A Simple Auditing Mechanism for Financial Reports in e-Ledger Project

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Abstract—e-Ledger requires the preparation of the ledgers electronically those express the technical regulations in a given format specified by Turkish Revenue Administration. Since the ledgers are huge-sized and difficult to analyze, some summary reports are needed. The summary reports give a brief feedback about the situation of company and allow companies to make self-auditing. In this paper, the experiences are stated while generating summary reports from the ledgers. Experimental results show that our tools can generate financial reports including Trial Balance in about 10-15 seconds for huge-sized ledgers.

Index Terms—e-Ledger, XML, XSLT, XSD, HTML, Schematron, Trial Balance, Income Table, Balance-Sheet

I. INTRODUCTION

As specified in the Tax Procedure Law (TPL), business enterprises and people should keep two types of ledger, Journal and General Ledger [8]. The ledgers are useful while keeping an account of the estimated expenses and incomes caused by the sale of goods, services and products [4]. In this paper, we use our commercial product named Idea VisionPlus e-Ledger which is the first platform-independent e-ledger application in Turkey [11]. Keeping the ledgers in electronic format reduces the money spent for archiving, prevents the paper wastage and speeds up the whole process. Also, e-ledgers can immediately be submitted when required. Since the produced ledgers contain huge amount of data and the data are not organized in a meaningful way, three types of summary reports; Trial Balance, Income Table and Balance-Sheet are generated from the huge-sized ledgers. When financial status of accounts need to be analysed in an efficient way, these summary reports become valuable for tax-payers in the industry before they send their ledgers to Turkish Revenue Administration (TRA).

II. RELATED WORK

eXtensible Business Reporting Language (XBRL) is a freely available and global standard for exchanging business information [12]. In XBRL, the objective is organizing and obtaining writeable form of data since the data cannot be compared by humans [5]. Furthermore, every country has different accounting purpose and this becomes a mess.

In general, there are two types of XBRL taxonomies used in the world; Global Ledger (GL) and Financial Reporting (FR). For those two types, technical rules are same but the representation of those rules is different [9] [10] [1].

In most of the countries, summary reports are obtained in a different way compared to Turkey. The trial balance is extracted from GL whereas balance-sheet and income table are created from FR. To sum up, all summary reports can be obtained from GL or FR [3] [13]. In Turkey, there is no FR format and GL is used to create Journal and General Ledger solely. While trial balance is extracted from general ledger, balance sheet and income table are generated from trial balance. Rules for balance sheet and income table are specified by unified accounting system that is published by TRA [6].

Since the process is more complicated in Turkey, there are some accounting tools like SAP, Logo Business Solutions and Mikro used for creating trial balance, income table and balance-sheet [7].

Our new simple auditing mechanism is trying to handle this complicated process. When e-Ledgers are produced with the VisionPlus e-Ledger application, the summary reports are also produced. This application is a desktop application and the reports can be viewed in browsers and also local computers by the tax-payers. Another important difference is that other reports allow making only cumulative analysis whereas our summary reports include both monthly and cumulatively results. The last and most important difference is that our summary reports make simple self-auditing [2] and this is done before sending e-Ledgers to TRA. This allows users to make cross-check between their own results obtained by the accounting tools and the new results coming from the VisionPlus application. This cross-check is not an obligatory situation but it can be very favourable since while generating their ledgers, taxpayers are tend to overlook some of official rules, because of missing audit rules. As a result of this, during a tax audit process they might put up with the consequences of an illegal ledger such as pecuniary punishment.

