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Development of Digital Hub to Inculcate Knowledge Sharing for Energy Company in Malaysia: A Pilot Study

[1]Muhammad Hazim Bin Muhmat Hilme, [2]Hairoladenan Bin Kasim, [3]Abbas M. Al-Ghaili

[1]*College of Computing & Informatics, Universiti Tenaga Nasional (UNITEN), Kajang, Selangor, Malaysia.*
[2,3]*Institute of Informatics and Computing in Energy (IICE), Universiti Tenaga National (UNITEN), Malaysia.*
Email: [1] hazim.hilme94@gmail.com,[2]hairol@uniten.edu.my, [3]abbas@uniten.edu.my

Abstract

Knowledge sharing activities, argued to be able to enhance organisational efficiency and gain competitive advantage for Malaysian power utility firms, are also not effectively induced. How Malaysia's energy sector should be encouraged to use a digital hub to inculcate information sharing practises is still a significant research topic. This paper suggests and explores the techniques included in the flow process, from the brainstorming of knowledge-sharing activity predictors within a Malaysian power utility corporation to the review of raw data to the study of human behaviour in detail. This paper aims to address a pilot study using a few main aspects of the research method, including, sample size determination, questionnaire and survey distribution configuration, estimation of data collection and response rate, data interpretation, and ultimately, outcomes and analysis. For the questionnaires, multiple variables have been chosen as the suggested variables. Via an online portal and hardcopy delivery, the questionnaires were distributed in following reasons. Two samples of questionnaires were developed for the purpose of this paper; one for the consumers and the other for the employees of power utility companies serving as respondents. In order to classify information sharing behaviour patterns of respondents, future research will try to concentrate on various views held on data processing using other statistical instruments and

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methods to study the relevant factors suggested in the questionnaire. In order to obtain strong arguments for each attribute defined in the questionnaires, this pilot study requires data analysis using a distinct statistical model that enables a normality test and a chi square test. The findings of this pilot study have shown that a virtual network, including a digital hub, needs to be built to inculcate information-sharing behaviour that could boost human skills, knowledge and competency in the energy sector.

Keywords: Knowledge sharing, digital hub, energy sector, pilot study

1 Introduction

It is safe to say that the current rise of globalization has revolutionized the concept of knowledge sharing in all economic and technological sectors [1]. In today's competitive era, knowledge and intellectual assets have become the best competitive advantage which can be effectively shared through computer networks [2]. Knowledge sharing has been proven to improve employees' effectiveness [3]. Knowledge sharing has also been suggested as the key element for knowledge management in sustaining competitiveness of an organization [4]. As we all know, knowledge sharing is a powerful resource that enables nations, organizations or even individuals to achieve benefits such as improving learning mechanism, innovation as well as helping in decision making situations [4].

Nowadays, more and more people have been using virtual platforms and digital technologies such as hubs, blogs, social media, and other online technology to share knowledge and information [6],[7]. These are the media through which knowledge or information are acquired, transferred, shared, and disseminated using the recent network architecture and technology. For instance, previous researchers have proposed a related knowledge hub model called UniProt which contains all sorts of information that describe several components of protein. The UniProt database has been cross referenced by over 150 worldwide databases of knowledge and have approximately 70 million sequences of protein entries [8]. Another example was a research that was conducted in United Kingdom to develop a collaborative regional framework for knowledge exchange, regarding off-site construction between university and industry. The idea was to create an industry-university relationship in order to derive skills content via knowledge hub that includes the process of capturing, developing and sharing [9]. These online applications share several common features, including collaboration elements that support members in different time zones and areas. They create non-volatile data and record collaborations that are stored in texts and enhanced by multimedia additions. The digital or knowledge hub is an approach or system that simplifies the process of acquiring, transferring, sharing, distributing, developing, and understanding of an individual or organizational knowledge [10]. There is a wide range of online platforms and technologies

that can be utilized to support knowledge sharing practices for energy sectors. However, the challenges are combining a variety of current and available platforms to suit the organizational setting and to promote knowledge sharing behavior. Previous research [2] and[11] have recommended that organizations, such as the energy sectors to consider utilizing their integrated ICT systems and related applications to analyze and understand their core business processes. In fact, these technologies also provide possible diffusion of knowledge and they permit individuals to obtain knowledge and information more accurately and efficiently.

