THREATS COMPARISON, STUDENT-T DISTRIBUTION APPROACH: A CASE STUDY OF IBRAHIM BABANGIDA LIBRARY (IBL) OF MODIBBO ADAMA UNIVERSITY OF TECHNOLOGY, YOLA

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ABSTRACT: In this paper threats comparison, student-t distribution approach: A case study of Ibrahim Babangida library of Modibbo Adama University of Technology, Yola, We identified three threats; human threats, Technological threats and Natural threats. Data on threats were obtained using questionnaire and personal interview; the data obtained were analyzed using Analytic hierarchy Process (AHP) and studet-t distribution. The results obtained revealed that human threats effect is greater than technological threats and technological threats effect is greater than natural threats effect associated with IBL activities at 5% level of significance. We recommended that the management should invest more resources to mitigate human threats than other threat.

KEYWORDS: Library, threats comparison, Students-t distribution, Analytic Hierarchy Process (AHP) and Modibbo Adama University.

1   INTRODUCTION

An adapted definition of threat, from National Institute of Standard and Technology (NIST) SP 800-30, is "the potential for a person or thing to exercise (accidentally trigger or intentionally exploit) a specific vulnerability."

There are several types of threats that may occur within an information system or operating environment. Threats may be grouped into general categories such as natural, human, and environmental. Examples of common threats in each of these general categories include:

Natural threats may include floods, earthquakes, tornadoes, and landslides. Human threats are enabled or caused by humans and may include intentional (e.g., network and computer based attacks, malicious software upload, and unauthorized access to Electronic Protected Health Information(EPHI)) or unintentional (e.g., inadvertent data entry or deletion and inaccurate data entry) actions. Environmental threats may include power failures, pollution, chemicals, and liquid leakage.

There are many Threats to the information stored in the library. These threats emanates from users and other sources. Premarathne (2013), states that, the abuse of library materials by marking, underlining, removing pages/parts of the pages, binding, barcodes, call number labels and damaging or defacing library materials is a threat to library collection.

GFI White Paper (2014) gives the clear posture of some information security threats in academic library. Security attacks were classified into; attacks on physical systems, authentication and privilege attacks, denial of service and malicious internet content.

 It is obvious that different materials in library are confronted with different varieties of threats. Some of these threats are: theft, mutilations, power surge and virus infections.

Bailey, et al., (1987) gives some few Library threats as follows:

- Any electrical sparking (appliance, wall outlet, etc.)
- Smoldering trash Smoke from an undetermined source
- Visible flame
- Smell of smoke or burning
- Any type of uncontrolled chemical related explosion or reaction
- Uncontrolled or unapproved grass fire, and
- Any other event with potential for property damage or personal injury

Ibrahim Babangida library of Modibbo Adama University of Technology Yola in particular, is facing security challenges just like other libraries, there are some cases whereby students gets into the library and steal some vital materials or documents either in form of a book or paper. In some situations whereby some students got into the library and tear some pages of books or damage some materials. The study carried out to analyse the risk associated with this kind of problems is known as security risk analysis.

In academic library like Ibrahim Babangida library for instance materials like, books, computers and disks, committee report and recommendations are among several pieces of information that require safety. The question is what can be done to enhance the safety of such important and highly sensitive information? depth study of every system is one of the best ways to propose a security policy for the system (Dzarma *et al.*, 2015).

Anyaobi and Akpoma (2012) assert that the abuse of library materials through theft, mutilation and other forms of abuse has posed tremendous challenge to the library profession. According to Jackson (1991) incidents of theft, non-return of materials and mutilation of library stock are on the increase. Sornam and Shyla (1997) reported that theft and mutilation of library materials was common in many libraries and only the magnitude of the crime differed from place to place. Ajegbomogun (2004) states that theft and mutilation of books and non-books is a common phenomenon in Nigerian university libraries and if not checked will create a serious threat to Nigerian libraries' collection and preservations., Senyah (2004) identifies the scarcity of needed books (90.9%) and selfishness (81.81%) as being the main cause of book theft and mutilation. His study was however not conclusive on the perpetrators of the abuse. He concluded that the absence of regular stock-taking or inventory has made it practically impossible for the libraries to quantify the extent of losses. Various writers have expressed their views on what contributes to the causes of different forms of abuse in the library. However, many researchers base their argument on economic depression and security as the main causes of abuse of library materials. These include Ajegbomogun (2004), Agboola (2001), Afolabi (1993), Akinfolarin (1992) among others.

