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Measuring Information Awareness of an Industrial Project for Sustainable Development using Fuzzy Logic

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The concept of sustainable development has attracted the attention of those concerned. The preservation of non-renewable resources and the work to increase information literacy and insight into the strengths is an important stage in order to overcome obstacles to the implementation of sustainable development. The aim of this research is to measure the extent of information awareness of the project manager, his insight and knowledge of the concept of sustainable development and its role in achieving it and measuring its desire to participate in achieving it, using fuzzy logic. Awareness and the amount of information development required to achieve sustainable development were measured. Follow-up of the standards in a periodic manner was conducted to determine the extent of access to the state of information awareness to ensure the continuity of sustainable development, assuming the decline of resources for sustainable development and the gradual loss of resources for future generations due to lack of information consciousness. The research indicated the need to develop a model using fuzzy logic to measure the level of uncertainty levels of information consciousness: such as a person's ability to discover information when needed, locate it, determine an assessment of the effective use of information when needed, knowledge of the use of IT equipment, and other conclusions.

Key words: *Fuzzy Logic, Information Awareness, Sustainable Development.*

Introduction

Achieving sustainable development in an industrial project is an urgent necessity to ensure the continuity of resources for future generations. Since the project environment in Iraq possessed the factors of instability, this research considered the use of fuzzy logic in the preparation of a mathematical model to measure the parameters of information awareness.

Research Objective

The research aims to identify the project manager's knowledge of the concept of sustainable development and its participation in achieving it. It aims to measure informational awareness factors in an environment characterized by stability in the field of informatics and to adopt a method that deals with honesty and to measure each of these factors in the project environment. Ownership and participation of the project manager and cadres of competencies, intelligent and effective in informational awareness of the community lead to the achievement of sustainable development.

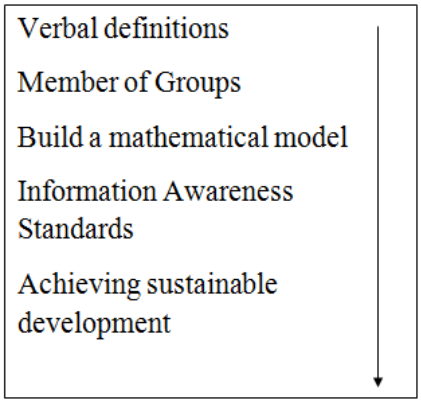
Importance of Research

A scientific addition to the measurement of informational awareness parameters using the mathematical model and the use of fuzzy logic is a precedent in the field of information awareness to achieve sustainable development, the basic parameters and behaviors within an uncertain environment and knowledge of the level of consciousness determines the mechanisms required to follow the development in the level of achieving sustainable development in practice.

Research Methodology

Fuzzy logic is a method dealing with an obscurity that focuses on the use of verbal parameters in terms of rules, after defining linguistic variables within a range of values, which gives all values of the fuzzy variable an organic degree of fuzzy totals. The 'fuzzification' process was performed and the fuzzy conclusion was applied through the rules and via the (OR) function and the fogging area was included graphically as presented in Figure 1 below.

Figure 1. Research Form. Prepared by the researcher



The Theoretical Side

Information literacy

The issue of owning an Iraqi individual through an awareness of information through a range of competencies is a means to be able to participate intelligently and effectively in Iraqi society towards sustainable development. Many researchers have investigated the characteristics of an information-conscious person (James, 2002). Patricia, (2000) showed that information literacy depends on seven elements in a comprehensive approach. Maris explained (Christine and Phil, 2000) that the process of acquiring knowledge is exploited by the individual to develop work and communication in the information society. He concluded (Spitzer et al.) that the capabilities information literate individuals must possess are critical thinking and decision-making with resolving constraints and clarifying procedures leading to technologies to access information. Further, performance and communication are key. The American Library Association (AIA) has made it possible for an informed person to be able to discover information when it is needed, as well as to locate and evaluate the effective use of information on demand. CAUL also defined information literacy as the assessment and use of information efficiently and to determine the need and location of information. While summarizing the National Forum for Information Awareness (NFIL), assessing the use of information and its utilization and the ability to distinguish that knowledge is what distinguishes an individual who is informed.