Past studies also proposed the role of human resources, leadership, knowledge culture and technology, such as organizational databases and hubs as the essential elements required for implementing knowledge sharing initiatives for energy sectors in Malaysia [6]. For instance, one of the main players in oil and gas industry has developed a knowledge-based platform that comprises several components, such as knowledge repository, communities of practice, expert directory and other applications to facilitate the sharing of knowledge by capturing information across the organization [6]. In order to develop hubs for documenting explicit knowledge, few techniques, such as knowledge acquisition, discovery, knowledge taxonomy techniques and data mining tools, could be applied. As mentioned by [12], digital hubs are essential for energy players to analyze the conversion, storage and management of renewable energy within residential homes and smart cities. Thus, digital hubs would assist the energy and utility sectors to manage the stability of their power system, especially when the operation is under stress during the peak load periods and higher demand from their customers [13].

An organization stands to reap several advantages and benefits if it promotes knowledge sharing behavior. Knowledge sharing is important because an individual's knowledge will not have much impact for the business unless it is available to other individuals [14]. Developing a knowledge sharing culture can be fostered by adapting a variety of measures such as rewards and incentives [4]. Therefore, knowledge sharing behavior will facilitate product and technical innovations, which can lead to new product development to accommodate customers' needs. There is however a huge obstacle when dealing with the sharing of tacit knowledge in order to facilitate the knowledge flow within an organization [15]. Therefore, promoting knowledge sharing behavior is a challenge for most knowledge-based organizations, such as the energy sectors. An efficient knowledge sharing behavior in any organization or business entity remains to be quite difficult and challenging [15]. The challenges mentioned by the expert are often related to motivating people to share knowledge, identifying key people to share knowledge, and making knowledge easily accessible. Developing a behavior that values and practices knowledge sharing is an effort involving attention to the social, technological [16], organizational factors as well as

user attitude or behavior. Previous studies have often assumed that implementing technology, such as digital platforms, will be enough to promote knowledge sharing behavior. While this intention has been revealed to be an effective approach, frequently, most of companies' knowledge resources are assigned to technology and not to other factors that stimulate knowledge sharing [17][18].

This pilot study is conducted mainly to gather raw data on the individual behaviors in terms of knowledge sharing through-out power utility companies in Malaysia. The methodology consists of several key processes that support this research study. An electricity company will become the power utility company for this research study and several processes will be conducted at the location. This paper is organized as follows: Section 2 explains the proposed methodology implemented to perform questionnaire related analysis. Throughout the data analysis, only performance expectancy variables will be covered in this paper. Results and Discussion will be presented in detail in Section 3 and Conclusion is provided in Section 4.