III. THE SYSTEM

The flowchart of the whole process is shown in Figure 2. The system is started with the analysis of current ledger

```
<gl-cor:accountingEntries>
    <gl-cor:entryHeader>
        <gl-cor:entriesType contextRef="journal_context">journal</gl-cor: entriesType >
        <gl-cor:entryNumber contextRef="journal_context">529</gl-cor:entryNumber>
        <gl-bus:totalDebit contextRef="journal_context" decimals="INF" unitRef="try">5873</gl-
        bus:totalDebit>
        <gl-bus:totalCredit contextRef="journal_context" decimals="INF" unitRef="try">5873</gl-
        bus:totalCredit>
        <gl-cor:entryDetail>
            <gl-cor:lineNumber contextRef="journal_context">860</gl-cor:lineNumber>
            <gl-cor:account>
                <gl-cor:accountMainID contextRef="journal_context">120</gl-
                cor:accountMainID>
                <gl-cor:accountSub>
                    <gl-cor:accountSubID contextRef="journal_context">120</gl-
                    cor:accountSubID>
                </gl-cor:accountSub>
            </gl-cor:account>
            <gl-cor:amount contextRef="journal_context" decimals="INF" unitRef="try">5873</gl-
            cor:amount>
            <gl-cor:debitCreditCode contextRef="journal_context">D</gl-cor:debitCreditCode>
            <gl-cor:postingDate contextRef="journal_context">2014-01-02</gl-cor:postingDate>
            <gl-cor:documentType contextRef="journal_context">Other</gl-cor:documentType>
            <gl-cor:documentNumber contextRef="journal_context">10051</gl-cor:documentNumber>
            <gl-cor:documentReference contextRef="journal_context">529</gl-
            cor:documentReference>
            <gl-cor:documentDate contextRef="journal_context">2014-01-02</gl-cor:documentDate>
            <gl-bus:paymentMethod contextRef="journal_context">Nakit</gl-bus:paymentMethod>
        </gl-cor:entryDetail>
        <gl-cor:entryDetail>
            ...
        </gl-cor:entryDetail>
    </gl-cor:entryHeader>
    <gl-cor:entryHeader>
        ...
    </gl-cor:entryHeader>
</gl-cor:accountingEntries>
```

Fig. 1. A portion from Current Ledger in XBRL format

that sums up each main and sub accounts debits and credits. The current ledger of each month is produced by VisionPlus e-Ledger application and it is in XBRL format [13]. This XBRL file is combined with the previous months Debit-Credit eXtensible Markup Language (XML) file that contains main and sub account codes, those accounts descriptions, monthly and cumulatively debit-credit balances and some meta-data.
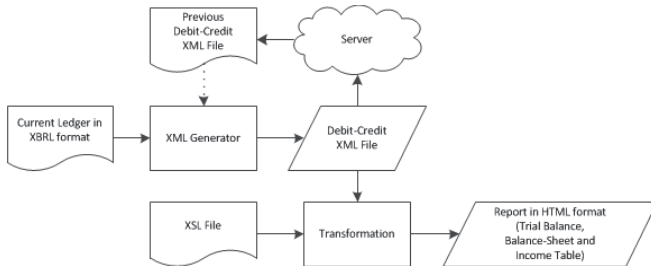

Fig. 2. Flowchart of System

The reason behind the combination of XBRL and XML files is that the cumulative debits and credits of current period are needed and that is achieved by merging the newest information coming from current ledger with the past data coming from Debit-Credit XML file. The XML Generator takes both and produces the new Debit-Credit XML file. This newly generated file is stored in server for the future use and also it is the primary input file of the transformation step. The samples of both, XBRL file and Debit-Credit XML file, can be found in Figure 1 and Figure 4.

The information about the accounts is firstly taken from the current ledger of that month and it is kept in HashMap in order

to avoid redundant file access. If the information is written to a separate file, it should be read again when this information is needed to combine with the past data coming from previous Debit-Credit XML file. The HashMap is also useful since the sub accounts are limited even for huge-sized ledgers.

At this step, since the new month's information is not merged with the past data yet, monthly values are kept. These monthly values are refreshed with the past data. There are two types of HashMap in the application. First one uses the main account ids as keys and contains all main account information like description, monthly debit and credit, cumulative debit and credit, and a new HashMap for its sub accounts. This new HashMap is the second type and collects the information about sub accounts. This layered structure gives opportunity to access, refresh and transform data fast.

In transformation step, any XML file is transformed with the help of its specific XSLT implementation into HTML format. Extensible Style-sheet Language Transformations (XSLT) is a specific language for XML that can add/remove elements, sort or rearrange them and a lot more. However, an XSLT file implemented for one XML file could not be used for other XML file. Therefore, every XML file has its own XSLT implementation and this XSLT file is the secondary input file of XSLT transform.

After transformation is completed, the report in HTML format is obtained. While creating HTML, XSLT is not sufficient enough to accomplish all objectives. For this reason, Cascading Style Sheets (CSS) and JavaScript are also used.