Sustainable Development

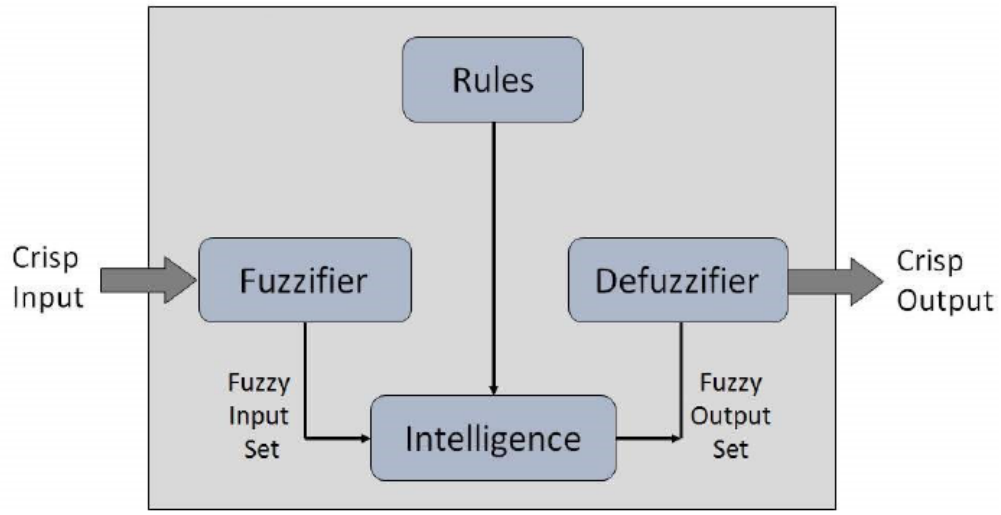
It is known that a focus must be on meeting the needs of the current generation without wasting the rights of future generations through the development of means of production in ways that do not lead to depletion of natural resources. To ensure the continuation of production for future generations, the sources pointed out that in 1992 issued in Rio Janeiro document documenting the concept of sustainable development includes 27 principles calling for achieving justice between different generations in the distribution of natural resources to ensure the continuation of the development process (Critical, 2006). Information literacy can be a guide and coordinator for research and development through a knowledge base to solve problems while ensuring sound decisions in different sectors of Iraqi society.

Fuzzy Logic

Some events are vague and do not satisfy binary or multivalued logic in interpretation and analysis. They must be modelled to solve complex problems that cannot be solved by conventional methods. The fuzzy logic technique aims to provide mathematical functions and judgments between truth and absolute negation between (1.0), based on the experience of

experts in building the system using natural languages. Fuzzy logic can be used in cases where the uncertainty associated with data is caused by blur rather than randomness, or both, that is, variables are not constant but fuzzy numbers, providing a way to arrive at a conclusion based on a vague, vague and inaccurate problem (Kurbanoğlu et al., 2015). Language expressions represent the shape of fuzzy groups. Therefore, in the practical aspect of the research will be prepared a mathematical model that turns into a fuzzy which focuses on (ambiguity and complexity, uncertainty in knowledge, language), where the researcher used the fuzzy logic of its advantages illustrated by his methodology in Figure 2 below.

Figure 2. Fuzzy logic methodology



The Practical Aspect of the Research

An introduction:

In order to achieve sustainable development, we must take into account that the information awareness in the industrial project is an imperative and that the measurement of information awareness of the project manager compels that we take into account the parameters of the uncertainty that has been influenced by the adopted research. Further, to build a mathematical model and prepare the data of the state of measurement of information awareness to achieve development. Sustainable development in a foggy environment is demonstrated in the following steps below:

1- Assume that the parameters of information literacy of the competencies possessed by the individual for the information conscious to be able to participate intelligently and effectively in the community are (in_info) within the options of a set of three parameters as shown in Table 1 below, and assume that the specifications of the person's ability to discover the

information when needed as well as Locating and evaluating the effective use of information when it is needed are the requirements of information consciousness (out_info) within the options of a set of five parameters. The model assumes that knowledge of the use of information technology equipment, knowledge of how to access information, accurate reflection on the nature of information, infrastructure of technical, social and cultural disciplines and the impact of information is (Del_info). Further, the fuzzy model assumes that awareness of tools and equipment, awareness of resources and methods access to information sources, social constructive awareness to be socially productive information, research awareness i.e. the ability to understand and use tools of dissemination and coordination and awareness to adopt the understanding and design of smart tools, levels of sustainable development factors (SD_info) which includes five Parameters in turn, and Table 1 below shows the parameters used in the fuzzy model.

