

# Chances of Survival in the Titanic using ANN

Udai Hamed Saeed Al-Hayik and Samy S. Abu-Naser

Department of Information Technology,  
Faculty of Engineering and Information Technology,  
Al-Azhar University, Gaza, Palestine

**Abstract:** *The sinking of the RMS Titanic in 1912 remains a poignant historical event that continues to captivate our collective imagination. In this research paper, we delve into the realm of data-driven analysis by applying Artificial Neural Networks (ANNs) to predict the chances of survival for passengers aboard the Titanic. Our study leverages a comprehensive dataset encompassing passenger information, demographics, and cabin class, providing a unique opportunity to explore the complex interplay of factors influencing survival outcomes. Our ANN-based predictive model achieved an accuracy rate of 78%, shedding light on the underlying patterns within the data. However, this paper underscores the multifaceted nature of survival prediction and acknowledges several challenges. These include missing data imputation, feature engineering, and the inherent noise within historical datasets. We further discuss the importance of model evaluation metrics, showcasing not only accuracy but also precision, recall, and F1-score as essential indicators of predictive performance. The research paper meticulously outlines the architecture of the ANN model, emphasizing the key hyperparameters, activation functions, and regularization techniques employed in model development. Additionally, we address ethical considerations related to data handling and potential biases within the dataset. While our achieved accuracy is a notable achievement, this study emphasizes the importance of interpreting the results with due caution. It underscores the need for a holistic perspective that considers the practical implications of false positives and false negatives, especially in the context of a disaster scenario. In conclusion, this research contributes to our understanding of survival prediction in historical events like the Titanic disaster using modern machine learning techniques. It calls for further exploration and refinement of predictive models, with a focus on enhancing the interpretability and generalizability of such models to real-world applications.*

**Keywords:** *Titanic, British passenger, ANN, JNN*

## 1. Introduction:

RMS Titanic was a British passenger liner, operated by the White Star Line, that sank in the North Atlantic Ocean on 15 April 1912 after striking an iceberg during her maiden voyage from Southampton, England, to New York City, United States. Of the estimated 2,224 passengers and crew aboard, more than 1,500 died.[1]. This research will talk about the correlation between the people who survived the tragic accident, and multiple factors that affect their survival, from Age, Gender, social standing and where were they when the iceberg got hit.

## 2. The objectives of the study.

1. To analyze how you would survive if you were in the titanic.
2. To analyze how Social Status, Age and Gender affect your survival rate.

## 3. Literature review

The RMS Titanic is an infamous ship that crashed that caused a big wave around the world. Many lives that were lost on that day are still mentioned in our history books. This Research paper takes into account Age, Gender, Social status into account to analyze who is more likely to survive that day.

Also this research indicates that physical status, and social status are a big part of who survived that day.

Titanic dataset have been acquired from Kaggle [3]

### 3.1 Artificial Neural Network

Adaptive Artificial Neural Network is a non-parametric technique to categorize based on input variables to categorize subjects into Survived or deceased. Classification and prediction of the passenger's condition based on risk factors are an application of artificial neural networks

Furthermore, ANN is an application of Artificial Intelligence. In artificial neural networks is inspired by the diverse structure of the human brain. Billions of nerve cells (neurons) through the communication that with each other (synapses) creates a biological neural

network in the human brain that is devoted to human activities like speaking, reading, comprehension, breathing, face detection, movement, voice recognition, also resolve issues and data storage. Artificial neural networks, in fact, mimic a part of brain jobs [2]

#### 4. Methodology

By looking intensely through literature, a number of factors have been recognized that have an impact on determining passenger’s survival in the subsequent period. These factors were prudently studied and coordinated with an appropriate number for coding the computer within the modeling environment ANN. These factors were categorized as input variables and output variables that reflect some possible levels of passenger.

The data were entered into the JNN tool environment, determined the value of each of the variables using JNN(the most influential factor on diabetes), then the data were trained, validated, and tested.

