EVALUATION OF THE ECONOMIC ACTIVITY THROUGH EXPERTS SYSTEMS

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Abstract:
The paper presents the complex process that represents the evaluation of the economic activity through experts systems. The evaluation of the economic activity of a company is based on how the assests are used in the process of businesses and how the combination of different factors are emerging in different results. An asset is by definition a resource controlled by an entity, the result of past events, and which is expected to generate future economic benefits. Certain economical assets are long-term assets used in the production of goods and services and are distinguished from fixed or tangible assets by lack of physical properties. They embody certain long-term legal rights or competitive advantages created or acquired by an enterprise. To evaluate these assets may be used expert systems that had a numerous instruments such as a knowledge database, rules, a programming language and other tools that permit to store different scenarious with a combination of data which conducts to various results. Every scenario may evaluate a certain asset that can be use in a combination with other assets and with an inference engine it can be choose the alternative that will provide competitive benefits.

Key words*: Economical assests, business rules, knowledge database, programing language, expert systems.*

Coduri JEL: C23, C26, C38, C55, C81, C87

1. Introduction

Intangible assets are long-term assets used in the production of goods and services and are distinguished from fixed or tangible assets by lack of physical properties. They embody certain long-term legal rights or competitive advantages created or acquired by an enterprise.

Intangible assets generally arise as a result of past events and have three main attributes:

- have no material substance,
- can contribute to obtaining net economic benefits from the holder;
- are legally protected or through a de facto right.

An intangible asset also includes the requirement for that asset to be identifiable, controllable, separable from the business in question. Given that the asset may be alienated only as part of the profit-making activity in which it participates, it is considered that it can not be dissociated from the goodwill associated with that asset

Activities, being accounted for in this way. From the economic perspective of the assessment, there are two key issues that need to be clarified about intangible assets, namely:

a) Which economic phenomenon is qualified as intangible asset?

b) What economic phenomenon is an indicator of the value of an intangible asset?

The distinction between the economic existence and the economic value of an intangible asset is essential for its assessment.

Just economic existence does not give intangibles and economic value. A registered trademark which is not exploited for the purpose of producing an income has economic existence. Over the protection period but not economic value and, as a consequence, can not be registered as intangible asset [1], [4]. In order to acquire an economic value, it should generate effects. A registered trademark that does not contribute to earning any income, but which is used as an entry barrier could have both economic existence and economic value. Thus, a definition of intangible assets should state that they are intangible, business-specific, have both economic existence and economic value, even if it is indirect.

2. The atributes of economic assets and the economic value of those

For an intangible asset to have a measurable value from the perspective of the economic analysis, it needs to have some additional attributes:

- generate a measurable amount of economical benefit to the owner. These may result either from an increase in revenue or as a result of cost reductions; such benefits are sometimes measured by comparison to size. The results available in the absence of the intangible asset and can be measured in several ways: net profit, net operating profit, and net cash flow;
- be able to increase the value of other assets with which he is associated; such assets could include all assets within the enterprise.

Economic phenomena that do not meet the specific attributes described above may not be qualified as distinct intangible assets. It is the case of descriptive phenomena such as:

- High market share of the owner / user;
- High profitability of the owner / user;
- Positive general reputation of the owner / user;
- Monopoly of the owner / user;
- Other economic phenomena.

Although these "descriptive" terms are not qualified as intangible assets, they may indicate the existence of distinct intangible assets that have economic value. Control, in the context of the definition of intangible assets, means the ability of an enterprise to obtain economic benefits through the holding and operation of that asset and to restrict access to these benefits.

In the case of intangible assets, control is normally provided by law: a franchise or license entitles the enterprise to access benefits over a fixed period; A patent or brand restricts the access of others to those benefits.

In the absence of legal rights, control is, however, more difficult to prove. However, control could also be achieved through physical custody. This would be the case where, for example, technical or other knowledge obtained from a research activity is kept not public.

