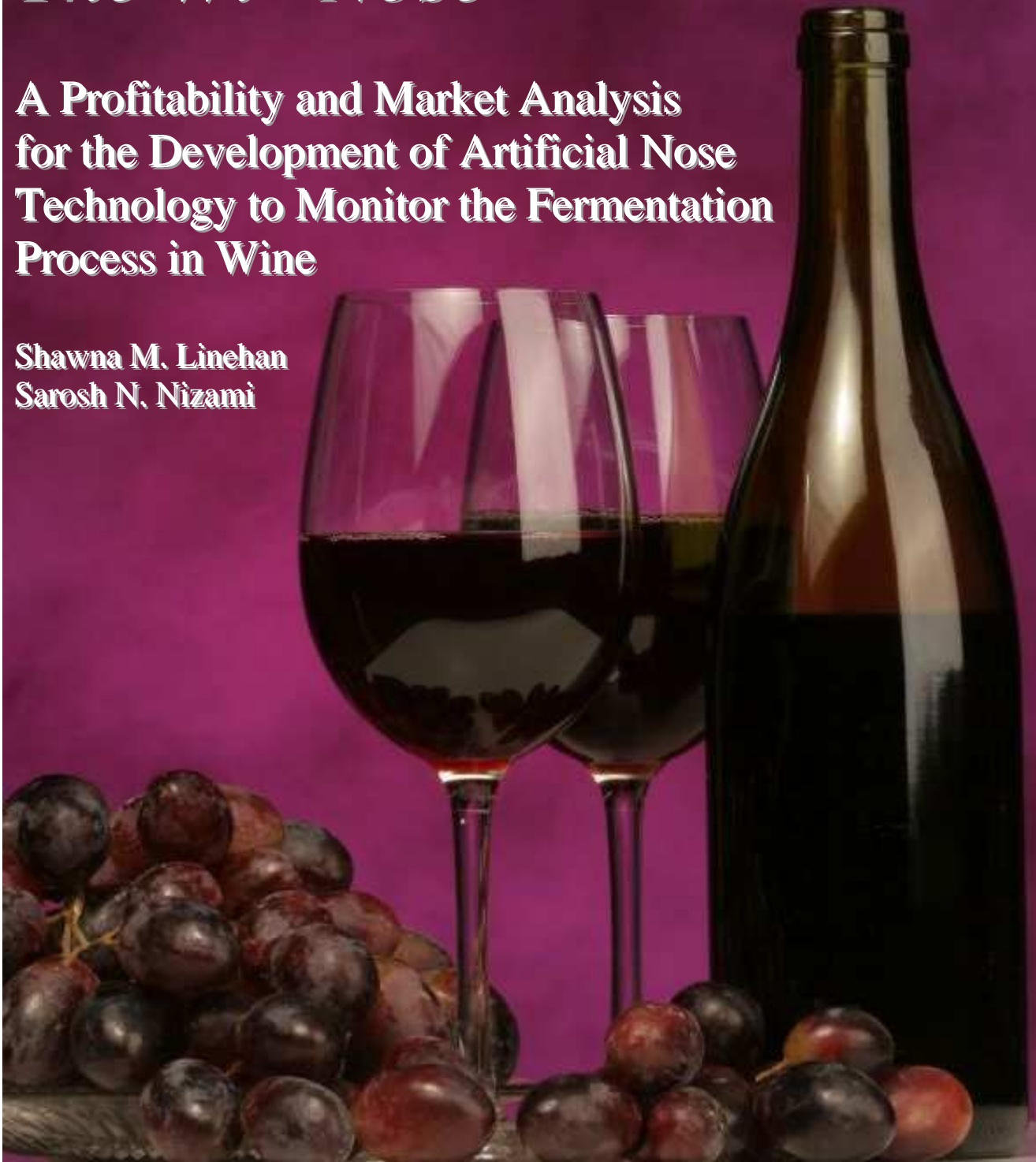


# *Artificial Nose Technology: The Wi –Nose*

**A Profitability and Market Analysis  
for the Development of Artificial Nose  
Technology to Monitor the Fermentation  
Process in Wine**

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## **ABSTRACT**

This paper is concerned with the development of an artificial nose to monitor the fermentation process in wine. The design objective of the Wi – Nose was to provide the wine industry with a light weight, compact, and accurate sensing device. Other design factors that were considered included ease of installation, level of maintenance, and lifetime of the device. Data was generated from sensor output versus concentration plots and this data was then classified with the use of a neural network model, specifically NeuroSolutions 5, the most powerful and easy to use neural network simulation environment on the market today. Data was classified into three outputs, stage 1, stage 2, and stage 3 of fermentation. The neural network data was trained, cross validated, and ultimately tested. The optimum percentage for these parameters were determined to be 80% training, of which 10% was cross validation, and 20 % testing. This model was used classify the data, giving accuracy results of 100% for all three fermentation stages. A customer satisfaction model was developed by varying design characteristics. This model ultimately resulted in superiority functions that were used to calculate product demands for varying product prices. These demands were then used to develop plots of net present worth's as functions of product price to determine the optimal design in terms of consumer satisfaction and profitability. The optimal design was determined to be a device with a 100% correct classification rate, with optimum dimensions of 36 cc and a weight of 1 lb. A TCI of approximately \$6.5 million is needed and a ROI of approximately 49% (NPW of \$11.2 million) is obtained. A risk analysis was performed varying the cost of raw materials, and it was determined that there is a 90% probability that the Wi – Nose will have an ROI between 40.6% and 57.9%. Thus, production and marketing of the Wi – Nose is a profitable venture under these conditions.