Threats to critical infrastructures can be classified into 3 categories, natural threats, human-caused, and accidental or technical. Natural threats include weather problems in both hot and cold climates and also geological hazards like earthquakes, tsunamis, land shifting and volcanic eruption. Natural threats like this could greatly affect Critical Infrastructure (CI) specially the transportation sector. For example, in 1995 an earthquake in japan destroys many Japanese critical Infrastructures. The highway was damaged, the port of Kobe which is Japan's largest container shipping port. It also damaged chemical manufacturers and steel manufacturers. Human-caused threats are sometimes referred to as terrorism. This may include cyber-attacks, rioting, product tampering, explosions and bombing. Accidental and technological threats include such issues as transportation accidents and failures, infrastructure failures and hazardous material accidents (Robles *et al.,* 2014).

Although Abdulkadir and Dzarma (2015) identified three categories of threats in Ibrahim Babangida Library (IBL) however, no any special technique was employ to compare them, the focus of this paper is to go beyond identifying the threats but also moving further to compare them using special techniques.

2   METHODOLOGY

ANALYTICAL HIERARCHICAL PROCESS AHP

The threats in Ibrahim Babangida Library were categorized into three, namely Human threats, Natural threat, and Technological threat with the aid of questionnaire and personal interview. The Analytic Hierarchy Process (AHP) Method used by Dzarma and Abdulkadir (2015) were adopted in this paper.   The threats in Ibrahim Babangida Library were rated using Saaty (1980) rating scale as illustrated in table 1.

Table1: Saaty's Rating Scale

Interpretation		Scale
(a)	Equally important	1
(b)	Moderately more important	3
(c)	Essentially more important	5
(d)	Strongly more important	7
(e)	Extremely more important	9
(f)	Intermediate values between two adjacent judgments are	2,4,6,8

Source (Sa'aty 1980)

The comparison made between three threats are as follows:

1. Human threat is equally to moderately more important than technological threat

2. Human threat is moderately more important than natural threat

3. Technological threat is equally moderately important than natural threat
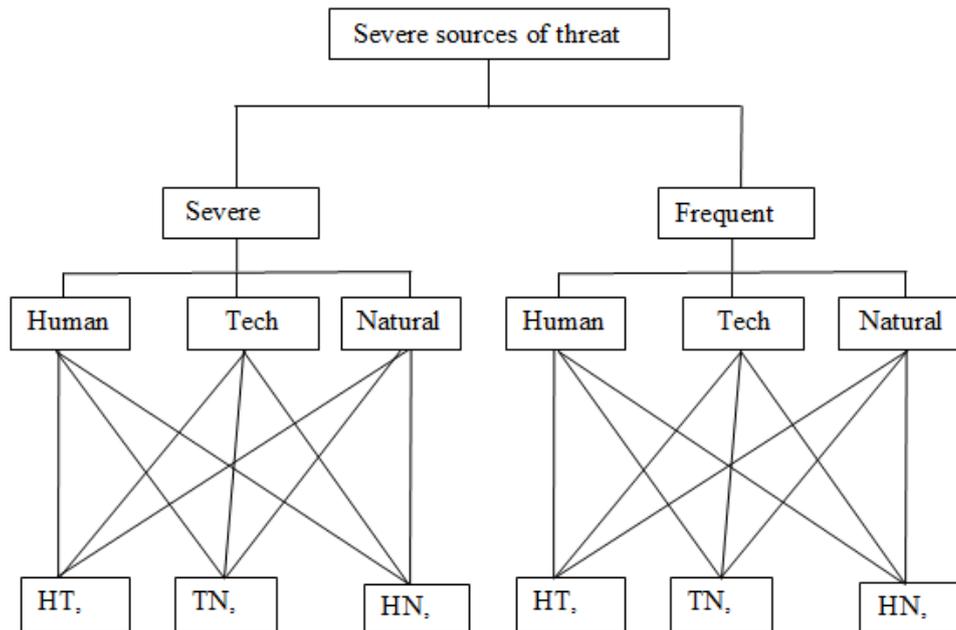
Figure 1 illustrates different kinds of threats in IBL

Figure 1. Threat Diagram of Different types of threats

Hence pair wise comparison matrix of threats in Ibrahim Babangida library was obtained from the diagram as :

$$
\begin{array}{c} \\ H \\ T \\ N \end{array}
\begin{array}{ccc} H & T & N \\ \left(\begin{array}{ccc} HH & HT & HN \\ TH & TT & TN \\ NH & NT & NN \end{array} \right) \end{array} \qquad (1)
$$

Where

HH, HT and HN = the rating of human threat
TT, TN and TH = the rating of Technological threat
NN, NT and NH =the rating of Natural threat

The weight of Human source of threat (W_H), Technological threat (W_T) and natural threat (W_N) were computed by normalizing and taking the row averages of threat matrix .