If an enterprise is expected to be able to obtain economic benefits in the future but is not controlled by legal rights or physical custody, it is considered that it does not have sufficient control over those results in order to recognize the intangible asset. An enterprise could benefit from a portfolio of clients or a qualified team of staff. While it may be appreciated that there is a high probability that clients in the portfolio continue to seek professional services from the respective enterprise or that the group of specialists continue to offer its services in the absence of legal or physical custody of clients or staff, The enterprise has insufficient control over the estimated future benefits determined by their presence, and the conditions for recognizing them as assets are not met [2], [3].

A product may be associated with one or more intangible assets. For example, a certain drug can be associated with some legal rights:

- The only production right guaranteed by the existence of a patent;
- The right to trade under a given brand, secured by ownership of the trademark;
- The right to protection on the packaging used in the distribution of the product.

Every legal right does not necessarily represent a separate intangible asset. In order to be considered as separate intangible assets, the legal rights involved in selling the product and obtaining income must be independent of each other, which means that they must meet the following conditions:

- Their values can be measured separately;
- The cash-flows associated with each of them can be evaluated separately;

- There is the possibility of their separate alienation.

If it is possible for the production and distribution rights to be valued and negotiated separately, then they can be recorded as separate intangible assets.

However, it may be unlikely that the distribution process can be further divided. Brand names and packaging protection could be parts of the same intangible asset.

Generally, analysts classify intangible assets in a few categories. Assets in each category are similar in nature and function.

A common group of intangible assets is as follows:

- Intangible related to technology (proprietary technologies, know-how, systems and procedures, manuals and technical documentation, etc.).
- Intangible customer-related (customer lists, customer contracts, etc.).
- Intangible related to contracts (contracts with suppliers, license agreements, etc.).
- Intangible data-processing (computer programs, databases, etc.).
- Intangible related to human capital.
- Intangible related to marketing (business brand, product brand, etc.).
- Intangible location.
- Intangible assets in the form of goodwill.

Goodwill is a broad concept, and targets the company's ability to make additional profits. It groups all the elements indispensable to it:

a) Customer-related items:
- Number and quality of customers;
- Customer loyalty and attitude towards the enterprise;
- Opportunities for customer development;
- Good customer relations.

b) Suppliers:
- The choice of suppliers;
- Quality of service provided by suppliers;
- The opportunity to compete after discussing the supply conditions.

c) Staff related items:
- Competence of the staff;
- Relationship between staff and management.

d) Relations with banks:
- The quality and stability of the relationship with the bank;
- Credit lines;
- Long-term borrowing capacity.

e) Relationships with third parties:
- Payment of obligations to various social, tax bodies.

f) Business patrimony elements:
- The quality of productive assets;
- The quality of the premises (public catering establishments, commercial units);
- Quantity and quality of IT equipment.
g) Factors related to the production of the enterprise:
- The quality of the manufactured products or services rendered,
- The reputation of products and services;
- Competitive prices.
h) Business management elements:
- The quality of the people in management;
- The quality of the driving methods (the driving methods used).

There are classical approaches used to assess intangible assets. The cost-based approach includes several related valuation methods, differentiated by the type of cost used.

There are two fundamental cost categories that can be considered in the evaluation:
- Reproduction cost;
- Replacement cost.

There are subtle but important differences in the definitions of these types of costs.

The reproduction cost considers the recreation of an intangible asset identical to the one evaluated. It represents the estimated cost of constructing, at current prices at the date of valuation, an intangible asset identical to the one valued, using the same materials, production standards, design and quality of labor as for the intangible asset under review.The replacement cost considers the cost to recreate the functionality or utility the intangible asset in question, but in a form or appearance that may be different from that of the intangible asset evaluated. It represents the cost of recreating, at current prices, an asset having the same utility as the intangible asset of the valuation. However, the intangible asset with which the replacement would be created would have been created with modern methods, in line with current standards, by resorting to modern design and a highly skilled workforce. Consequently, the intangible substitute asset may have a greater utility with respect to the intangible asset [2], [4].