##### 4.1 Input variables:

No	Attribute Name	Attribute Meaning
1	Pclass	Ticket Class, First class, Economy Class or Crew
2	Sex	Gender of the passenger
3	Age	Age of the passenger
4	SibSp	Number of sibling / spouses aboard
5	Parch	Number of parents / children aboard.
6	Ticket	Ticket number
7	Fare	Fare price
8	Embarked	Passenger Embarking point

##### 4.2 The Output Variable

No.	Output variable	Description
1	Survived “1”	Passenger survived
2	Deceased “0”	Passenger is deceased

##### 4.3 Neural network evaluation

As mentioned above, the purpose of this experiment was to identify whether or not the person has survived. We used Backpropagation algorithm, which provides the ability to perform neural network learning and testing. Our neural network is the front feed network, with one input layer (6 inputs), one hidden layer and one output layer (1 output) as seen in Figure 2. The proposed model is implemented in Just Neural Network (JNN) environment. The dataset for the Passengers of the titanic were gathered from Kaggle which contains 1500 samples with 10 attributes . This model was used to determine the value of each of the variables using JNN which they are the most influential factor on who survived prediction as shown in Figure 3. After training and validating, the network, it was tested using the test data and the following results were obtained. The accuracy of the survival rage predication was (78%). The average error was 0.88. The training cycles (number of epochs) were 100. The training examples were 30. The control parameter values of the model and the detail summary of the proposed model.

	Pclass	Sex	Age	SibSp	Parch	Fare	Survived
892	3	male	34.5000	0	0.0000	7.8292	false
893	3	female	47.0000	1	0.0000	7.0000	true
T:2	2	male	62.0000	0	0.0000	9.6875	false
T:3	3	male	27.0000	0	0.0000	8.6625	false
T:4	3	female	22.0000	1	0.0000	12.2875	true
T:5	3	male	14.0000	0	1.0000	9.2250	false
T:6	3	female	30.0000	2	0.0000	7.6292	true
T:7	2	male	26.0000	0	0.0000	29.0000	false
T:8	3	female	18.0000	1	0.0000	7.2292	true
T:9	3	male	21.0000	0	0.0000	24.1500	false
T:10	3	male	45.0000	0	0.0000	7.8958	false
T:11	1	male	46.0000	0	0.0000	26.0000	false
T:12	1	female	23.0000	1	1.0000	82.2667	true
T:13	2	male	63.0000	2	2.0000	26.0000	false
T:14	1	female	47.0000	0	0.0000	61.1750	true
T:15	2	female	24.0000	1	0.0000	27.7208	true
T:16	2	male	34.0000	1	0.0000	12.3500	false
T:17	3	male	21.0000	0	0.0000	7.2250	false
T:18	3	female	27.0000	0	0.0000	7.9250	true
T:19	3	female	45.0000	0	0.0000	7.2250	true
T:20	1	male	55.0000	0	0.0000	59.4000	false
T:21	3	male	9.0000	1	0.0000	3.1708	false
T:22	1	female	33.0000	2	2.0000	31.6833	true
T:23	1	male	21.0000	1	1.0000	61.3792	false
T:24	1	female	48.0000	1	0.0000	262.3750	true
T:25	3	male	50.0000	1	0.0000	14.5000	false
T:26	1	female	22.0000	0	1.0000	61.9792	true
T:27	3	male	22.5000	1	0.0000	7.2250	false
T:28	1	male	41.0000	0	0.0000	30.5000	false
T:29	3	male	45.0000	2	0.0000	21.6792	false
T:30	2	male	24.0000	0	0.0000	26.0000	true