The consistency Ratio (CR) of Matrix A were computed as follows

$$CR = \frac{\text{Consistency Index (CI)}}{\text{Ratio Index (RI)}} \qquad (2)$$

Where

$$CI = \frac{\lambda max - n}{n} \qquad (3)$$

$\lambda max =$ the product of Weights of all threats and threat matrix A that is

$$\lambda max = \sum_{i=1}^{n} AW \qquad (4)$$

$$A = \begin{array}{c} \\ H \\ T \\ N \end{array} \begin{array}{ccc} H & T & N \\ \left[\begin{array}{ccc} HH & HT & HN \\ TH & TT & TN \\ NH & NT & NN \end{array} \right] \end{array} \qquad (5)$$

$$W = \begin{bmatrix} W_H \\ W_T \\ W_N \end{bmatrix} \qquad (6)$$

$$RI = \frac{1.98(n-2)}{n} \qquad (7)$$

TEST OF HYPOTHESIS

The following hypotheses were tested using student-t distribution.

(a) $H_0: \pi_1 = \pi_2$, (there is no significant diff. between human and technological threat)

   $H_1: \pi_1 \neq \pi_2$ (there is significant diff. between human and tech. threat)

(b) $H_0: \pi_1 = \pi_3$, (there is no significant diff. between human and natural threat)

   $H_1: \pi_1 \neq \pi_3$ (there is significant diff. between human and natural threat)

(c) $H_0: \pi_2 = \pi_3$, (there is no significant diff. between technological and natural threat)

   $H_1: \pi_2 \neq \pi_3$ (there is significant diff. between technological and natural threat)

Where $\pi_1 =$ the proportion (weight) for human threat

   $\pi_2 =$ the proportion (weight) for technological threat

   $\pi_3 =$ the proportion (weight) for natural threat

The estimate of $\pi_1, \pi_2,$ and π_3 are $\hat{\pi}_1, \hat{\pi}_2,$ and $\hat{\pi}_3$

$$t_1 = \frac{\hat{\pi}_1 - \hat{\pi}_2}{\sqrt{\frac{\hat{\pi}_1(1-\hat{\pi}_1) - \hat{\pi}_2(1-\hat{\pi}_2)}{n}}} \tag{8}$$

$$t_2 = \frac{\hat{\pi}_1 - \hat{\pi}_3}{\sqrt{\frac{\hat{\pi}_{1(1-\hat{\pi}_1)} - \hat{\pi}_3(1-\hat{\pi}_3)}{n}}} \tag{9}$$

$$t_3 = \frac{\hat{\pi}_2 - \hat{\pi}_3}{\sqrt{\frac{\hat{\pi}_{2(1-\hat{\pi}_2)} - \hat{\pi}_3(1-\hat{\pi}_3)}{n}}} \tag{10}$$

$\hat{\pi}_1$ = the weight of Human Threats, $\hat{\pi}_2$ = the weight of Technological Threats

$\hat{\pi}_3$ = the weight of Natural Threats, this weight were obtained using AHP.

the value of t_1, t_2, t_3 calculated were compared with the value of T obtained from the table at 0.05 level of significant

3 RESULTS AND THE DISCUSSION

The weight for Human threat, Technological threat and Natural threat were obtained as explained above are as follows:

$\hat{\pi}_1$ = 0.65, $\hat{\pi}_2$ = 0. 25 and $\hat{\pi}_3$ = 0.10

t_1, t_2 and t_3 were also obtained as explained ealier

t_1 = 4.54, t_2 = 3.08 and t_3 = 2.205

The value of $t_{\alpha/2}$ at 5% level of significant was obtained from the table as 2.08

TEST OF SIGNIFICANT DIFFERENCE

According to the result in section 3, the calculated t_1 is 4.54 and the tabulated T is 2.08 at 5% level of significant. Since 4.54 > 2.08 there is no evidence to accept the null hypothesis. Therefore the human threats effect is greater than technological threats. Similarly t_2 = 3.08 which is greater than T (2.08) obtained from the table. We reject the null hypothesis and conclude that human threats effects are greater than natural threats associated with IBL activities; this in line with Stephen (1999) which states that if the observed result differs from the expected results, hence null hypothesis is rejected on the basis of evidence obtained. If we fail to reject the hypothesis of no difference, then we must reject the alternative hypothesis-again, no exceptions. There are absolutely no circumstances in which we could either fail to reject both or accept both (Bohnenblust and Kumza, 2001). t_3 = 2.205 and t tabulated at 5% level of significance is 2.08. Since 2.205 is greater than 2.08 we can conclude that there is no evidence to accept the null hypothesis, therefore the technological threat effect is greater than natural threat associated with IBL activities. In general, based on the tests carried out human threats has greater effects on IBL activities, followed by technological threats and natural threats.

4 CONCLUSION

In this Research we used questionnaire and personal interview to obtained data from readers' department of IBL. Analytic Hierarchy Process (AHP) were used to analysed the data and the results of the analysis shows the human threats effect is greater than technological threats and human threats effects are greater than natural threats associated with IBL activities.

The management is recommended to do the following so as to mitigate threats in invest more resources to mitigate Human threats so as to secure library materials from destruction.

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