Another cost category that can be used is the historical cost that involves identifying the costs incurred over time with the development of the intangible asset concerned and updating them at the valuation date by means of an update factor calculated by taking into account a The corresponding inflation index. These cost categories provide a reasonable measure of the value of intangibles when two conditions are met. The first is to include all the components of the intangible costs and the second to the

correction of their value according to all forms of wear. Regardless of the type of cost to be estimated (breeding cost, replacement cost, historical cost), the analysis generally includes the following four cost components:

a) the material costs that include the expenses related to the tangible elements of the intangible development process; They are usually insignificant in relation to the global cost of developing an intangible asset.

b) labor costs typically have a significant share of the cost involved in the development of a intangible asset; They typically include the wages and bonuses of employees and all those engaged in the development of intangible assets; Even if historical records can be used as a basis for estimating labor costs, they need to be updated to reflect current costs at the time of valuation.

c) Fixed costs include utilities expenses, secretarial costs, costs involved in managing the respective activity by management, etc.

d) The profit that the creator of the intangible asset would have required to pay for his work; this cost element reflects the value in the sense that, if an intangible asset had externally developed to the enterprise, its creator would amplify the costs to include the profit element.

For the purpose of evaluation, the evaluator should consider the concepts of defunctionality and utility. Functionality is an engineering concept that designates the intangible asset's ability to perform its function for which it was originally designed.

Utility is an economic concept that designates the intangible asset's ability to provide an equivalent amount of satisfaction. Although the intangible asset considered as the basis of valuation performs the same task as the valued intangible asset, it may be more performing than the asset in question, thus providing greater satisfaction. The replacement cost determines the maximum amount a prudent investor would pay for an intangible asset. Insofar as it is considered that the intangible asset evaluated is less useful than an ideal replacement asset, its value should be adjusted accordingly [3], [5].

The evaluator must be careful to adjust according to this factor in the estimation of wear. Cost and value are not the same. Reproduction or replacement costs, almost always, will exceed the value because, in order to obtain the latter, the degree of wear is also taken into account. In order to determine the value, the cost of an intangible asset (replacement, breeding, historical) must be adjusted according to the degree of wear.

Because the intangible asset being evaluated is not completely new, it is theoretically inferior to a new asset that is the basis of valuation for cost-based approaches.

The forms of wear and tear that are generally considered in the cost-based valuation of intangible assets are as follows:

- functional wear and tear, reduction in value due to the inability of the intangible asset to perform the tasks or to ensure the economic utility for which it was initially conceived;
- Technological wear (form of functional wear), the decrease in the value of the intangible asset due to improvements in technology that make an intangible asset inferior to its replacement ideal; This form of wear and tear occurs if, due to improvements in design or production technology, another intangible asset is deemed to be more performing than the intangible asset evaluated; Often technological wear is considered a specific form of functional wear.
- External or economic wear is the reduction in value due to the effects, events and conditions outside the intangible asset that are not controlled by the current use or condition of an intangible asset; The impact of economic depreciation is usually out of control of the intangible asset holder and is generally considered to be irrecoverable.

Regarding the measurement of wear and tear, special care must be taken to differentiate the wear and tear of intangibles from that associated with the tangible assets involved in the activity. Qualitative methods such as Life Cycle Analysis and Remaining Life Analysis may be useful in assessing the degree of wear and tear of an intangible asset. In estimating the size of the functional, technological and economic wear of an intangible asset, considering its current age and estimated life expectancy, it is essential to properly apply cost-based methods.

The essence of these methods is to determine the value of intangible assets based on the additional profits expected to be obtained by the enterprise as a result of the holding and operation of the asset.

Applying this method involves a sequence of steps:

- Determining the additional cash flows that are expected to be obtained with credibility of the enterprise following the exploitation of the respective asset;
- Determining the explicit forecasting period (the estimated probability of the expected economic lifetime, the duration of which is expected to generate the additional cash flows);
- Determining the rate used to update (capitalize) the estimated additional cash-flows.

