

# A Comparative Study on Information Technology (IT) Infrastructure and Disaster Recovery Methodology

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## Abstract

The threats of disruptions to business continuity loom over companies as they enhance more capabilities using information technology (IT) infrastructures. What is the best way to divert a disaster that occurs in IT infrastructure? Many individuals are unsure as to the best method. A comprehensive literature covering subjects like software-defined network principles, business continuity, and their connection to unified theory of acceptance and use of technology included in the study. The participants, information technology professionals, located in the Southeastern region of the U.S. will benefit from the anticipated value or impact to the problem domain. The research intends to determine which backup methods are considered most representative of an IT population based on distinct variables emphasized by the textbook authors. This study analyzes variables such as key performance indicators of education, recovery experience, and professions to develop insight concerning the current type of recovery methodology. Our summarized results lead to several conclusions that are relevant to the choice of recovery methodologies; traditional backup and virtualization, for IT disaster recovery.

**Keywords:** information technology; key performance indicators; network function virtualization; traditional backup; disaster recovery; UTAUT;

## 1. INTRODUCTION

Disaster recovery has become a focal point in business impact analysis (BIA) according to Zio (2016), especially for IT professionals employed in a network or database infrastructure. Moreover, the importance of determining the appropriate backup method that supports the recovery was paramount to ensure business continuity. Zio (2016) asserted that having an adequate disaster recovery plan has a massive influence on the BIA, which strengthens the organizational structure.

The goal of this study was to examine IT disasters from a quantitative perspective to provide a determination for the best suited recovery

method. In the study, a hypothesis highlighted an underlying analysis that interprets the correlations to participants' professional experiences, perceptions, and opinions of information technology (IT) professionals. These key performance indicators (KPIs) are defined variables like recovery time objectives (RTO), recovery point objectives (RPO), and cost on the development of an IT disaster recovery plan (Kerzner, 2017). Frank Webster (2014) found that valid backup methods like traditional or network function virtualization (NFV) are critical to establishing a sound disaster recovery plan (DRP). Known to reduce IT catastrophes, Tucker (2015) believed that determining backup methods in DRPs rely on the different IT personnel's professional experiences,

considerations, and opinions. Analysts concentrated more on critical variables such as recovery time objectives and recovery point objectives, found in business impact analyses (Lemieux, 2004).

### **Research Purpose**

The purpose of the quantitative study enhance IT professionals' assessment of their IT posture during an IT disaster. This investigation taps into IT professionals at mid-size information technology organizations in the Southeastern region of the United States. The study explored the influence of the rate of accepting emerging technologies; unified theory of acceptance and use of technology theory on IT professionals in the disaster recovery area. At that point, a sound assessment can be made as to the best recovery method at acceptable service levels. IT professionals gain quality decision-making abilities in areas that lacks constant innovation like disaster recovery.

## **2. METHODOLOGY**

The direction from the hypothesis's position plus measures and practices for data gathering that provide a theoretical context for quantitative methodology (Newton & Rudestam, 2014). The research question is: what is the relationship between key performance indicators (KPIs), education, recovery experience, profession and the selection of a backup method?

Quantitative data gathering methodologies depended on random sampling and structured data collection instrument that are appropriate for various experiences into prearranged reaction groupings. The data gathering generates results that are straightforward to generalizations, versatility, and standardization amongst all participants.

### **Data Collection**

By extracting information from a survey questionnaire instrument, data is analyzed primarily using binary logistic regression calculations. The instrument was pre-designed and tested by Howard Marks for Information Week Research. For this study the survey was delivered by Survey Monkey. The platform distributes survey instruments across multiple platforms (Windows and Apple) and various devices such as mobile devices, tablets, and computers (Bryson, 2015).

Overlooking to acknowledge variables and data sets involved will produce disparities in the research data thereby causing more difficulties in

drawing a comprehensive conclusion. Every survey will incorporate the following typical practice: (1) introduce the research study (2) inform its objective and constrictions; (3) acquire an endorsed permission accord form (d) use the survey protocol to ensure all questions are asked and are in the correct format, (4) recognition of respondent's participation.