Figure 1: Imported data into JNN environment

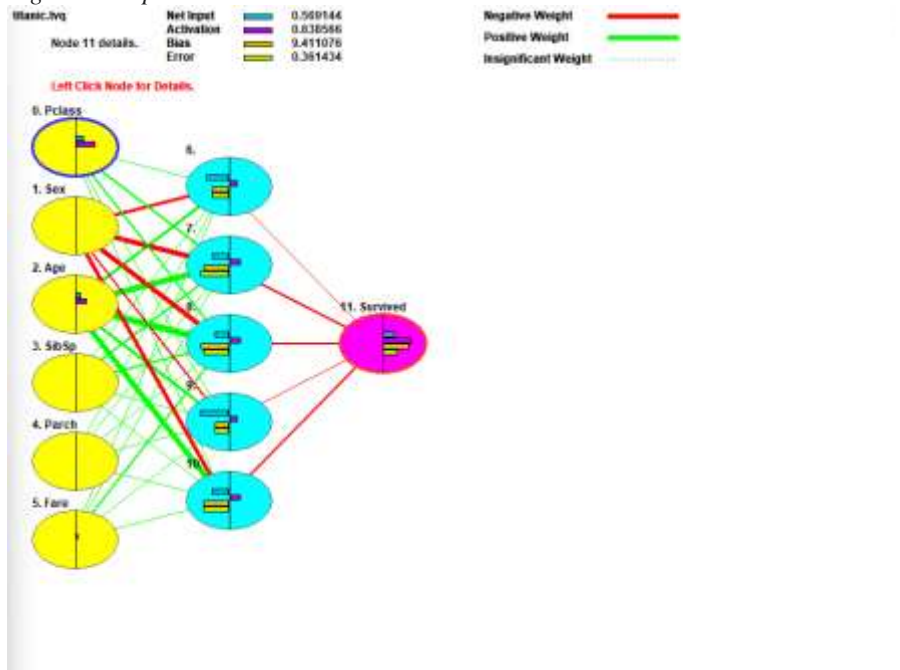


Figure 2: Architecture of ANN Model

titanic.tvq 2039 cycles. Target error 0.0100 Average training error 0.008361

The first 6 of 6 Inputs in descending order.

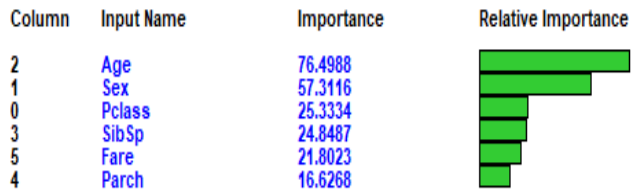


Figure 3: The most influential Features

### Conclusion

In this paper, artificial neural network was used to predict passengers survival on what features affected that result the most In general, artificial neural network is a parallel processing system that is used to detect complex patterns in the data. The aim of this study was to determine the effective variables and their impact on survival rate of the titanic death.count The proposed model was implemented in JNN environment. The diabetes dataset contains 30 samples with 10 attributes. This model was first used to determine the value of each of the variables using JNN (the most influential factor on survival rate). After training, validating, and testing the dataset, we got (78%) accuracy, average error was (0.88), number of epochs was (100), number of training examples was (120), and number of validating examples was (30).

