Audit Validation Using Ontologies

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Requirements to increase quality audit processes in enterprises are defined. It substantiates the need for assessment and management audit processes using ontologies. Sets of rules, ways to assess the consistency of rules and behavior within the organization are defined. Using ontologies are obtained qualifications that assess the organization's audit. Elaboration of the audit reports is a perfect algorithm-based activity characterized by generality, determinism, reproducibility, accuracy and a well-established. The auditors obtain effective levels. Through ontologies obtain the audit calculated level. Because the audit report is qualitative structure of information and knowledge it is very hard to analyze and interpret by different groups of users (shareholders, managers or stakeholders). Developing ontology for audit reports validation will be a useful instrument for both auditors and report users. In this paper we propose an instrument for validation of audit reports contain a lot of keywords that calculates indicators, a lot of indicators for each key word there is an indicator, qualitative levels; interpreter who builds a table of indicators, levels of actual and calculated levels.
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1 Structures for the Audit Reports

In [1], [2] audit is defined as activity that corrections are made on the way to include techniques, methods and models for analysis and control of information products.

An audit process is an assurance service regarding to organizational process, risks and control environment and financial statements accuracy based on auditing methodology.

Auditing processes have well defined task duration in time and tasks set for the team members are characterized by inputs and outputs described in procedures consistent, coherent and effective.

According to ISACA Standards [3] the audit report should contain: scope, objectives, period of coverage and the nature, findings, conclusions and recommendations, timing and extent of the audit work performed.

From our point of view an audit report is a qualitative structure of information and knowledge as a results of an audit process. In most of cases audit reports contains: auditor, audited entity, scope (or limitations of scope), reference to auditing standards, period, findings, conclusions, opinion and recommendations.

Consider a real-world entity E to be undertaken by a team using the resources they appear financially restrictions. Entity E is a product, activity, process or a technology.

It develops a project based on the objective that aims to achieve the entity's project containing: description of the entity to be performed; deadlines falling in the process of implementation; resources; risks; controls; activities; inputs; outputs; expenditure budget; implementation team and sharing tasks on each member.

The audit is a complex activity, which is meant to establish the level of concordance between what is written in the draft with what happened in reality to obtain concrete form of the entity E. If there are computer applications programming specifications that define a virtual entity as E. When performing software have seen the extent to which it matches the description in the specification and implementation process concrete form to the entity E – computer application, was the same specifications defined.

There is concern at the organization level to

conduct and produce products and services at a defined quality level, so the market to satisfy demand / supply ratio, which means the liquidation realization of finished goods respectively maximum use of specific lines provide services.

The audit process is one of the most important process of Corporate Governance. A good corporate governance means the coordination, collaboration, communication between all entities involved like shareholders, board of directors, managers, stakeholders and auditors (internal and external) for divergent objectives so [4],[5]:

- transparency;
- accountability;
- minimizing risks;
- performance;

Also for a good corporate governance board of directors, management and auditors must focus on the following objectives:

- not work on stock;
- persons performing services respecting procedures have no goals in production;
- the quality was not affected in any way and is unconditionally the procedures using materials exactly as specified; each person is so trained that makes self of what worked and responsible to control by those who provide quality management;
- framing costs in limits that do not affect profit organization;
- the deadlines in managing contracts and using additional delays that allow recovery delays.

Assess the returns good governance audit to the initial documentation that contains technical data, procedures, specific consumption and the parallel implementation of information describing the way in which processes within the organization in all managerial aspects of individuals activities, of consumption, recipes of production, operating machinery, the use of raw materials and materials, finished goods stocks management.

Audit good governance finally materialized through a variety of reports. In order to improve the transparency, monitoring and multidimensional analysis of corporate governance, these reports can be represented using XBRL [6], [7].

2 Validation Processes in Auditing

Validation in auditing is the auditing audit but is a process which shows that audit steps are well constructed, audit objectives are well defined, as team members auditing tasks are distributed and balanced specific flows audit is complete [9], [10].