## **3. ANALYSIS OF DATA**

The soundest analytic technique for this study was a binary logistic regression. Binary logistic regression has two or more independent variables, and the dependent variable (nominal) has only two outcomes available. In SPSS, the binary logistic regression had three methods to determine the best model: forced entry, forward, or backward stepwise (George & Mallery, 2016). Binary logistic regression estimates the probability that a characteristic was present.

The study was intended to determine whether there was a need for a specific recovery method. This approach's execution follows assessing the correlation amid the independent variables of KPIs, education, and recovery experience, profession, and the dependent variable required backup method. The value of the independent variables was entered in the binary logistic regression to determine if there was a need for a specific backup method; network function virtualization and traditional.

IBM's SPSS will be used for investigation in this study. SPSS was one of the well-known programs used for statistical assessment and file managing. This investigative tool can assist in business, educational, and, perform statistical analyses with the information. It was an instrument for intermediary to sophisticated clients (Field, 2013). Attaining expert technical support for troubleshooting software issues and assess present probes confirming adherence of ethical standards.

## **4. FINDINGS**

The research study consists of participants that are located in the Southeastern region of the United States. The region was comprised of 11 states which was the first criteria for any participant in the quantitative analysis. Participants were 200 adults who met additional criteria as a knowledge professional in the information technology field located in the Southeastern region.

The geographical location of the participants is depicted in Figure 1. Florida (N = 66) along with Virginia and West Virginia (N = 54) led in providing the most participants for this research study. North Carolina (N = 31), Kentucky (N = 18), and Georgia (N = 10) followed in participant's location. Using a diverse population was meant to provide an accurate representation of professionals within information technology unlike previous research by White (2017).

Other characteristics of the participants involve job position, level of education, and years of experience. Figure 2 displays a graphic review of the information collected from population such as job position and level of education. The majority of survey respondents held an entry level job position at 42.5 percent. That tally nearly doubled the closet groups of intermediate workers and middle management at (N = 40 and 39, respectively). Also, many of them achieved a higher level of education. In Figure 2, of the total participants surveyed (N = 200), 79 had obtained a bachelor's degree, and about half of this group were entry level (N = 29).

The survey study explored annual revenue of the participants' organizations. Yearly income can point to a capacity of openness which allows midsize companies to adopt emerging technologies quicker. However, many respondents (69) didn't know their organizations annual revenue. Similarly, in Figure 3, 41 participants found their organizations to have between zero to \$50,000. There were 33 respondents, whose organizations had over one million dollars in revenue.

As information was revealed from the results, clear designations differentiated the study from previous research. Also, the results below provided more insights and relationships into IT disaster recovery as the data was extracted from a diverse population. Of the total respondents surveyed (N = 200), 56 had obtained an associate's degree, while a large majority held a bachelor's degree (N = 79). Twenty-three respondents had attained a master's degree as their peak level of education. A large portion of respondents in the population were employed in entry level positions (N = 85). The table in Figure 4 conveys the frequency and percentage gathered from the population concerning years of experience.

The participants revealed in Figure 10 the level of quality in the organization's data backup processes. 113 or 56.5% of the participants felt the quality of the backup process was over 60 %.

Only 32% or 64 respondents disclosed that their quality level 40% or below. Mounting dependence on information technology, in addition to compliance and governing obligations, has led many organizations to focus on business continuity and disaster recovery (DR) solutions. Critchley (2016) believed availability has become a significant concern for business survival. Therefore, it becomes mandatory that one should take a detailed look at disaster recovery testing and the specific steps to ensure a disaster recovery plan performs as expected. The research measured the frequency of an organization's disaster recovery testing. The data showed the effectiveness of preparedness as 67.5% hold recovery testing once a month or more. In Figure 4, 18 or 9% of participants test their recovery plans annually. Testing brings out the practical concerns implicated in executing business transactions during an outage and validates the actual efficiency of DR procedures.

## 5. DISCUSSION

The survey instrument measured confident in the participants' disaster recovery skillset and employer's ability to align emerging technology with their business functions. The result indicated in Figure 5 and Figure 6 respondents showed confidence in their IT recovery abilities and employer adoption of technology. In Figure 5 just one hundred and one participants, 47 (100 to 81%) and 54 (80 to 61%), were over 60% confident in their DR skillsets. There were 28 participants at zero to 20%, 40 participants with a 21% to 40%, and 31. Participants at 41 to 60% confidence in their skills. The scale is dissimilar when reviewing the population's confidence level in the organization's ability to incorporate emerging technology. The majority of the populace, 94 participants answered very confident, 63 respondents were extremely confident while no one was found to be neutral. Also, in Figure 6, 37 participate deemed themselves as slightly confident, and a mere 6 respondents felt not confident about their organizations. Graham and Kaye (2015) believed a comprehensive recovery exercise is vital to build confidence amongst IT professionals in handling outages that impacts business functions effectively.