2 Methodology

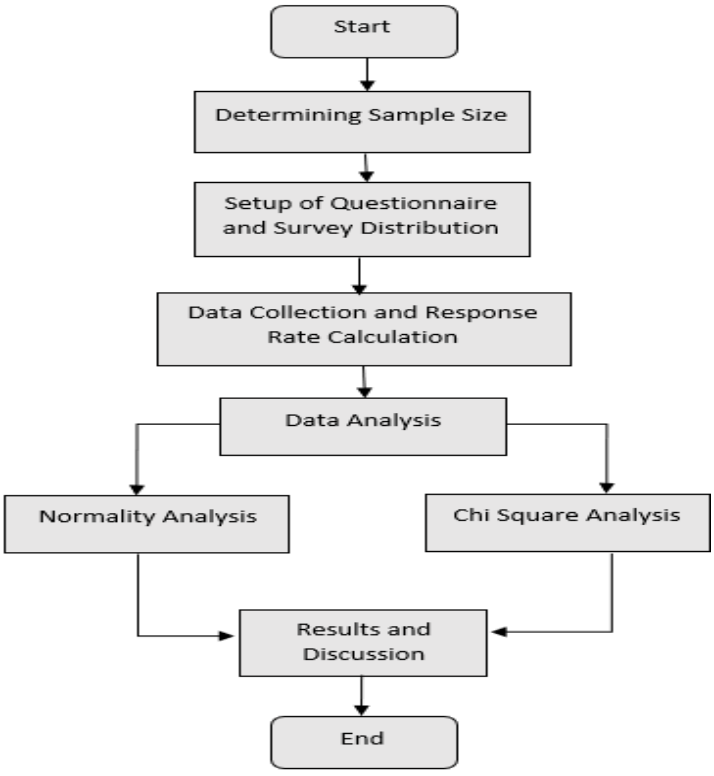

Figure 1 A Flow Chart of the Feature Selection Heuristic

Figure 1 illustrated the actual flow of the methodology used in this research studies. Several steps need to be accomplished in order to deliver a good research methodology flow. All of steps mentioned above will be explained in detail below.

2.1 Determining Sample Size

Determining a sample size based on total population is crucial in a quantitative research study. It is essential to include the entire population to a study. However, by selecting only a sufficient representative from the total amount of population is adequate to provide reliable information representative of the population to whatever level of accuracy is needed [16]. Therefore, by defining a sample size, researchers are enabled to provide unambiguous judgements when producing statistical results that are accepted to be correct and have sufficient power to detect a meaningful pattern from the study [19]. Past researchers have concluded that the sample size should never be too small or too large. Smaller sample size may result in gaining an insufficient power to prove it statistically, which leads to the important differences between the study of groups to be statistically insignificant [19]. On the other hand, applying too large of a sample set may be considered unethical as it results to in wasteful resources which can affect the feasibility of a study [19]. In order to define the sample size, two attributes need to be defined first. First, the margin of error or confidence intervals have to be defined precisely. The margin of error is a range of potential true or actual values which depends on several factors such as the variety in the responses, the sample size representatives and the size of sub-group on which the estimate is computed [20]. Next is to determine the confidence level for this study. By determining a relevant confidence level, it can provide a meaningful way to summarize the results' hypothesis for many effects of sample sizes [21].

Table1 Sample Size Table

Population size	Confidence = 95%					Confidence =99%
	Margin of error					
	5.0 %	3.5 %	2.5 %	5.0 %	3.5 %	2.5 %
30	28	29	29	29	29	30
50	44	47	48	47	48	49
75	63	69	72	67	71	73
100	80	89	94	87	93	96
150	108	126	137	122	135	142
200	132	160	177	154	174	186

Table 1 defines the required sample size (n) for the research population.

This study uses two sample sizes from two different populations. The first sample is given to staff. The preference is to select staff that frequently interact with customers in their daily task. As this study is focusing on knowledge sharing behavior within an energy sector, the data sampling from staff is gathered from the Customer Service Department of Tenaga Nasional Berhad (TNB) with 75 members of staff as respondents. The second sample needed for this study is that from the customers. Due to the large number of TNB customers, a small population from UNITEN has been selected to be the respondents, totaling 200. The next step is to select the confidence level and margin of error in order to determine the sample size (n) from both entities. Due to the limitations and challenges in the procedure to obtain the data samples from both entities, the confidence level of 95% and margin of error of 5% are considered sufficient for this research study. In Table 1, the number of sample size (n) from both populations has thus been identified.

Table 2 Required Sample Size for this Study

Target Sample	Sample Population	Population size	Confidence level =95% Margin of error = 5.0 %
Staff	Customer Service Department, TNB	75	*63*
Customer	Customer of TNB from UNITEN	200	*132*
Total		275	*195*

Table 2 is the required sample size (n) from both samples with a total of 195 samples representing the selected populations.

