meant by a non-penetrating hole (*misykat*) is a hole in the wall of a house that is not translucent until it is next to it, usually used to place a lamp, or other items. Oils meaning, the olive tree grows on a hilltop it can get sunlight both when the sun rises and when the sun will set, so that the tree is fertile and the fruit produces good oil.

The letter An-Nuur that mention above, indication of energy was from the fruit. So this is where the focus of the search for renewable energy should be pursued. Prioritize or pursue more renewable energy sources from trees, because that is what has happened since long ago, now and later. In the past people burned fire directly from wood - even the green ones (Yaasiin 80 letters). The scholars first translated the fire from green wood - as it is, because there are certain woods that are still green - they can be burned - that is the wood of Al-Markh and Al-‘Afar that grows in the Hijaz. While the most popular energy of the last century is in the form of hydrocarbons, they also come from trees but which have become fossils in a process that lasts millions of years. The interpretation of the Yaasiin letter is still valid for the energy of the fossil era.

Renewable energy is biomass, biodiesel, bioethanol and the like. Everything can also be produced by green wood trees or from the fruit. Again the Al-Qur'an interpretation of the Yaasiin 80 letter remains valid for the renewable energy era. Consider for example the scientific evidence related to that energy. When Bedouin Arabs swipe Markh wood and wood ‘Afar to produce fire - the mufassirins explain the interpretation of the Yaasiin letter - the

material being swiped is essentially biomass, the majority is cellulose with the chemical formula C6H10O5 (n). The last century our fuel is fossil hydrocarbons such as gasoline, diesel and the like, the chemical formula in general is CnH2n + 2. When humans make renewable energy in the form of bioethanol or biodiesel from plants, the chemical formulations remain similar, including C2H6O for bioethanol and C19H36O2 for biodiesel. See the similarities between the formulas above, shapes can change - but the basic elements of fuel, wood, fossil and biofuel remain the same, namely carbon (C) and Hydrogen (H) elements. What is different is only oxygen (O) which is not found in fossil fuels - because the process of wood into fossils that runs millions of years is anaerobically underground. So with this basic CHO formula, we can use all the renewable energy sources from trees or plants. Including from fruits that contain carbohydrates or starches whose basic chemical elements are the same as Cellulose above C6H10O5, only the molecular shape is different. Because energy or fuel can also be made from food ingredients that contain carbohydrates, starch or oil, it is very possible to have a conflict between food needs and energy needs. (Editor of *Energy World*, 2015).

3. Potential Renewable Energy in South Sulawesi

Energy and Mineral Resources (ESDM) Minister Ignasius Jonan said South Sulawesi was a pioneer in renewable energy. This is because, processing palm trees to be mixed into gasoline. "After Sidrap 75 MW PLTB, Bayu Power Plant (PLTB), 72 MW Tolo I PLTB, South Sulawesi, which is rich in palm trees, is expected to later become a producer of gasoline mixes, as well as fostering the economy of the community. We encourage a mixture of 5% bioethanol for fuel so that the sky of South Sulawesi remains blue, "Jonan said (2018). During this visit, Jonan inaugurated 15 Drilling Wells and 21 Renewable Energy Power Plants (EBT) throughout South Sulawesi, which were concentrated in Batujala Village, Bontoramba District, Jeneponto Regency, South Sulawesi. Drilling and generating wells (PLTS and PLTMH) were built using APBN 2017 in the State Budget. He advised residents to maintain and maintain the infrastructure that was officially opened today. Because this infrastructure was built using public money and returned to the people. "President Joko Widodo's mandate, that services are prioritized directly to the public. The National Budget is for the maximum possible for the people. This is the real result for the community," he said. To the beneficiaries of the results of development through the Ministry of Energy and Mineral Resources in attendance, Jonan advised, please be guarded well, for the drill well if it is treated with a joint venture of Rp. 5,000 to Rp. 20,000 for water and electricity needs. "I don't think this will burden the citizens. Let's be guarded and managed together," he added. According to Jonan, one drill well can usually be used by around 3,000 people. Because, in the village (Batujala) the number of residents is around 600 people. "Please be able to share with the surrounding villagers who need it," he added.