The outcomes were logically and systematically summarized and interpreted in relation to their importance to the research questions and hypotheses. The comments on the findings address observed consistencies and inconsistencies and discuss possible alternate interpretations. What, if any, was the relationship

between education (IV) and the selected backup method (DV)? The null hypothesis is there was no correlation between education (IV) and the selected backup method (DV). H1A: There was a correlation between education (IV) and the selected backup method (DV). In this research study, the binary logistic regression technique comprises of two quantifiable purposes 1) to determine which independent variables were significant and had an effect on the dependent variable and 2) establish how the logistic regression model predicted where the dependent variable binary in nature e.g. backup method [traditional backup vs. NFV].

The results show that education levels except education level (2) has a significance of 0.002 which is below 0.05. Decoded as bachelor's degrees, it is statistically significant to determine a backup method selection. Thus, the hypothesis (H1A) is accepted as education has a correlation selecting a backup method.

The secondary research question states: what, if any, was the relationship between recovery experience (IV) and the selected backup method (DV)? H20: There was no correlation between recovery experience (IV) and the selected backup method (DV). H2A: There was a correlation between recovery experience (IV) and the selected backup method (DV).

The Wald statistic indicates no contribution to the dependent variables at .305, 1.517, .349, and .755 respectively. From the information uncovered in the results recovery experience was no bearing on the dependent variable. Specifically, the null hypothesis (H20) was accepted as no correlation between recovery experience (IV) and the selected backup method (DV) was found in the research study.

The third research question suggests what, if any, was the relationship between profession (IV) and the selected backup method (DV)? The H30 null states there was no correlation between profession (IV) and the selected backup method (DV).

The Wald statistic was assessed for importance by means of a 95% confidence level. The p-values were greater than .05, then that variable was considered not a significant influence. Within the current model all predictor variables except job title (1) and (4) were not individually significant. Based upon the researcher's coding method job title (4) was any respondent that selected the

employment position of owner, executive, or c-level and job title (1) is decoded as an intermediate worker. With a Wald statistic of 0.053 and 0.045, this indicated that the independent predictor variable has a slight effect on the dependent variable. All significance have been found to be greater than 0.05, thus the null hypothesis; no direct correlation between profession and backup method selection, is accepted.

The research recognized the necessity to examine whether the model is more precise than simply guessing the outcome will be the more common of the two categories. Therefore, the -2log likelihood (-2LL) was reviewed in the model summary for each variable in Figure. The likelihood establish how appropriate the regression model is once the data was input into it. The -2LL shows number for education (-2LL = 175.408), recovery experience (-2LL = 191.542), and profession (-2LL = 192.768). The smaller the -2LL the likely that variable is a better fit to predict.

## 6. CONCLUSIONS

The responses of 132 participants in the study were surveyed to increase comprehension into the complex of selecting IT disaster recovery methods; traditional or network function virtualization. The results of the quantitative survey instrument were analyzed. Based on that analysis, the architecture of the recovery methodology has distinctive considerations, in addition to those in common factors. A key finding was that the certain employment positions; owner/executive/c-level and intermediate workers. The deficiency of the understanding the organization's annual revenue, the potential importance of key performance indicators classified as other.

Based on these results, recommendations for future research were proposed. While it is difficult to address the lack of knowledge, a solution utilized by some vendors is to reduce the complexity and knowledge requirement by providing alternative mechanisms to authoring rules. These alternatives include reducing the size of rulesets and utilization of a spreadsheet-like interface to capture conditions and actions.