It is considered an auditing process defined by:

- specialists team structure: $S_1, S_2, ..., S_{ns}$;
- set procedures on which the audit is performed activities $P = \{p_1, p_2, ..., p_{np}\}$;
- people team performed set activities $A = \{a_1, a_2, ..., a_{na}\}$.

It is considered a lot of organizations $ORG = \{org_1, org_2, ..., org_{norg}\}$ for which good governance is analyzed using validation processes defined above;

In the event that there is a final audit report in which the activity is acceptable or good governance audit team found that is not acceptable, it is build the Table 1.

Table 1. Audit reports for organizations

Organization	The result of the audit	Long term real results of the organization	The result validation
org_1	rez_1	rr_1	α_1
org_2	rez_2	rr_2	α_2
…	…	…	…
org_i	rez_i	rez_i	α_i
…	…	…	…
org_{norg}	rez_{norg}	rr_{norg}	α_{norg}

$$rez_i = \begin{cases} \text{accepted, if the audit report concludes that is good governance} \\ \\ \text{unacceptable, if the report concludes that is bad governance} \end{cases}$$

$$rr_i = \begin{cases} \text{accepted, if the real results concludes that is good governance} \\ \\ \text{unacceptable, if the real results concludes that is bad governance} \end{cases}$$

If $rr_i = rez_i \Rightarrow \alpha_i = 1$

If $rr_i \neq rez_i \Rightarrow \alpha_i = 0$

It is calculate the IV, index validation by the formula:

$$IV = \frac{\sum_{i=1}^{norg} \alpha_i}{norg}$$

If IV > 0,92 means that the validation audit process for good governance is **very well** built.

If IV <0,92 and IV>0,78 means that the validation process for the proper auditing process is **well** good governance built.

Otherwise the validation process of auditing for good governance is itself invalid.

3 Procedures for Evaluation the Management Based On Ontology

To carry out the study audit management based on ontology is necessary to design a tool that includes a lot of procedures that are activated in a time sequence that ultimately leads to a conclusion on corporate governance at the organization level [11].

The procedures are divided into three categories:

- procedures for preparing information database on which calculations are processed in order of aggregate indicators; are extracted from the database elements of the set of people; the set of activities, elements of the set conditions, raw material elements of the set, the set of finished products, elements of the set flows, elements of the set of documents and other elements of sets that need to be taken in the analysis to give a complete assessment of corporate governance in the organization; if this set of procedures is built so that the crowds be obtained based on text analysis, automatic analysis will increase in terms of the coverage;

- procedures for mapping the elements of the sets obtained with full characterization using predetermined templates; the set of chips for workstations persons extract certain

elements that define achieve planned levels; the set activities for technological chips are extracted information on planned consumption of raw materials, actions planned durations, successions of simple actions from the work and its characterization; all the sets required for a complete analysis are defined templates and automatically completes;

- procedures for calculating aggregate indicators involving scanning databases containing the evolution of the organization over a given period by extracting actual levels of all elements associated template sets considered; values are obtained aggregated indicators at different levels of the structure of the organization; it is important to ensure the homogeneity of aggregation processes

working only with indicators in resources, people, activities, moods, resources have the same importance, namely, working only with indicators that appear in shares of large crowds associated elements; if the organization structure type is the highest level of aggregation tree, tree root properly, resulting aggregate indicator that has a certain value which belongs to a subinterval and subinterval is placed in correspondence with a quality level.

Building lists of resources, people, the state, the rule is based on a tailored approach of BNF description - *Backus Naur Form* used in describing programming languages.

The procedures are grouped within an organization so:

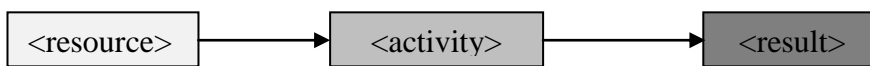< procedure>::=<resources list ><activities list><results list>

where:

<resources list>::= represents all resources used by the organization in its processes for obtaining profit;
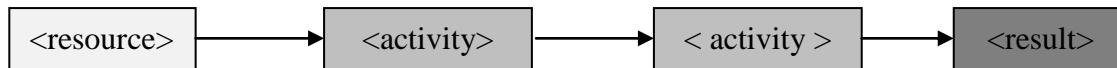
<activities list>::= represents all activities performed by the organization;

