# Analytical Support of Financial Footnotes: Developing a Text Mining Approach

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## Abstract

Financial analysis is the process of interpreting financial information in order to accelerate business decisions. In recent decade and with the advent of eXtensible Business Reporting Language (XBRL), financial reports have a great mutation in terms of a unified reporting process. Nevertheless, the unstructured part of financial reports, so called footnotes, remains as barrier facing an accurate automatic and real-time financial analysis. Footnotes are a complementary disclosure in context of understanding and interpreting financial values. The understanding and usage of both structured and unstructured financial data types is critical to users who benefit from using financial information like analysts, investors, auditors, or external decision makers. According to existing literature, there are no standards for clarity or conciseness among financial footnotes and a labor intensive manual content analysis is needed. Furthermore, the growing volume of footnote pages as well as strong demand of financial analysts to access to the textual information demonstrate the need for research in the financial analysis area in the context of financial footnotes to support financial analysis process by developing an automatic analytical solution which can be integrated with existing methods. According to a recent study by Ernst & Young indicates, as the volume of financial footnote pages has grown, that it is difficult for financial statement users to find the most important information.

This research aims to provide a method, following design science research, to overcome this problem for a future automatic footnotes analysis. To realize this approach, a prototype based on text classification methods is implemented. The prototype classifies textual footnotes into constituent sentences and relates each sentence to pre-defined categories automatically. This avoids manually reading of the entire text. The prototype has been evaluated through an experiment phase by experts. Allowing such text mining solution can facilitate the contribution of footnotes to perform a comprehensive financial analysis process.

The major contribution of this paper is to support the analysis of financial footnotes in an alternative and more automated way, which facilitates existing manual analysis. The findings contribute to financial analysis research discussions in terms of reducing access time to textual-based financial information and increasing accuracy as well.

The research follows design science research methodology (DSR), which consists of three main phases: In the problem identification phase, we accomplished expert interviews to gain understanding regarding existing methods and applicable strategies towards financial footnotes in the real world and their impacts on the financial analysis process. The experts' opinion revealed the need of developing an automatic solution to facilitate extraction and analysis process of financial footnotes. In the second phase and to get an impression about the feasibility of those demands, a text mining prototype is designed to compensate the existing manual process. Finally, the prototype is evaluated using an experiment with involved human judges to prove its utility in the financial analysis process. The results of evaluation revealed that the features of the text mining prototype such as time access reduction, information presentation, and the relation between categories and extracted sentences is considerable and supports users to access required soft information easier and facilitate time-consuming and rigid manual analysis and extraction process of unstructured parts of financial reports.

However, we acknowledge various limitations. The prototype could be improved by applying more footnotes in different industries with different priorities in their financial analytics. In addition, as the prototype progressed, textual financial information taken from internet, news and different media can be used and analyzed more accurate and faster. Furthermore, it is also of interest to develop this solution by adding more capabilities thereby to map extracted sentences into related figures in financial statements.