The report is designed in a user-friendly format and include three tabs; Trial Balance, Income Table and Balance-Sheet. Each tab in the report is generated from the same Debit-Credit

VisionPlus E-Ledger Financial Reports

Trial Balance Income Table Balance Sheet

Filter: FOR EX: 320, CHECK   Show All Sub Accounts   Hide All Sub Accounts

Item No	Main Account	Sub Account	MONTHLY ACCOUNT ACTIVITIES				CUMULATIVE TRIAL BALANCE			
			AMOUNT		RESIDUAL		AMOUNT		RESIDUAL	
			Debit	Credit	Debit	Credit	Debit	Credit	Debit	Credit
102	Banks		0,00	2.500,00	0,00	2.500,00	0,00	5.000,00	0,00	5.000,00
	YKB Deposit Account.2	102.010.00.0	0,00	2.500,00	0,00	2.500,00	0,00	5.000,00	0,00	5.000,00
103	Cheques Given and Payment Orders (-)		0,00	3.500,00	0,00	3.500,00	0,00	7.000,00	0,00	7.000,00
120	Purchasers		11.800,00	0,00	11.800,00	0,00	23.600,00	0,00	23.600,00	0,00
191	Deductible VAT		360,00	0,00	360,00	0,00	720,00	0,00	720,00	0,00
320	Vendors		10.000,00	2.360,00	7.640,00	0,00	20.000,00	4.720,00	15.280,00	0,00
321	Notes Payable		0,00	4.000,00	0,00	4.000,00	0,00	8.000,00	0,00	8.000,00
391	VAT Calculated		0,00	1.800,00	0,00	1.800,00	0,00	3.600,00	0,00	3.600,00
600	Domestic Sales		0,00	10.000,00	0,00	10.000,00	0,00	20.000,00	0,00	20.000,00
770	General Administrative Expenses		2.000,00	0,00	2.000,00	0,00	4.000,00	0,00	4.000,00	0,00
900	Letters of Guarantee		1.000.000,00	1.000.000,00	0,00	0,00	2.000.000,00	2.000.000,00	0,00	0,00
	TOTAL :		1.024.160,00	1.024.160,00	21.800,00	21.800,00	2.048.320,00	2.048.320,00	43.600,00	43.600,00

Fig. 3. A sample Trial Balance

```
<?xml version="1.0" encoding="UTF-8"?>
<?xml-stylesheet type="text/xsl" href="all.xslt"?>
<TrialBalance>
    <VKN>0123456789</VKN>
    <CompanyName>ABC AŞ.</CompanyName>
    <PeriodCoveredStart>01.04.2015</PeriodCoveredStart>
    <PeriodCoveredEnd>30.04.2015</PeriodCoveredEnd>
    <MainAccount>
            <MainID>100</MainID>
            <MainAccDesc>SAFE DEPOSIT</MainAccDesc>
            <CurMainDebit>950</CurMainDebit>
            <CurMainCr>5900</CurMainCr>
            <CumMainDebit>950</CumMainDebit>
            <CumMainCr>5900</CumMainCr>
            <SubAccount>
                <SubID>100.01</SubID>
                <SubAccDesc>SAFE DEPOSIT</SubAccDesc>
                <CurSubDebit>950</CurSubDebit>
                <CurSubCr>5900</CurSubCr>
                <CumSubDebit>950</CumSubDebit>
                <CumSubCr>5900</CumSubCr>
            </SubAccount>
            <SubAccount>
                        ...
            </SubAccount>
    </MainAccount>
    <MainAccount>
            <MainID>102</MainID>
            <MainAccDesc>BANKS</MainAccDesc>
            <CurMainDebit>850000</CurMainDebit>
            <CurMainCr>900000</CurMainCr>
            <CumMainDebit>850000</CumMainDebit>
            <CumMainCr>905000</CumMainCr>
            <SubAccount>
                <SubID>102.010.00.0</SubID>
                <SubAccDesc>YKB Deposit</SubAccDesc>
                <CurSubDebit>0</CurSubDebit>
                <CurSubCr>0</CurSubCr>
                <CumSubDebit>0</CumSubDebit>
                <CumSubCr>5000</CumSubCr>
            </SubAccount>
    </MainAccount>
    <MainAccount>
            ...
    </MainAccount>

</TrialBalance>
```

Fig. 4. A portion from Debit-Credit XML File

XML file. However each of them have specific rules those are implemented in their specific XSLT files. These rules and challenges are explained in next sections.