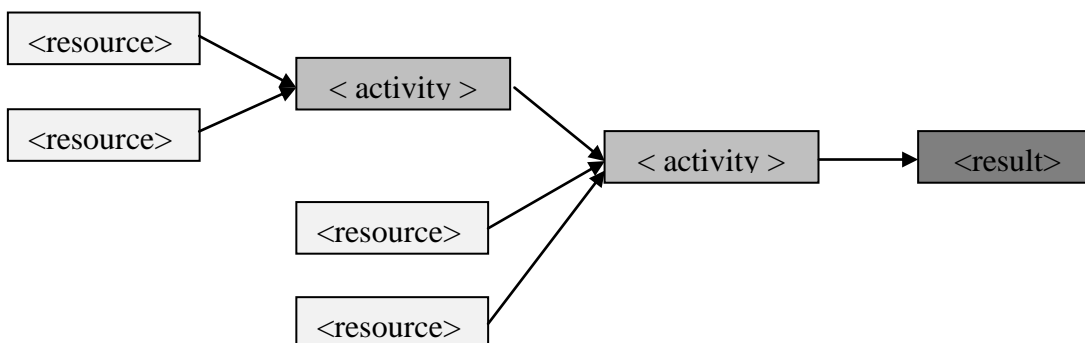<results list>::= represent the results on which is based the profit obtained by the organization.

All coordinating and getting the finished product as a result starting from primary resources are called procedures. And take part of the category defined above.

Figure 1. The simple construction form of procedures

Figure 2. The construction form of the procedures

Fig. 3. Complex form of building procedures

In addition there are numerous forms of constructing procedures depending on the interaction between resources, activities and results.

Best practice means to be a scripted list of materials and actual list of results.

Are the results desired and achieved real results. Between them the resulting analysis examines differences between plan and actual.

In reality an organization achieve a number np of procedures from the P set $\{P_1, P_2,..., P_i,..., P_{np}\}$.

Assuming it is considered that all procedures are equally important. And it goes on the idea that:

$$J(p_i) = \begin{cases} 1, & \text{if the procedure is complet accomplish} \\ 0, & \text{if the procedure is NOT complet accomplish} \end{cases}$$

$J(p_i)$ is the planned level of the procedure p_i

Based on that calculation now is possible to calculate the IG indicator with the next formula:

$$IG = \frac{\sum_{i=1}^{np} J(P_i)}{np}$$

The value date of IG indicator shows whether or not there is a good practice within the organization. So if:

- $IG \in [0; 0,78)$ is not well;
- $IG \in [0,78; 0,92)$ is well;
- $IG \in [0,92; 1]$ is very well;

In this hypothesis a validation audit management requires:

- establish the list of procedures;
- establish the graph of the precedents so as to know the order in which the procedures are performed, Figure 4.
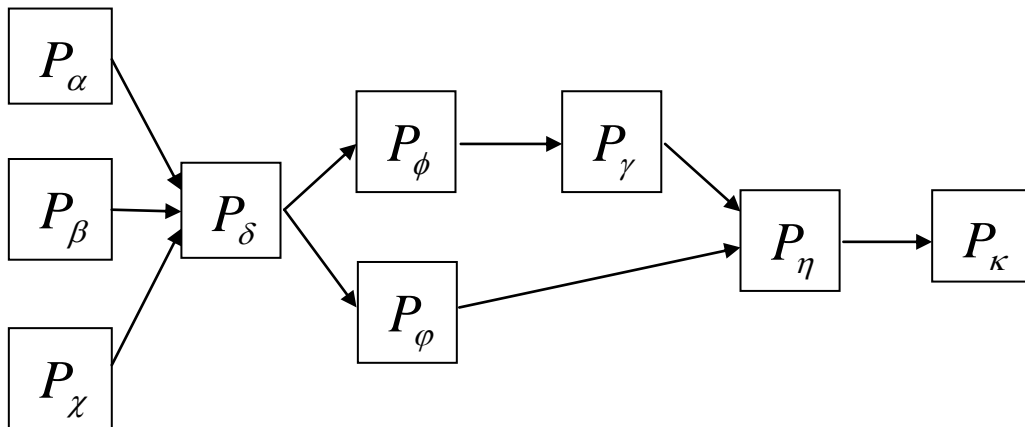

Fig. 4. Graph of precedents

- procedures are analyzed;
- indicator IG is calculated;
- determined the level of audit validation.