## References

1. Zaid, A. A., et al. (2020). "The Impact of Total Quality Management and Perceived Service Quality on Patient Satisfaction and Behavior Intention in Palestinian Healthcare Organizations." *Technology Reports of Kansai University* 62(03): 221-232.
2. Sultan, Y. S. A., et al. (2018). "The Style of Leadership and Its Role in Determining the Pattern of Administrative Communication in Universities-Islamic University of Gaza as a Model." *International Journal of Academic Management Science Research (IJAMSR)* 2(6): 26-42.
3. Salman, F. M. and S. S. Abu-Naser (2019). "Expert System for Castor Diseases and Diagnosis." *International Journal of Engineering and Information Systems (IJEIS)* 3(3): 1-10.
4. Saleh, A., et al. (2020). Brain tumor classification using deep learning. 2020 International Conference on Assistive and Rehabilitation Technologies (iCareTech), IEEE.
5. Salama, A. A., et al. (2018). "The Role of Administrative Procedures and Regulations in Enhancing the Performance of The Educational Institutions-The Islamic University in Gaza is a Model." *International Journal of Academic Multidisciplinary Research (IJAMR)* 2(2): 14-27.
6. Nassr, M. S. and S. S. Abu-Naser (2018). "Knowledge Based System for Diagnosing Pineapple Diseases." *International Journal of Academic Pedagogical Research (IJAPR)* 2(7): 12-19.
7. Nasser, I. M., et al. (2019). "Artificial Neural Network for Diagnose Autism Spectrum Disorder." *International Journal of Academic Information Systems Research (IJAIRS)* 3(2): 27-32.
8. Nasser, I. M. and S. S. Abu-Naser (2019). "Predicting Tumor Category Using Artificial Neural Networks." *International Journal of Academic Health and Medical Research (IJAHMR)* 3(2): 1-7.
9. Musleh, M. M., et al. (2019). "Predicting Liver Patients using Artificial Neural Network." *International Journal of Academic Information Systems Research (IJAIRS)* 3(10): 1-11.
10. Musleh, M. M. and S. S. Abu-Naser (2018). "Rule Based System for Diagnosing and Treating Potatoes Problems." *International Journal of Academic Engineering Research (IJAER)* 2(8): 1-9.
11. Mettleq, A. S. A., et al. (2020). "Mango Classification Using Deep Learning." *International Journal of Academic Engineering Research (IJAER)* 3(12): 22-29.
12. Mettleq, A. S. A. and S. S. Abu-Naser (2019). "A Rule Based System for the Diagnosis of Coffee Diseases." *International Journal of Academic Information Systems Research (IJAIRS)* 3(3): 1-8.
13. Masri, N., et al. (2019). "Survey of Rule-Based Systems." *International Journal of Academic Information Systems Research (IJAIRS)* 3(7): 1-23.
14. Madi, S. A., et al. (2018). "The Organizational Structure and its Impact on the Pattern of Leadership in Palestinian Universities." *International Journal of Academic Management Science Research (IJAMSR)* 2(6): 1-26.
15. Madi, S. A., et al. (2018). "The dominant pattern of leadership and its Relation to the Extent of Participation of Administrative Staff in Decision-Making in Palestinian Universities." *International Journal of Academic Management Science Research (IJAMSR)* 2(7): 20-43.
16. Kashkash, K., et al. (2005). "Expert system methodologies and applications-a decade review from 1995 to 2004." *Journal of Artificial Intelligence* 1(2): 9-26.
17. Hilles, M. M. and S. S. Abu-Naser (2017). "Knowledge-based Intelligent Tutoring System for Teaching Mongo Database." *EUROPEAN ACADEMIC RESEARCH* 6(10): 8783-8794.
18. Elzamyly, A., et al. (2015). "Classification of Software Risks with Discriminant Analysis Techniques in Software planning Development Process." *International Journal of Advanced Science and Technology* 81: 35-48.
19. Elsharif, A. A. and S. S. Abu-Naser (2019). "An Expert System for Diagnosing Sugarcane Diseases." *International Journal of Academic Engineering Research (IJAER)* 3(3): 19-27.
20. Elqassas, R. and S. S. Abu-Naser (2018). "Expert System for the Diagnosis of Mango Diseases." *International Journal of Academic Engineering Research (IJAER)* 2(8): 10-18.
21. El-Mashharawi, H. Q., et al. (2020). "Grape Type Classification Using Deep Learning." *International Journal of Academic Engineering Research (IJAER)* 3(12): 41-45.
22. El Talla, S. A., et al. (2018). "The Nature of the Organizational Structure in the Palestinian Governmental Universities-Al-Aqsa University as a Model." *International Journal of Academic Multidisciplinary Research (IJAMR)* 2(5): 15-31.
23. El Talla, S. A., et al. (2018). "Organizational Structure and its Relation to the Prevailing Pattern of Communication in Palestinian Universities." *International Journal of Engineering and Information Systems (IJEIS)* 2(5): 22-43.
24. Dheir, I. and S. S. Abu-Naser (2019). "Knowledge Based System for Diagnosing Guava Problems." *International Journal of Academic Information Systems Research (IJAIRS)* 3(3): 9-15.