Another thing, Jonan revealed, South Sulawesi also has Karaeng Block. Of course this will increase employment in the area. "Now that it's already been tendered, hopefully there are those who are interested. If you go forward, there will be a DBH, also open jobs for the community," Jonan concluded. In addition, the Province of South Sulawesi turned out to hold a large potential for renewable energy sources. For example, the potential of hydroelectric

power plants is 2,946.8 MW, the potential of mini hydro power is 70.2 MW, the potential of micro hydro power plants is 7.66 MW, and the potential of geothermal energy reaches 371 MW. Not to mention small-scale wind power plants, solar energy, and bioenergy. The potential of hydropower that reaches 2,946.8 MW has been utilized as much as 518 MW. While for mini hydro, 10.6 MW has been utilized from the potential of 70.2 MW, and 63 units of Micro Hydro Power Plant have been installed with a capacity of 1,897 kW from the total potential of 7,662.9 MW. (http://tribuntimurmakassar.com)

According to Syahrul, South Sulawesi is noted to utilize renewable energy (water) for the electricity sector in 2017 by 28 percent, and has exceeded the national target of 23 percent by 2025. Currently, four large dams and weirs are also temporarily built, and all of them can be used for energy electricity. "It is hoped that with this potential, South Sulawesi will be the province most prepared with electricity infrastructure," he said. So far, South Sulawesi is also increasing the number of Bayu Power Plants (PLTB), in Sidrap and Jeneponto Regencies. The use of wind as a source of electricity in South Sulawesi is very adequate, because in general the wind speed in this area ranges from 2-4 m / sec. In certain areas such as Takalar, Bulukumba, Sidrap and Selayar, the wind speed is more than 4 m / sec, so it is sufficient for small-scale power plants. Not there, South Sulawesi also has a geothermal energy source with a potential of 371 MW spread in 16 locations in South Sulawesi. While bioenergy development is very suitable to be applied because it is supported by the availability of sufficient land for the cultivation of bioenergy-producing crops such as biodiesel (601,992 Ha), bioethanol (40,700 Ha).

Governor of South Sulawesi, Syahrul Yasin Limpo said, "in 2017 our electricity energy has a surplus of 200 MW,". It is known, in South Sulawesi, the biggest PLTB construction in Indonesia is being carried out, precisely in Sidrap Regency. By having 30 Wind Turbine Generators (WTG) or windmills, Sidrap PLTB will generate electricity of 75 MW, and is projected to be able to flow electricity to 70,000 customers in the South Sulawesi region. The Sidrap PLTB area has entered the final stage of the construction of Wind Turbine Generator (WTG) or 5 wind turbines. Later this PLTB will have a total of 30 windmills which currently have built 25 windmills.

Construction of the Sidrap PLTB maintenance and technical center building has also been completed. The windmill project is being worked on by US investors, UPC Renewables, in collaboration with PT Binatek Energi Terbarukan. Since it was signed in August 2015, the completion of the PLTB is estimated to be in line with the target in February. In terms of the investment value of the project, it has an investment of 150 million US dollars or around Rp 1.99 trillion (with a dollar exchange rate of Rp. 13,300). Sidrap PLTB is the first and largest wind power plant in Indonesia that utilizes approximately 100 hectares of land. Besides Sidrap PLTB, South Sulawesi will also have a PLTB in Jeneponto Regency. If there are no obstacles, the PLBT will operate in June. Built by Equis Energy PT Energi Bayu Jeneponto, with a capacity of 72 MW, the investment value is USD 160.7 million, utilizing 60 hectares of land and a two-year working period. "The presence of this PLTB not only builds the project, but builds a new civilization. I hope that this energy will also reach Takalar and even Selayar. I will also speak with PLN," said Syahrul.

The 21 Renewable Energy PLT units were inaugurated with a total capacity of 1,688 kW, a total of 4,926 house connections with an asset value of Rp 136,528,768,595, spread in

Regencies / Cities in South Sulawesi and built using the 2017 APBN. In his remarks the ESDM Minister advised residents to maintain and maintain the existing infrastructure properly because this infrastructure was built using public money and returned to the people. "President Joko Widodo's mandate, that service is prioritized directly to the community. The state budget is as much as possible for the people. This is the real result for the community," said Jonan in his remarks at the inauguration. In the 2016-2017 budget year, the Directorate General of EBTKE has implemented Renewable Energy PLT development in 27 locations in 5 districts in South Sulawesi Province, with the following details:

1. Selayar Islands Regency: 7 Centralized PLTS Units with a total capacity of 750 kWp which electrified 2,301 households.
2. East Luwu Regency: 2 Centralized PLTS Units with a total capacity of 80 kWp, which are 311 households electrified.
3. Pangkajene Kepulauan Regency: 8 Centralized PLTS Units with a total capacity of 505 kWp which electrified 1,443 households,
4. Sinjai Regency: 4 units of PLTMH and 1 unit of PLTS centralized with a total capacity of 388 kW which electrifies 946 households.
5. Takalar Regency: 5 Centralized PLTS Units with a total capacity of 260 kWp which electrified 1,113 households.