IG indicator is calculated for each procedure from P list. Then the management level is determined by averaging the values calculated for the indicator IG of all procedures of the organization.

The level of automation of the entire process of analysis depends oriented ontology:

- coverage associated with each set lists;
- templates complexity associated elements of crowds;
- accuracy and stability planned levels;
- representativeness of the sub-associated qualitative levels.

Such software is highly complex and requires the computer system to have an open nature

of the organization so that primary information to underpin the establishment of all crowds, the more it requires the computer system of the organization to be designed so upgraded to be conducted by adding information to identify the person, place, of when specific events occurred updating.

4 Orientation on Ontology of the Audit

Auditing processes have a specific vocabulary describing the steps, activities, inputs, outputs, resources, people, functions, products, processes and qualifications to assess how the audited organization has evolved in the context of corporate governing.

The auditors are available database containing descriptions of product structures, equipment, fabrication of recipes, the activities, the way in which workers have developed interactions on a specified time and reflection at the carrying amounts and all financial flows. Developing an ontology-oriented approach to the audit process returns to:

- levels planned big data available and

- actual levels;
- framing intervals or outside timeframes;
- activities, processes, products qualitative aspects analyze;
- quantitative results mapping with qualitative levels;
- building an ontology-oriented audit metrics.

Process-oriented approach ontologies audit complexity requires taking more steps, which the most important are:

- specific vocabulary building corporate governance;
- audit reports structure defining;
- search algorithms and extract words from database developing;
- differential counting from the analysis between the planned and actual level;
- simple indicators calculation;
- aggregate indicator calculating;
- quantitative and qualitative levels mapping;
- conclusion of acceptance or rejection generates.
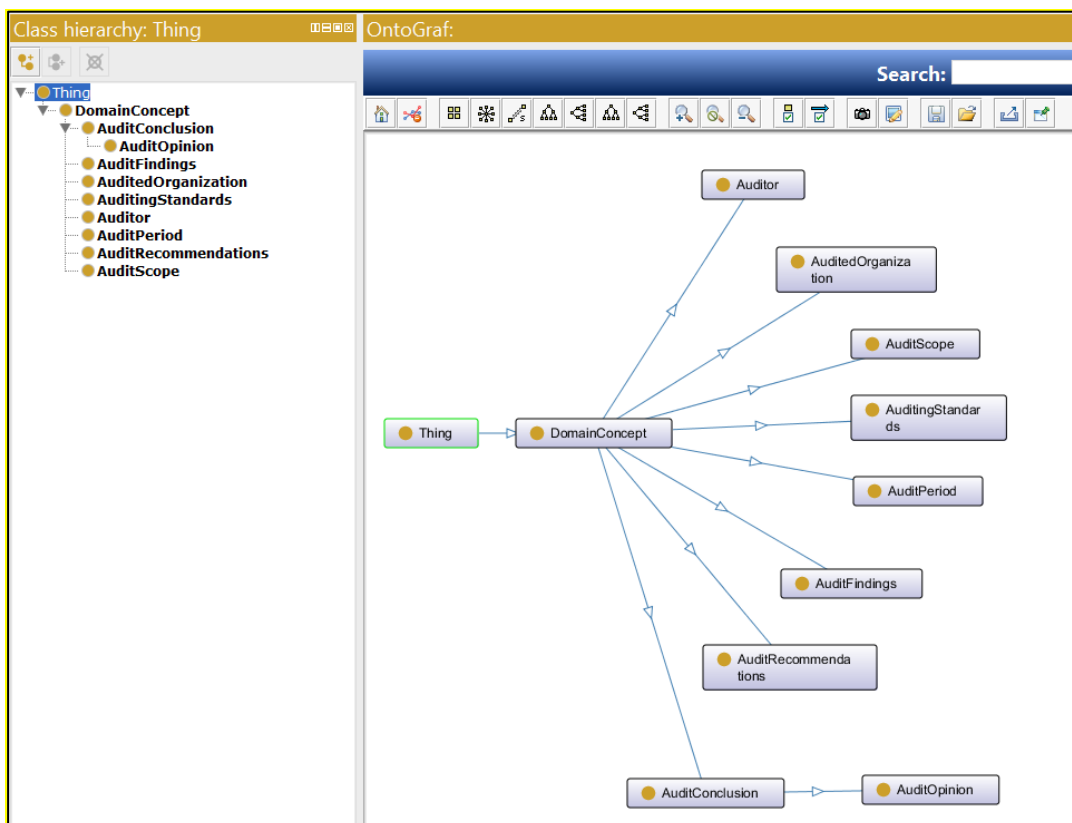
Fig. 5. Class hierarchy of audit report domain knowledge developed in Protégé [8]