2.2 Setup of Questionnaire and Survey Distribution

There are several main factors and variables assessed in this study. The questionnaires are divided into three main parts. The first part is the respondent's demographic profile. In this stage, all demo-graphic profile data are recorded such as gender, race, age and several other variables. As the questionnaire targets two types of possible respondents, the demographic profile question design for each will be different. For the staff questionnaire, the questions will target the respondent's working perspective as opposed to the questionnaire for the customers where the questions are only based on the general demographic profile. The subsequent part is on the individual behaviour. In this section, possible respondents are asked on the individual's behaviour in terms of knowledge sharing. The purpose of the questionnaire is to investigate why and how the individual derives such behaviour. The last part of the questionnaire is divided into several main factors and variables. The variables include performance expectancy, effort expectancy, social

influences, facilitating conditions, system quality, service quality and knowledge quality. However, as mentioned earlier, only the performance expectancy attributes will be highlighted in this paper. The variable is described in Table 3.

Table 3 Required Sample Size for this Study

Factor	Definition
Performance Expectancy	For this factor, different focus is applied for staff and customer respondents. Firstly, the questions for staff , will focus on the effects of the digital energy hub on work performance. For the customer, on the other hand, the focus will be to find out individual's belief on whether or not using the digital energy hub platform will improve and enhance their individual's interest to find and search for knowledge.

The questionnaires are distributed using two different modes. Initially, softcopy distribution was selected as the distribution channel for the customer samples. However, due to the large number of target respondents, the distribution process was expected to be time consuming. Therefore, to resolve this issue, the distribution of survey for customers are instead done in a few stages via online distribution. The target duration for the customer questionnaire distribution is one month. On the other hand, a hardcopy distribution has been selected as the preferable mode of distribution for the staff.

2.3 Data Collection and Response Rate Calculations

Table 4 Data Collection

Sample Population	Sample size	Distributed	Collected
Staff	63	*75*	*42*
Customer	132	*200*	*75*
Total	195	*275*	*117*

At this stage, data collection and response rate calculations are executed. As for data collection, both samples have gathered a total of 117 responses, out of 195 sample sizes from both groups with 42 and 75 responses gathered from staff and customer samples respectively. However, the suitability of data for analysis needs to first be determined through the calculations of response rate. Response rate is crucial for survey quality because the quality measurements is based on the higher rate which implies less potential for the non-response bias [22]. Several researchers have utilized this algorithm for

response rate. The accepted response rate for the data analysis is that the percentage of response need to be higher than 20% [22],[23]. The formula to calculate response rate is as (1).

$$\text{Response Rate} = \frac{x}{n} \times 100, \quad (1)$$

x = Collected data responses

n = Total of sample size

After running the number of collected data responses with the formula mentioned above, the results find out that the response rate for this study is 60 % and indeed exceeds 20% response rate which fulfills the requirement for data analysis. Therefore, complying to the sample size of 195 respondents is appropriate and valid for analysis which exceeds 100 samples [23],[24].

3 Results and Discussion

As the purpose of this paper is to present a pilot study, the results and analysis for this study will only be focusing on one factor as mentioned in the introduction. The only factor that will be analyzed and discussed in this paper is that which is related to performance expectancy factor.

3.1 Normality Analysis for the Performance Expectancy

A normality test is to define the assumption of correlational analysis. The data will be run through a normality test to view the shape of its distribution. Normality test is a useful assumption in many modelling frameworks which is well-known to assume normally distributed residuals of a sample [23]. In addition, adapting the normality test into the data sample can generate whether the data need to be analyzed using parametric statistical test or non-parametric statistical test [25]. After the data screening and cleaning were conducted, vast assumptions were checked by applying descriptive statistics. The normality of a certain distribution is measured using the z values which need to be divided by both skewness and kurtosis value with the standard error. A normal distribution is acceptable when the z values for the dependent variable is within the range of -1.96 and +1.96 [23],[24]. All test is done using SPSS statistical software. The normality test for staff and customer samples for performance expectancy that is based on gender will be illustrated in the Table 5 and 6.