25. Dahouk, A. W. and S. S. Abu-Naser (2018). "A Proposed Knowledge Based System for Desktop PC Troubleshooting." *International Journal of Academic Pedagogical Research (IJAPR)* 2(6): 1-8.
26. Barhoum, A. M. and S. S. Abu-Naser (2018). "Black Pepper Expert System." *International Journal of Academic Information Systems Research (IJAIRS)* 2(8): 9-16.
27. Ashqar, B. A. M. and S. S. Abu-Naser (2019). "Identifying Images of Invasive Hydrangea Using Pre-Trained Deep Convolutional Neural Networks." *International Journal of Academic Engineering Research (IJAER)* 3(3): 28-36.
28. Anderson, J., et al. (2005). "Adaptation of Problem Presentation and Feedback in an Intelligent Mathematics Tutor." *Information Technology Journal* 5(5): 167-207.
29. AlZamily, J. Y. and S. S. Abu-Naser (2018). "A Cognitive System for Diagnosing Musa Acuminata Disorders." *International Journal of Academic Information Systems Research (IJAIRS)* 2(8): 1-8.
30. Al-Shawwa, M. and S. S. Abu-Naser (2019). "Knowledge Based System for Apple Problems Using CLIPS." *International Journal of Academic Engineering Research (IJAER)* 3(3): 1-11.
31. Alshawwa, I. A., et al. (2020). "Analyzing Types of Cherry Using Deep Learning." *International Journal of Academic Engineering Research (IJAER)* 4(1): 1-5.
32. Al-Nakhal, M. A. and S. S. Abu Naser (2017). "Adaptive Intelligent Tutoring System for learning Computer Theory." *EUROPEAN ACADEMIC RESEARCH* 6(10): 8770-8782.
33. Almurshidi, S. H. and S. S. Abu Naser (2017). "Design and Development of Diabetes Intelligent Tutoring System." *EUROPEAN ACADEMIC RESEARCH* 6(9): 8117-8128.
34. Almasri, A., et al. (2019). "Intelligent Tutoring Systems Survey for the Period 2000-2018." *International Journal of Academic Engineering Research (IJAER)* 3(5): 21-37.
35. Almasri, A., et al. (2018). "The Organizational Structure and its Role in Applying the Information Technology Used In the Palestinian Universities-Comparative Study between Al-Azhar and the Islamic Universities." *International Journal of Academic and Applied Research (IJAAAR)* 2(6): 1-22.
36. Al-Habil, W. I., et al. (2017). "The Impact of the Quality of Banking Services on Improving the Marketing Performance of Banks in Gaza Governorates from the Point of View of Their Employees." *International Journal of Engineering and Information Systems (IJEIS)* 1(7): 197-217.
37. Alhabbash, M. I., et al. (2016). "An Intelligent Tutoring System for Teaching Grammar English Tenses." *EUROPEAN ACADEMIC RESEARCH* 6(9): 7743-7757.
38. AlFerjany, A. A. M., et al. (2018). "The Relationship between Correcting Deviations in Measuring Performance and Achieving the Objectives of Control-The Islamic University as a Model." *International Journal of Engineering and Information Systems (IJEIS)* 2(1): 74-89.
39. Al-Bastami, B. G. and S. S. Abu Naser (2017). "Design and Development of an Intelligent Tutoring System for C# Language." *EUROPEAN ACADEMIC RESEARCH* 6(10): 8795.
40. Alajrami, M. A. and S. S. Abu-Naser (2018). "Onion Rule Based System for Disorders Diagnosis and Treatment." *International Journal of Academic Pedagogical Research (IJAPR)* 2(8): 1-9.
41. Al Shobaki, M., et al. (2018). "Performance Reality of Administrative Staff in Palestinian Universities." *International Journal of Academic Information Systems Research (IJAIRS)* 2(4): 1-17.
42. Al Shobaki, M. J., et al. (2018). "The Level of Organizational Climate Prevailing In Palestinian Universities from the Perspective of Administrative Staff." *International Journal of Academic Management Science Research (IJAMSR)* 2(5): 33-58.
43. Al Shobaki, M. J., et al. (2017). "Learning Organizations and Their Role in Achieving Organizational Excellence in the Palestinian Universities." *International Journal of Digital Publication Technology* 1(2): 40-85.
44. Al Shobaki, M. J., et al. (2017). "Impact of Electronic Human Resources Management on the Development of Electronic Educational Services in the Universities." *International Journal of Engineering and Information Systems* 1(1): 1-19.
45. Al Shobaki, M. J., et al. (2016). "The impact of top management support for strategic planning on crisis management: Case study on UNRWA-Gaza Strip." *International Journal of Academic Research and Development* 1(10): 20-25.
46. Al Shobaki, M. J. and S. S. Abu Naser (2016). "The reality of modern methods applied in process of performance assessments of employees in the municipalities in Gaza Strip." *International Journal of Advanced Scientific Research* 1(7): 14-23.