The key themes which materialized from the quantitative analysis are listed below:

1. Lack of diversity in decision making.
2. The common regularity of testing.

3. Satisfaction of KPIs
4. Major IT disaster recovery usage.
5. Confidence in the integration of emerging technology.
6. Regular restoration errors occurrences.
7. Confidence in skillset

Based on these themes, the importance of adequate education and position of employment is vital when selecting a solution to remedy an IT disaster. A reoccurring and fundamental model related to understanding the nature of IT catastrophes including how they link to business function, the DR methodologies, and the importance of managing event of an IT disaster. The study also exposed the importance of applying education to certain employment positions can lead to the selection of methodologies to DR solutions.

#### **Future Research**

To further create an advantageous decision-making for mid-size IT companies, professionals should focus on potential exploration. Intended future research actions comprise of the following:

1. Explore a qualitative analysis of the effects of decision making from owners, executives, and intermediate workers on information technology disaster recovery in organizations.
2. Investigate quantitative analysis of the correlation between actions variables and IT disaster recovery methodology.
3. Execute a study pertaining to the influence of a baccalaureate education on the selection of IT disaster recovery methodology.

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## Appendices and Annexures

Variable	N	Percentage
<b>Location</b>		
Alabama	4	2
Florida	66	33
Georgia	10	5
Kentucky	18	9
Mississippi	7	3.5
North Carolina	31	15.5
South Carolina	3	1.5
Tennessee	4	2
Maryland	3	1.5
Virginia and West Virginia	54	27
Total	200	100

Figure 1. Participants Demographic

Demographic Variable	N	Percentage
<b>Job Position</b>		
Owner / Executive / C-Level	14	7
Senior Management	22	11
Middle Management	39	19.5
Intermediate	40	20
Entry Level	85	42.5
Total	200	100
<b>Level of Education</b>		
Master's Degree	23	11.5
Bachelor's Degree	79	39.5
Associates' Degree	56	28
Other (i.e. training, high school)	35	17.5
No education	7	3.5
Total	200	100

Figure 2. Occupation and Educational Breakdown

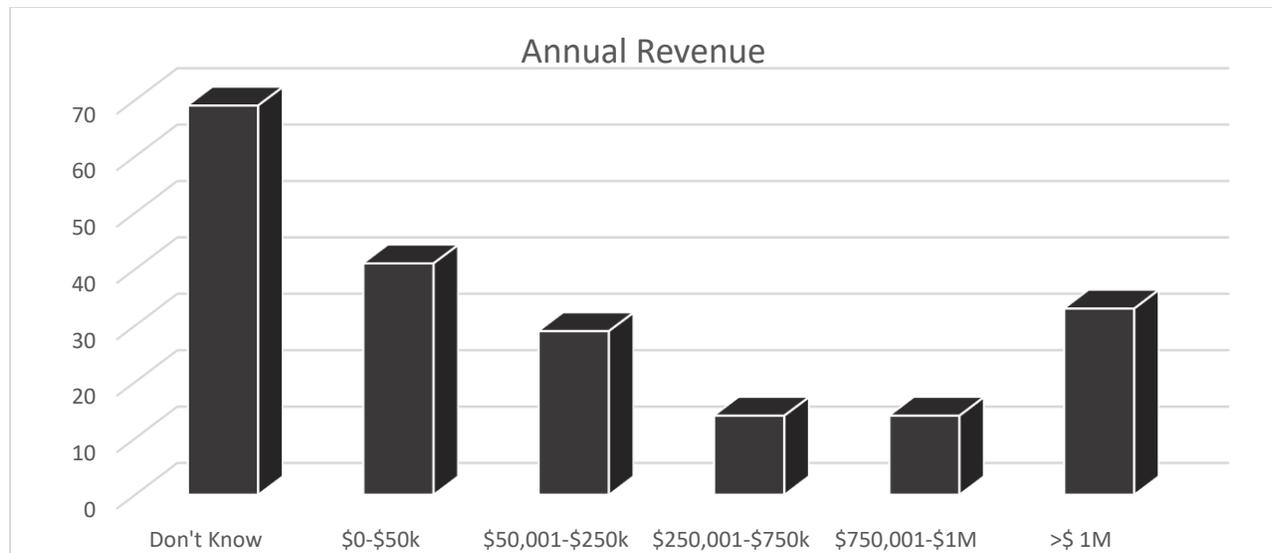


Figure 4. Annual Revenue

Primary Disaster Recovery Method Option		N	Percentage
Traditional Backup		105	52.50%
Network Function Virtualization		95	47.50%