Based on the normality test for both samples in terms of performance expectancy factor as the dependent variable (DV) and gender as the independent variable (IV) shows that it does differ significantly from normality. Regarding the skewness and kurtosis value, the results appear abnormally skewed and kurtotic. As from the normality test for the female customer sample, it shows that it is normally distributed based on the average of z values which indicates the range of -1.96 and +1.96. However, looking at the opposite gender, the skewness and kurtotic values shows abnormality distributions as none of the z values reach in between ±1.96. The same goes

to the normality test for staff as it shows similar abnormality of distributions. Abnormal distributions need to be run through a procedure of non-parametric and it has been proven that this procedure can also execute analysis from a small sample size data [26]. As shown by the normality test result, the data samples cannot be analyzed using parametric statistical method and should be analyzed using non-parametric statistical method, such as Chi Square analysis.

Table 5 Customer normality test for Performance Expectancy by gender.

Gender	Answer Option	Z values	
		Skewness	Kurtosis
Female	Digital energy hub platforms will be useful in terms of searching for knowledge regarding energy sector	-0.377	0.673
	Digital energy hub platforms will help me to alert on any situations and knowledge updated by the energy sector	-0.073	-0.455
	Digital energy hub platforms will help me to acquire knowledge regarding energy sector in a trusted environment	0.210	-0.420
	Digital energy hub will help me to retrieve knowledge needed for problem solving task , decision making situation and learning regarding energy sector	-1.207	1.131
	Digital energy hub will be the new alternative for me to search knowledge regarding energy sector company rather than searching by myself through google, bing and etc	-0.156	-1.657
Male	Digital energy hub platforms will be useful in terms of searching for knowledge regarding energy sector	-7.880	23.670
	Digital energy hub platforms will help me to alert on any situations and knowledge updated by the energy sector	-6.250	17.238
	Digital energy hub platforms will help me to acquire knowledge regarding energy sector in a trusted environment	-2.760	3.044
	Digital energy hub will help me to retrieve knowledge needed for problem solving task , decision making situation and learning regarding energy sector	-3.457	6.043
	Digital energy hub will be the new alternative for me to search knowledge regarding energy sector company rather than searching by myself through google, bing and etc	-3.994	7.650

Table 6 Staff normality test for Performance Expectancy by gender.

Gender	Answer Option	Z values	
		Skewness	Kurtosis
Female	Digital energy hub platforms will be very useful in my job environment	0.807	0.401
	Digital energy hub platforms will help me to accomplish tasks more quickly and efficiently	-1.358	2.268
	Digital energy hub platforms will help me to acquire knowledge from the right people without any time constraint in my organization	4.046	1.952
	Digital energy hub will help me to retrieve knowledge needed for problem solving task , decision making situation and learning	1.100	1.151
	Digital energy hub will be the new alternative replacing the current process of sharing knowledge	1.516	4.001
Male	Digital energy hub platforms will be very useful in my job environment	0.076	-0.137
	Digital energy hub platforms will help me to accomplish tasks more quickly and efficiently	0.246	-0.511
	Digital energy hub platforms will help me to acquire knowledge from the right people without any time constraint in my organization	-0.041	-0.245
	Digital energy hub will help me to retrieve knowledge needed for problem solving task , decision making situation and learning	-0.041	-0.245
	Digital energy hub will be the new alternative replacing the current process of sharing knowledge	-1.020	-0.562

3.2 Chi Square Analysis

As one of the non-parametric statistical techniques, Chi square analysis is categorized. It is used for two basic objectives, the study of a hypothesis of two or more classes and the checking of the likelihood of data distribution following the predicted distribution[27]. The evaluation for the success expectancy variables involves the numerical and categorical files in case of this article. In that case, because the intention of this analysis is to find the

relationships between gender and the performance expectation for the digital hub, a Chi Square test is a relevant statistical method for this study. In this study, a question is asked; is there a relationship between gender and performance expectancy of digital energy hub ? Thus, a null and alternative hypothesis are constructed.

$\mathbf{H_o}$: There is no relationship between gender and performance expectancy.

$\mathbf{H_a}$: There is a relationship between the gender and performance expectancy.

Table below is the computed Chi Square test from both customer and staff data sample for performance expectancy variable.