47. Al Shobaki, M. J. and S. S. Abu Naser (2016). "Performance development and its relationship to demographic variables among users of computerized management information systems in Gaza electricity Distribution Company." *International Journal of Humanities and Social Science Research* 2(10): 21-30.
48. Al Shobaki, M. J. and S. S. Abu Naser (2016). "Decision support systems and its role in developing the universities strategic management: Islamic university in Gaza as a case study." *International Journal of Advanced Research and Development* 1(10): 33-47.
49. Ahmed, A. A., et al. (2018). "The Impact of Information Technology Used on the Nature of Administrators Work at Al-Azhar University in Gaza." *International Journal of Academic Information Systems Research (IJAIRS)* 2(6): 1-20.
50. Abu-Saqr, M. M., et al. (2020). "Type of Grapefruit Classification Using Deep Learning." *International Journal of Academic Information Systems Research (IJAIRS)* 4(1): 1-5.
51. Abu-Saqr, M. M. and S. S. Abu-Naser (2019). "Developing an Expert System for Papaya Plant Disease Diagnosis." *International Journal of Academic Engineering Research (IJAER)* 3(4): 14-21.
52. Abu-Nasser, B. S. and S. S. Abu Naser (2018). "Rule-Based System for Watermelon Diseases and Treatment." *International Journal of Academic Information Systems Research (IJAIRS)* 2(7): 1-7.
53. Abu-Naser, S. S., et al. (2011). "An intelligent tutoring system for learning java objects." *International Journal of Artificial Intelligence & Applications (IJAILA)* 2(2): 86-77.
54. Abu-Naser, S. S. and M. J. Al Shobaki (2016). "Computerized Management Information Systems Resources and their Relationship to the Development of Performance in the Electricity Distribution Company in Gaza." *EUROPEAN ACADEMIC RESEARCH* 6(8): 6969-7002.
55. Abu-Naser, S. S. and M. A. Al-Nakhal (2016). "A Ruled Based System for Ear Problem Diagnosis and Treatment." *World Wide Journal of Multidisciplinary Research and Development* 2(4): 25-31.
56. Abu-Naser, S. S. (2016). "ITSB: An Intelligent Tutoring System Authoring Tool." *Journal of Scientific and Engineering Research* 3(5): 63-71.
57. Abu-Naser, S. S. (2009). "Evaluating the effectiveness of the CPP-Tutor, an Intelligent Tutoring System for students learning to program in C++." *Journal of Applied Sciences Research* 5(1): 109-114.
58. Abu-Naser, S. S. (2008). "JEE-Tutor: An Intelligent Tutoring System for Java Expression Evaluation." *Information Technology Journal* 7(3): 528-532.
59. AbuEloun, N. N. and S. S. Abu-Naser (2017). "Mathematics intelligent tutoring system." *International Journal of Advanced Scientific Research* 2(1): 11-16.
60. Abu Naser, S. S., et al. (2017). "Trends of Palestinian Higher Educational Institutions in Gaza Strip as Learning Organizations." *International Journal of Digital Publication Technology* 1(1): 1-42.
61. Abu Naser, S. S., et al. (2016). "Measuring knowledge management maturity at HEI to enhance performance-an empirical study at Al-Azhar University in Palestine." *International Journal of Commerce and Management Research* 2(5): 55-62.
62. Abu Naser, S. S. and M. J. Al Shobaki (2016). The Impact of Management Requirements and Operations of Computerized Management Information Systems to Improve Performance (Practical Study on the employees of the company of Gaza Electricity Distribution). First Scientific Conference for Community Development.
63. Abu Naser, S. S. (2008). "Developing an intelligent tutoring system for students learning to program in C++." *Information Technology Journal* 7(7): 1055-1060.
64. Abu Naser, S. S. (2006). "Intelligent tutoring system for teaching database to sophomore students in Gaza and its effect on their performance." *Information Technology Journal* 5(5): 916-922.
65. Abu Naser, S. S. (1999). "Big O Notation for Measuring Expert Systems complexity." *Islamic University Journal Gaza* 7(1): 57-70.
66. Abu Naser, S. S. (1993). A methodology for expert systems testing and debugging. North Dakota State University, USA.
67. Abu Nada, A. M., et al. (2020). "Arabic Text Summarization Using AraBERT Model Using Extractive Text Summarization Approach." *International Journal of Academic Information Systems Research (IJAIRS)* 4(8): 6-9.
68. Abu Nada, A. M., et al. (2020). "Age and Gender Prediction and Validation Through Single User Images Using CNN." *International Journal of Academic Engineering Research (IJAER)* 4(8): 21-24.
69. Abu Amuna, Y. M., et al. (2017). "Understanding Critical Variables for Customer Relationship Management in Higher Education Institution from Employees Perspective." *International Journal of Information Technology and Electrical Engineering* 6(1): 10-16.
70. Abu Amuna, Y. M., et al. (2017). "Strategic Environmental Scanning: an Approach for Crises Management." *International Journal of Information Technology and Electrical Engineering* 6(3): 28-34