A. Trial Balance

Trial balance report is a kind of summary that indicates the sum of debits, credits and balances of each main and sub account. The sums and balances are calculated from the beginning of fiscal period and also for each month. Each journal value is not stated like as in general ledger and instead of this, the total of each account is shown.

The main objective of this report is to check the equality of debits and credits for each amount and residual in monthly and cumulatively. The monthly check is not important as the cumulative one.

This report has extra features. Users can search for accounts and account descriptions, view sub-accounts by clicking on the main accounts, analyse summary by closing all sub-accounts and easily see long reports with the help of sliding titles.

Trial balance is not an obligatory report; it makes analysis and control of accounts easier. Furthermore, trial balance allows making self-auditing while producing the ledger in VisionPlus e-Ledger application.

Two types of mistakes can be detected while doing self-auditing. First one is that if a main account has to pay credit/debit balance and this main account does not obey this rule in total then a red box appears for that main account. Second one is that if a main account has to pay credit/debit balance and this main account's any sub account does not obey this rule then a red box appears for the sub account and orange box appears for the main account. The sample output file is shown in Figure 3.

B. Income Table

Income table is a summary report in that the enterprises can analyse all incomes, expenses and costs for a specific period

Profit or Loss from Gross Sales	Operating Profit or Loss	Ordinary Profit or Loss	Period Profit or Loss	Period Net Profit or Loss
60-Gross Sales	Profit or Loss from Gross Sales	Operating Profit or Loss	Ordinary Profit or Loss	Period Profit or Loss
61-Sales Discounts	63-Operating Costs	64-Income and Profits from Other Ordinary Operations	67-Extraordinary Income and Profits	69-Period Net Profit and Loss
62-Cost of Sales		65-Expense and losses from Other Ordinary Operations	68-Extraordinary Expense and Losses	
		66-Financial expenses		

and reach that periods net profit and loss. Income table is divided into five main parts listed below;

- Profit or Loss from Gross Sales
- Operating Profit or Loss
- Ordinary Profit or Loss
- Period Profit or Loss
- Period Net Profit or Loss

Each part is formed with specific formulas and those formulas get the values of some account groups. Actually, first part is the base of second, second is the base of third and so forth. The account groups for each part are listed in Table I.

Every account group is sum of some accounts and the value of each account is negative if the account pays debit balance. In contrast, if the account pays credit balance, the value becomes positive.

Fig. 5. A sample Income Table

The values of accounts are obtained from the Debit-Credit XML file. For each account, there is a variable defined in XSLT file. This variable is used for both calculating the values of each account group and class and also presenting the value in output report.

After the values are collected, the data is altered with specific functions in order analyse data in a more user friendly approach. XSLT changes the structure of data with the help of CSS and JavaScript and creates easily comparable tables.

In the output table, there should be a label for each account value and those labels should be gathered from the Debit-Credit XML file like as values. However, since some of the accounts are not placed in Debit-Credit XML file, a look-up table for labels is created. If the account does not present in Debit-Credit XML file, then the label is taken from look-up table and the value of that account is set to 0.

The sample output file is shown in Figure 5. In the output table; the labels with (-) should give the negative value and values with parenthesis are less than zero. Also, all account groups have their own different account values and an example of this situation is A-GROSS SALES in Figure 5. When the table is analyzed, these little details need to be considered.

C. Balance Sheet

Balance-sheet report is a summary report that gives an opportunity to compare the results of two main categories; Active Assets and Total Liabilities and Shareholders Equity. Active Assets contain two account classes; current and fixed assets. Total liabilities include the short term and long term liabilities. The general structure of the categories can be found in Table II.

Total of Active Assets	Total of Total Liabilities and Shareholders Equity
1- Current Assets	3- Short Term Liabilities
2- Fixed Assets	4- Long Term Liabilities
	5- Shareholders Equity

For each of the five account classes, there are specific formulas those sum up not all but some account groups. The numbers like 10, 24, 36, 47, etc. represents the beginning of accounts IDs used in e-Ledger application.