For validation, analysis and interpretation of audit reports based on ontology we define a class hierarchy of audit report domain knowledge, Figure 5.

Accuracy of auditing in corporate governance as a process-oriented ontology requires a long process of analysis, evaluation and validation and only after that it will be considered as an acceptable solution has been obtained for the problem defined.

If is wishes to develop problem to consider process refining that involves simplifying indicators, steps, reporting structures, so without losing the quality of the results to obtain valid conclusion of the audit.

5 Process Validation by Ontologies in Auditing

Note that solving a problem specific to registration on a level corresponding to each generation based on a knowledge obtained at a time. It speaks of object-oriented and comprehensive approach consisted in object-oriented analysis, object-oriented design, object oriented programming, object oriented databases which means that at this level of knowledge entire development cycle of systems included techniques, methods and technologies based on object orientation. Switching to another generation requires that all elements which contribute to the realization of a system to be based on the latest technologies. In this case we talk about a form of corporate governance process oriented auditing approach is complete if ontologies but everything about the audit is based on ontologies, including validation.

Process validation is very specifically in many areas of computer science applied to the data validation, diagrams validation, source texts validation processing validation to the most complex components included in software engineering. A valid means to conclude that an entity meets all the conditions subject to actual use in a specific context.

Auditing methods for improvement of corporate governance is based on a clear set of procedures designed that ultimately leads to a series of texts that form the final report by concatenation. The analysis of these texts constitute a linear list that works on the principle of seriality through a process of analysis equivalent to a continuous crossing leads to the conclusion that corporate governance was held on acceptable terms, and conditions fragmented crossing conclusion is contrary.

Build a validation process oriented ontology for auditing processes governing corporate returns to identify those elements that refer to an organizations collection that have specific audit for corporate governance oriented ontology.

It builds a small set of indicators that highlight the agreement between the audit result oriented ontology and the actual behavior of organizations with corporate governance on a time interval following audit.

Calculation of indicators and their aggregation allows getting a picture on the quality of the audit process.

Oriented ontology auditing processes analyzing of many organizations and aggregating information get that level will show that technology audit is rejected.

It is achieved in this way by focusing on ontologies homogenization of the audit process but also the validation process.

6 Conclusions

Corporate governance systems have a high level of complexity that requires a new approach when analyzed and subjected to evaluation. The auditing process is an important element for improving corporate governance and assuring the transparency, accountability in order to increase performance of organizations.

Corporate governance based organizations are subjects to regular audit process completed, which also requires a new approach to technology so that all elements of the virtual environment that reflects the dynamics of the process organization inputs. The only way to achieve this is oriented

approach in a accepted ontologies are defined sets organized in a structure abstraction, put in correspondence with elements of real sets and categories and concepts are related assessment appearances quantitative values in the intervals qualitative levels. Existing hardware and software resources and access any components thereof are operating such an approach.

Developing and implementing an ontology-based solution for validating, analyzing and assessing audit reports create a base for a collaborative decision-making support of auditors and audit reports users in order to increase the performance of organizations corporate governance.

Acknowledgement

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