Table 1: Parameters of Fuzzy Mathematical Model for information awareness to achieve sustainable development

INFO	SUP- info	INFO
In_info	In_info_des	Information literacy teacher of competencies owned by the individual.
	In_info_soc	Informational awareness of ability and empowerment.
	In_info_nat	Ability to participate intelligently and effectively in society.
Out_info	Out_info_pla	Specifications of a person's ability to discover information.
	Out_info_mat	The ability of a person to determine what information is needed.
	Out_info_val	Determine where to access the information.
	Out_info_sma	Assess the effective use of information.
	Out_info_tec	Assess where to get the information.
Del_info	Del_info_met	Knowledge of using IT equipment.
	Del_info_val	Know how to access the information.
	Del_info_int	The exact reflection on the nature of the information.
	Del_info_tec	Infrastructure for artistic, social and cultural specialties.
	Del_info_art	Effect of information.
SD_info	SD_info_edu	Awareness of tools and equipment for sustainable development levels
	SD_info_inf	Resource awareness and methods of accessing information sources for sustainable development levels.
	SD_info_res	Constructive social awareness to make information socially productive for sustainable development levels
	SD_info_eff	Research Awareness Ability to understand and use dissemination and coordination tools for sustainable development levels
	SD_info_nat	Awareness to adopt understanding and design of smart tools for sustainable development levels.

2. Table 1 shows the set of factors and the definition of each factor within the fuzzy model, which includes the input factors of the in_info model, the output of the fuzzy model out_info and the amount of change in the levels of information awareness of the variable Del_info. And SD_info SDGs. The researcher hypothesized that the change in the level is by (5), and assuming four rules or laws of (1-4) were treated fuzzy behavior of factors within the wire of the rules.

3. Building the model is to define the parameters of information awareness to achieve the issue of sustainable development in society, on the basis that each parameter is complementary to the set of parameters of information awareness for sustainable development. Where A is a comprehensive n set of informational awareness specifications, and refers to informational awareness parameters (i) and a set of r of the parameter in achieving sustainable development. **O= { o_1 , o_2 ,o_3 ....., o_r}**

4- The rules of the fuzzy model are defined and four laws containing the parameters in table (1) are identified to find an application in the fuzzy model of information consciousness to achieve sustainable development:

First Law:
If in_info is in_info_soc and Del_info is Del_info_int, then SD_info is SD_info_res

The Second Law:
If out_info is out_info_mat and del_info is del_info_val then sd_info is sd_info_inf

Third Law:
If in_info is in_info_nat and del_info is del_info_art, then sd_info is sd_info_nat

Fourth Law:
If in_info is in_info_des and del_info is del_info_int, then sd_info is sd_info_inf

1. The importance of parameter awareness to achieve sustainable development with the imposition of measuring the achievement of this parameter are the spaces between the possession of such information strongly - the extent of uncertainty of information awareness, such as the ability of a person to discover the information when it needs, determine its location, determine the evaluation of the effective use of information when needed.

5. The set of parameter elements that achieve sustainable development and measure their impact to have an information awareness towards each parameter assumes that (bi) is the content of the option group {P} where: i = 1,2,3, ……, r, and assuming that the level scale Consciousness ranges from (50-90) to indicate the amount of informational awareness, so fuzzing takes the following form:

In-info-des=$\left\{\frac{1}{50}+\frac{1}{60}+\frac{0}{70}\right\}$
In-info-soc=$\left\{\frac{0}{60}+\frac{1}{70}+\frac{0}{80}\right\}$
In-info-nat=$\left\{\frac{0}{70}+\frac{1}{80}+\frac{1}{90}\right\}$

6 - We assume that the levels of information awareness take levels from (0) to (6), as the researcher hypothesized that to reach the achievement of sustainable development must be achieved at least six levels to understand the parameters of information awareness, so the fuzziness takes the following form: **Del-info-val**=$\left\{\frac{0}{4}+\frac{1}{2}+\frac{0}{0}\right\}$

Del -info-int=$\left\{\frac{0}{2}+\frac{1}{0}+\frac{0}{3}\right\}$
Del -info-art=$\left\{\frac{0}{2}+\frac{1}{4}+\frac{1}{6}\right\}$
out -info-mat=$\left\{\frac{0}{30}+\frac{1}{50}+\frac{0}{70}\right\}$

The rules are applied to the fuzzy model, if the amount of change in the level of information consciousness by five for the Del_info parameter is as follows:

$\mu_{in-info-des}$ **(55)=0.25**
$\mu_{in-info-soc}$ **(55)=0.75**
$\mu_{in-info-nat}$ **(55)=0.0**
$\mu_{Del-info-val}$ **(5)=0.8,**
$\mu_{Del-info-int}$ **(5)=0.2, and**
$\mu_{Del-info-art}$ **(5)=0.0**

Assume that (0.8) is the level that achieves sustainable development in the Iraqi society through the information awareness of the Iraqi citizen and assume that (0.2) level leading to non-achievement of sustainable development. For the out_info_mat parameter, we apply the four rules:

$\mu_{out-info-mat}$ **(50)=0.9**

LAW = 0.20 =0.20 ∩ 0.75 : **(1)** $\mu_{SD-info-res}$
LAW = 0.80 =0.9 ∩ 0.8 : **(2)** $\mu_{SD-info-inf}$
LAW = 0.0 =0.0 ∩ 0.0 : **(3)** $\mu_{SD-info-not}$
LAW = 0.2 =0.25 ∩ 0.2 : **(4)** $\mu_{SD-info-inf}$