Table 7 Chi Square test for Customer data in terms of Performance Expectancy by Gender

No	Answer option	Pearson Chi-Square	
		Value	α
1	Digital energy hub platforms will be useful in terms of searching for knowledge regarding energy sector	8.861	0.051
2	Digital energy hub platforms will help me to alert on any situations and knowledge updated by the energy sector	7.030	0.071
3	Digital energy hub platforms will help me to acquire knowledge regarding energy sector in a trusted environment	2.671	0.445
4	Digital energy hub will help me to retrieve knowledge needed for problem solving task , decision making situation and learning regarding energy sector	2.809	0.590
5	Digital energy hub will be the new alternative for me to search knowledge regarding energy sector company rather than searching by myself through google, bing and etc	7.480	0.058

Based on the Chi Square analysis for customer sample data printed in the Table 7, the results shown for standard deviation (α) for a single answer option contradicts with the requirement of p values, ($\alpha > 0.05$) probability level to reject the null hypothesis. Thus, the null hypothesis has failed to be rejected. By this means, it is statistically proven that there are no relationships between gender and performance expectancy attributes. This assures that every single question asked does not rely on gender attributes. Furthermore, it shows that both male or female from the customer's respondents, expect the best performance to be executed by the digital energy

hub.However, a different result is obtained from the staff response as presented in the Table 8.

Table 8 Chi Square Test for Staff Data in Terms of Performance Expectancy by Gender

No	Answer option	Pearson Chi-Square	
		Value	α
1	Digital energy hub platforms will be very useful in my job environment	3.296	0.192
2	Digital energy hub platforms will help me to accomplish tasks more quickly and efficiently	3.111	0.211
3	Digital energy hub platforms will help me to acquire knowledge from the right people without any time constraint in my organization	3.222	0.200
4	Digital energy hub will help me to retrieve knowledge needed for problem solving task , decision making situation and learning	0.943	0.624
5	Digital energy hub will be the new alternative replacing the current process of sharing knowledge	7.035	0.030

The Chi Square Test for staff described in Table 8, shows that the majority of response for performance expectancy differs from that of the customers. For answer option number 1 until 4 shows that every p values, α indicated more p values, ($\alpha > 0.05$). On that note, answer option 1 until 4 totally failed to reject the null hypothesis stating that there is no relationship between gender and performance expectation factor. However, the p values, α shown for the last answer option differs from the other answers. The p values, α recorded for the answer option 5 is 0.030 which is below the significant level which can prove that the answer option number 5 is statistically significant. Thus, the null hypothesis is successfully rejected. Therefore, there is a relationship in gender influence for digital hub substitution from the current process of knowledge sharing. Eventually, it is proposed that gender appears to be particularly relevant in terms of performance measurements [28].

4 Conclusion

This paper has focused on the flow and method to gather and acquire the raw data from possible respondents. In addition, it has also given a full research flow to be adapted in the actual study in the future. The discussion in this paper has found that in order to gather the correct data, a suitable selective variable is crucial to determine whether the data can contribute to the research purposes. The data set discussed by this paper shows

the different perspectives from both samples which represented the customers and staff. All data collection should lead to data analysis to produce a strong argument based on proven statistical method. However, since this paper is focusing on pilot studies, it cannot include the full data analysis. In conclusion, for future recommendation, the study should include other statistical tools and method to generate strong arguments and discussion from different perspectives to obtain a more variety of in-depth view of data analysis. Furthermore, the data analysis should propose other key variables mentioned in earlier section in order to study the correlations between each variable to determine the behavior of knowledge sharing in the energy sector.

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Biographies :

Muhammad Hazim Bin Muhmat Hilme, College of Computing & Informatics, Universiti Tenaga Nasional (UNITEN), Kajang, Selangor, Malaysia.

Hairoladenan Bin Kasim, Institute of Informatics and Computing in Energy (IICE), Universiti Tenaga National (UNITEN), Malaysia.

Abbas M. Al-Ghaili, Institute of Informatics and Computing in Energy (IICE), Universiti Tenaga National (UNITEN), Malaysia.