Figure 5. Backup Method Selection

	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
							Lower	Upper
What was your education level?	.288	.382	.568	1	.451	1.333		
What was your education level? (1)	.118	.990	.014	1	.905	1.125	.162	7.824
What was your education level? (2)	-1.936	.620	9.757	1	.002	.144	.043	.486
What was your education level? (3)	-.150	.464	.104	1	.747	.861	.347	2.137
What was your education level? (4)	.405	.629	.415	1	.519	1.500	.437	5.148

Note: base= other (i.e. training, high school), 1=associate degree, 2=bachelor's degree, 3=master's degree, 4=PhD or doctorate,

Figure 6. Education Analysis

Recovery Work Experience								
	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
							Lower	Upper
How many years have your work in IT disaster recovery?(1)	.351	.636	.305	1	.581	1.420	.408	4.939
How many years have your work in IT disaster recovery?(2)	.679	.552	1.517	1	.218	1.973	.669	5.816
How many years have your work in IT disaster recovery?(3)	-.525	.887	.349	1	.555	.592	.104	3.370
How many years have your work in IT disaster recovery?(5)	-.169	.194	.755	1	.385	.845		

Figure 7. *Recovery Experience Analysis*

Profession						
	B	S.E.	Wald	df	Sig.	Exp(B)
Which of the following best describes your job title?	-.201	.26	.598	1	.439	.82
Which of the following best describes your job title?(1)	.114	.492	.053	1	.817	1.120
Which of the following best describes your job title?(2)	.424	.466	.826	1	.363	1.528
Which of the following best describes your job title?(3)	.201	.538	.139	1	.709	1.222
Which of the following best describes your job title?(4)	-.136	.640	.045	1	.832	.873

Note: base=entry level, 1=intermediate, 2=frontline management, 3=senior management, 4=owner/executive/c-level

Figure 8. *Profession Analysis*

Demographic Variable	N	Percentage
<b>Years of Experience</b>		
5 to 7 years	157	78.5
8 to 10 years	14	7
11 to 13 years	18	9
15 or more years	11	5.5
Total	200	100

Figure 9. *Recovery Work Experience*

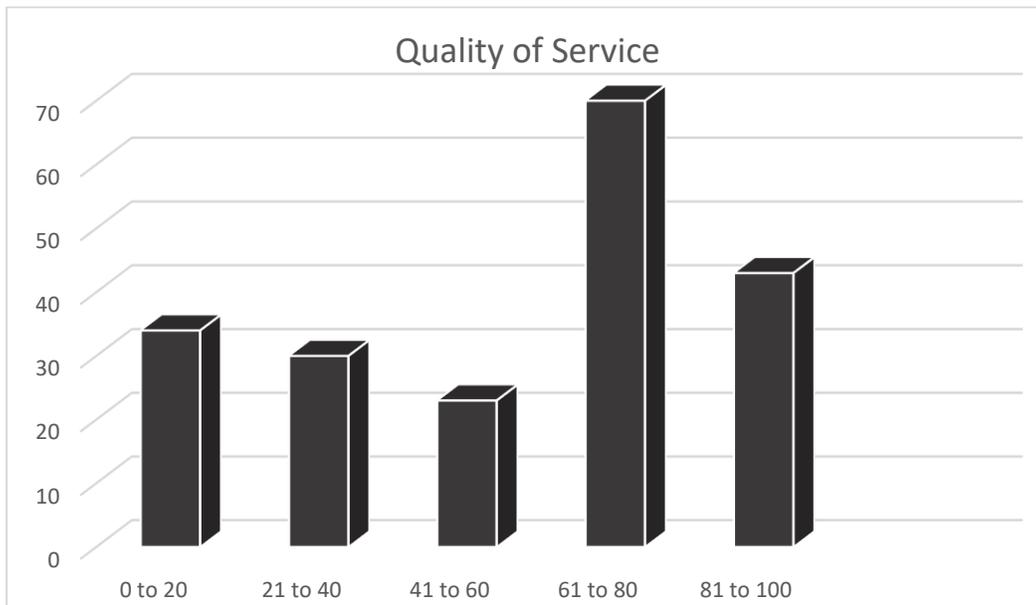


Figure 10. *Quality of Data Recovery Process*