It should be noted that higher valuation rates (capitalization) are used for the valuation of intangible assets, due to the higher risks of not realizing the forecasts for obtaining estimated cash-flows.

Updating involves a limited (finite) time period. Capitalization involves an infinite period. These effects will be generated infinitely.

Additional net profits estimated to be generated by intangible assets may arise from the impact of their operation on either the enterprise's revenue or costs.

From the point of view of revenue growth, an intangible can lead to:

- increase sales volume;
- obtaining a higher price;
- winning new markets;
- obtaining a dominant (monopolistic) position on the market;
- providing future business sources;
- developing new products and new markets;

From the point of view of reducing costs, an intangible can lead to reducing wage costs, reducing utility consumption, reducing scrap and losses, reduction of commercial (promotion) costs, ensuring cheap and safe sources of funding (reducing financing costs).

3. The characteristics of expert systems that are used in the economic evaluation

An Expert System (ES) is a complex application (a software program) that explores a multitude of knowledge to get new findings about difficult activities to examine using methods similar to human experts. An expert system can succeed in problems without a deterministic algorithmic solution. The main features of expert systems are:

- A database (knowledge base), together with
- A deduction algorithm specific to the reasoning method.

Expert systems are a field of artificial intelligence, the branch of information technology that aims to develop intelligent programs and applications. What is remarkable for expert systems is the wide range of applicability, which has already covered many areas of activity.

An expert system consists of the following main components:

- The Knowledge Base - serves to store all knowledge elements (facts, rules, methods, solvers, heuristics) specific to the application domain, taken from human or other sources.

- Inference engine - is a program in which the knowledge of control, procedural or operative is implemented, which exploits the knowledge base for making judgments in order to obtain solutions, recommendations or conclusions.

- User Interface - allows user dialogue during consultation sessions as well as their access to basic facts and knowledge for adding or updating the database.

- Knowledge Enrichment Module - Helps the expert user to introduce new knowledge in a form that is supported by the system or to update the knowledge base.

- The explanatory module - has the role of explaining to users both the knowledge of the system and its rationale for obtaining solutions in the consultation sessions.

Explanations in such a system, when properly designed, also improve the way the user perceives and supports the system (feedback).

The knowledge base is made up of two parts: the basis of rules that contains general knowledge in the field of expertise and the basis of facts formed in particular from the knowledge specific to the problem being solved. The rule-based elements are enunciation of the form:

If condition then action.

The rules were taken over in the SE from mathematical grammar structures, where they are called production rules; hence the initial designation of SEs of production rules systems or production systems. The conditional part of a rule is also called antecedent, or left hand (LHS), and the action is also called the consequence, or part of the conclusion, or the right part of the rule "Right Hand Side" (RHS). The conditional part of a rule may contain one or more elements, which are called patterns. Syntactically, they will be of the same form as facts in the facts base and between all the patterns in the conditional part of a rule is understood the conjunctive operation. The elements on the right of a rule will be called actions, and, as for the left, between actions there is implicitly the conjunction operation [5], [6].

The basis of facts is also called work memory and contains statements that are considered true at that time, that is, facts; they must be syntactically identical to the rule patterns.

The inference engine is the one to determine all the rules that are activated, thus making the correlation between the facts base and the rule base, and then it also selects one of the rules that are activated at a given time, which it puts into execution. Execution of a rule means the implementation of the right part of the rule, which may have one or more effects such as modifying the facts base, transmitting messages to the operator, or transmitting signals to the outside, depending on the actions provided for in part To conclude the rule.

At the beginning of the operation, the baseline must contain the situation that is initially valid for the problem at work and is loaded by the user through an appropriate interface. This interface, which provides the way of communication between the user and SE, can also be used during SE work. Thus, once the working memory has been loaded, the user starts the SE consultation. The inference engine initiates a search in the knowledge base trying to solve the problem proposed by matching the left parts of the rules with the facts in the working memory and executing the rules that are being activated. SE may ask questions to the user when working, when he gets stuck (he did not solve the proposed problem and can not activate any rule) by using this dialog in the same interface. This also illustrates the difference of principle

from conventional programming: the path that the inference engine will follow to reach the solution is not determined in advance. It depends on the user's problem (the baseline state of the facts) and the responses the SE receives during work. It is also worth mentioning that the above explanation refers to SE using forward search.