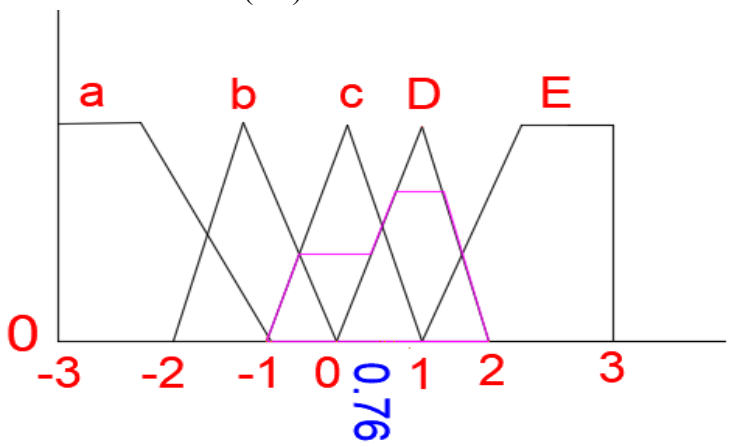
To discuss the four fuzzy laws applied above, we note that the fuzzy group of the parameter on social consciousness to make information socially productive to achieve a level of sustainable development achieved by the application of the law (1). Whereas the application of Laws (2) and (4) will lead to awareness of sources and methods of access to information sources to achieve sustainable development, it has been used in an (or) manner.

Assuming that awareness of sources and methods of access to information achieves sustainable development, it takes 0.8%. Assuming that the levels of information awareness

range from (0-6) where (1,2 and 3) are levels that do not achieve a level of information awareness; levels of information literacy and zero are the factors that are required to initiate a change in the level of information literacy by a certain amount of 0.1. We assume that the level of information awareness needs (61) stage (level) of the level of information literacy level According to the law (1-1):

$$\textbf{Output}=\frac{\sum_i \mu(xi)}{\sum_i \mu(\text{xi})} \quad \textbf{.....(1-1)}$$

Figure 3. The values of (a-e)



Also by substituting a default value of 0.76 using the above law (1-1) as represented in Figure 3 above, it was found that the factors (a, b, c, D, E) of the outputs in the fuzzy system are as shown in Fig. Ranks in each improvement or no improvement. The system assumed that the SD_info_inf factor is 0.8 in the case of sustainable development.

a= SD_info_nat , b= SD_info_eff , c= SD_info_res , d= SD_info_inf
e= SD_info_ecu

SD_info_res assumes that level 0.20 will not achieve sustainable development. This means that sustainable development must double the level of ranks if the level of inquiry through information literacy is 0.1.

Conclusions

1. The application of the fuzzy model of information literacy parameters in achieving sustainable development found information literacy to be socially productive information for

achieving sustainable development levels in an industrial project essential within the criteria of information awareness of a fogged environment.

2. Awareness of sources and methods of accessing information sources to achieve sustainable development are also key parameters for achieving sustainable development.

3 - Knowledge and how to access information, accurate reflection on the nature of information, infrastructure for technical, social and cultural specialties, the impact of information, awareness of tools and equipment, awareness of resources and methods of access to information sources, social awareness of the structural to be information socially productive, research awareness, ie the ability to understand and use tools for dissemination and coordination, awareness-building on the understanding and design of smart tools (SDGs) are critical.

REFERENCES

Christine, B. & Phil, C. (2000). People, politics and potential, in information literacy around the world, Charles Sturt Uni Press, Riverina, 5(36): 172 – 185.

Critical, (2006). Critical Information Literacy: Implications for Instructional Practice, 32(2): 192-199, https://doi.org/10.1016/j.acalib.2005.12.004.

James, W. M. (2002). Rethinking information literacy. The Library Quarterly, 1(72): 1-26. (Jan., 2002): https://doi.org/10.1086/603335.

Kurbanoğlu, S., Boustany, J., irpiranec, S., Grassian, E., Mizrachi, D. & Roy, L. (2015). Information literacy: Moving toward sustainability, Third European Conference, ECIL 2015, Tallinn, Estonia, October 19-22, 2015, 5(59): 265 – 268.

Patricia, B. (2000). Foreword, information literacy around the world, edited by Bruce, C and Candy P. Charles Sturt University, 2(64): 124 – 163.

Spitzer, K. L., Eisenberg, M. B. & Lowe, C. A. Information literacy: Essential skills for the information age, 7(61): 216 – 235. https://eric.ed.gov/?id=ED427780.