The construction of renewable energy power plants is based on the regulation of the Minister of Energy and Mineral Resources No. 39 of 2017 concerning the Implementation of Physical Activities for the Utilization of EBTKE, which this year was revised by ESDM Minister Regulation No. 12 of 2018. ESDM cq Director General of EBTKE along with other supporting documents. According to Jonan, South Sulawesi is a pioneer province of EBT. "After Sidrap 75 MW PLTB, 72 MW Tolo I PLTB, and it is hoped that South Sulawesi, which is rich in palm trees will also become a producer of gasoline mixes, at the same time foster the economy of the community. We encourage a mixture of 5% bioethanol for fuel so that the skies of South Sulawesi remain blue, "Jonan said. "This year the PLTS and PLTMH development will be carried out more by PLN. But the Government of South Sulawesi can still apply to us. In addition to PLTS and PLTMH, we also provide Solar Power Street Lighting, this can also be submitted to us. , "added Jonan.

Minister of Energy and Mineral Resources (ESDM), Ignasius Jonan has inaugurated 21 Renewable Energy Power Plants (PLT) in South Sulawesi which are water-based (Micro Hydro-PLTMH Power Plants) and solar (Centralized Solar Power-PLTS) and 15 points of groundwater drill wells, which were centered in Batujala Village, Bontoramba District, Jeneponto Regency, South Sulawesi Province. Along with the ceremonial activities of the inauguration in Batujala, a video conference was also held with the beneficiaries of the centralized PLTS namely Mattiro Baji Village, Liukang District Tupabbiring Utara, Pangkajene Kepulauan Regency. South Sulawesi holds a large enough potential for renewable energy sources when used for electricity generation, including 2,946.8 MW of hydropower, 70.2 MW of mini hydro, 7.66 MW of micro hydro, 371 MW of geothermal energy, and others from power plants small-scale wind power, solar energy, and bioenergy. This was stated by the Head of Electricity and Energy Utilization of the ESDM Department of South Sulawesi, Bustanuddin, at the Secretariat General / Cross-Sector Public Relations Communication Forum held by the National Energy Council (DEN) in Makassar, October 30,

2011. Bustanuddin explained, the potential that has been used by PLTA is 518 MW, mini hydro is 10.6 MW, and PLTMH is 1,897 kW. For geothermal potential spread in 16 locations, where the average geothermal resources are around 25 MWe. Meanwhile, in general, wind energy in South Sulawesi has a speed of 2-4 m / sec. In some areas such as Takalar, Bulukumba, Sidrap and Selayar can exceed 4 m / sec, so it is sufficient and suitable for small-scale power plants installed in rural areas.

Solar energy in South Sulawesi is utilized in the form of Solar Home Systems (SHS) for rural lighting as many as 14,799 units with a capacity of 10 Wp and 50 Wp, while 11 centralized solar power plants have been built. For bioenergy itself, the availability of land in South Sulawesi is sufficient to cultivate bioenergy-producing crops such as biodiesel covering an area of 601,992 Ha, bioethanol covering 40,700 Ha, biogas of 1,190,708 tails, and biobriquette of 1,000,966 tons. Meanwhile in 2010, a PLTBm pilot project was developed from corn cobs in Biring Bulu District in Gowa Regency with a capacity of 2 x 20 kW with a gasification system.

Conclusion

1. Energy systems are changing fundamentally and fast. These challenges require cutting-edge products and services covering the entire energy value chain. Specifically, it calls for a comprehensive portfolio of physical and digital technologies, products and solutions that allow us to actively build the new energy for the future.
2. Islamic Holy Book, the Koran clearly mentions renewable energy. This renewable energy is at least discussed in Surah Yaasiin verse 80, Surat Al-Waqi'ah verses 71-72, and Surah An-Nuur verse 35. In the Surah Yaasiin and Al-Waaqi'ah the indication of the energy source was from the tree, while in the Surah An-Nuur the indication was from the fruit.
3. South Sulawesi is noted to utilize renewable energy (water) for the electricity sector in 2017 by 28 percent, and has exceeded the national target of 23 percent by 2025. Currently, four large dams and weirs are also temporarily built, and all of them can be used for energy electricity. This potential energy in South Sulawesi will be the province most prepared with electricity infrastructure. So far, South Sulawesi is also increasing the number of Bayu Power Plants (PLTB), in Sidrap and Jeneponto Regencies. The use of wind as a source of electricity in South Sulawesi is very adequate, because in general the wind speed in this area ranges from 2-4 m / sec.

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