Every account group contains accounts and the value of each account is calculated by considering the rules below;

- If an account is under Active Assets category and
  - If it pays debit balance then it should be positive.
  - If it pays credit balance then it should be negative.
- If an account is under Total Liabilities and Shareholders Equity and
  - If it pays debit balance then it should be negative.
  - If it pays credit balance then it should be positive.

| Trial Balance | Income Table | Balance Sheet | | | | | |

Balance Sheet							
	Previous Period	Current Period			Previous Period	Current Period
Detailed Balance Sheet Table	30 April 2014	30 April 2015	Detailed Balance Sheet Table		30 April 2014	30 April 2015
I - CURRENT ASSETS	**621.941,60**	**777.427,00**	**III - SHORT TERM LIABILITIES**		**699.514,30**	**822.958,00**
A-Detailed Balance Sheet Table	**(22.760,00)**	**(28.450,00)**	**A-Financial Liabilities**		**510.000,00**	**600.000,00**
B-Stock and Shares	**0,00**	**0,00**	**B-Trade Liabilities**		**88.587,00**	**104.220,00**
C-Trade Accounts Receivable	**27.605,60**	**34.507,00**	**C-Other Liabilities**		**95.810,30**	**112.718,00**
D-Other Accounts Receivable	**600.000,00**	**750.000,00**	**D-Advances Received**		**0,00**	**0,00**
1-Receivables from Shareholders	200.000,00	250.000,00	**E-Contract Progress Income**		**0,00**	**0,00**
2-Receivables from Affiliates	200.000,00	250.000,00	**F-Taxes Payable and Other Liabilities**		**4.073,20**	**4.792,00**

Fig. 6. A sample Balance-Sheet

While generating the output file, the same strategy explained in Section III-B is followed. The sample output file is shown in Figure 6.

Since the objective of this report is determining whether two parts; Active Assets and Total Liabilities and Shareholders Equity, equal or not, whenever there is an inequality it will be highlighted as red. This a simple auditing mechanism example.

IV. EXPERIMENTAL RESULTS

In order to understand code execution time for generating several-sized summary reports, the equation below is used;

$$T_{Total} = T_{DCG} + T_{Trans} \qquad (1)$$

The analysis for Debit-Credit XML file generation is made in Java and the time for generating different-sized Debit-Credit XML file from various ledgers is measured. It is represented with T_{DCG} in the Eq. 1. 10 trials are done and the average is considered for each scenario. The analysis for Transformation is handled in Java with Saxon library. The time that passes for generating HTML output file from different-sized of Debit-Credit XML file is calculated.It is represented with T_{Trans} in the Eq. 1. The process is repeated for 10 times and the average is considered. The total time that is represented with T_{Total} in the Eq. 1 is tried to be calculated.
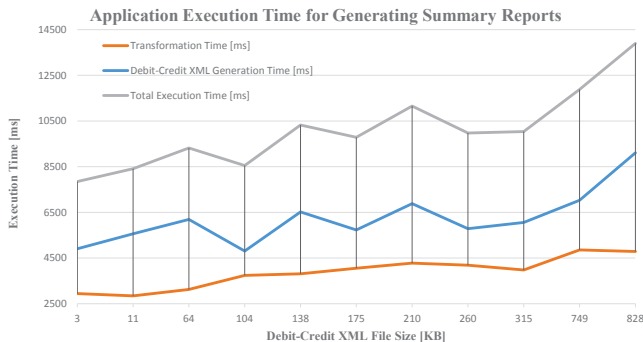
The diagram that represents Debit-Credit XML Generation Time, Transformation Time and Total Execution Time of summary reports from the various sized ledgers can be found in Figure 7. As it is obvious from the chart, our tool is scalable in terms of execution time according to various input file sizes.

V. CONCLUSION

This paper introduces development process of generating summary reports with VisionPlus e-Ledger application. Since the analysis of ledgers is difficult, summary reports help companies to check their accounts. The world has no common accounting system so every country has its own rules to represent summary reports. In Turkey, this new approach gives opportunity to create summary reports automatically and also cross-check them before sending to TRA. Since one of the objectives is making easier analysis, the summary reports allow to make self-auditing. Simple self-auditing mechanisms are also explained in the paper.

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Fig. 7. Execution Times of Summary Report Generation for Different-Sized Debit-Credit XML Files