The user interface is also related to two other components: the explanation subsystem and the knowledge acquisition subsystem. If the inference engine, the knowledge base, and the user interface are always present in an SE, the other two subsystems are optional in an SE, and are often present in an SBC.

The explanation subsystem is the one that, guided by the inference engine, ensures that the user tracks the solution path. This is easy to accomplish in an SE by memorizing the order in which the rules were executed. The explanation subsystem may allow the user to ask SE questions (such as: why? how? but if?) And in such a case he may himself be an SE who, having access to the knowledge base of the main SE and keeping track of its evolution, resolves these questions.

The Knowledge Subsystem allows the user to introduce new knowledge, mainly on a rule basis, by creating new rules or updating existing rules. Unlike the factual basis, which has a dynamic character, evolving during the work of the SE from the initial state, the one corresponding to the formulation of the problem, to the final state in which the problem is solved, the evolution produced by the action (run) SE, the basis of rules has a static character. It stores knowledge that is generally valid for the field of expertise and its modification is done off-line, ie outside of the SE; this is the most common case. In addition, the knowledge acquisition subsystem and the user interface must ensure that the user is updating the knowledge base, which requires an automatic encoding of the information provided by the user without the presence of the programmer [1], [5].

If knowledge acquisition is required even during SE run, or if an SE adaptation is required according to the information gathered from the environment, as may be the case for some knowledge-based control systems, then the rule base may also become The knowledge acquisition subsystem and the user interface (or process interface) must be modified, in which case the SE may improve its behavior over time by making appropriate, on- If the first rule-based programming environments did not allow for a dynamic character for the rule base, the current ones have such facilities, leaving it to the SBC builder to develop an appropriate interface for acquiring knowledge.

Developing a system involves acquiring the knowledge base by acquiring knowledge from experts or from other sources. Knowledge is separated in declarative knowledge (the basis of facts) and procedural knowledge (the basis of rules). Development also includes the construction or acquisition of an inference engine as well as other component modules.

SE consultation:

Once the system is developed and validated, it goes into user exploitation. If users want a tip, a recommendation, or another result from the system, it is launched in the chat session that takes place through a dialog, namely:

- The user can ask questions in order to obtain facts about the specific situation in which he is;

- The system accepts the questions and answers. This effort carries out the inference engine, the only one who decides which altogether to use to look for the most appropriate answer to the question. Expert systems can also ask questions and can expect user responses. Improving expert systems - is possible in many ways and is done through a prototyping process.

An important aspect in PROLOG is the satisfaction of the purpose of a program. By convention, it is called the set of facts in a baseline program, and the set of rule-based rules. In the first step it is considered that the program contains only facts. Assume that the goal has the form p1, p2... pn. If the goal does not contain variables then the clauses are satisfied in the order in which they are listed. If the base of facts can satisfy the whole purpose, PROLOG responds with "yes" and otherwise responds with "no". If the goal contains variables, then the goal is to find all the possible links for variables that satisfy the purpose.

Consider the following program:

```
/* Program 1 */
domains
  nume_pers = symbol
predicates
  debitor(name, forename)
  creditor(name, forename)
clauses
  debitor(name1, forename1).
  debitor(name2, forename2).
  creditor(name3, forename3).
  creditor(name4, forename4).
```

Here's how PROLOG responds to the following queries:

```
Goal : debitor(X, forename1)
  X = forename2
  X = forename3
2 Solutions
Goal : debitor(name1, X), creditor(name2, X)
  X = name1
1 Solution
Goal : debitor(name1, X), creditor(name3, X)
```

No Solution

In the case of the first query, the two solutions correspond to the two facts associated with the debtor predicate that have the second argument identical to the ionescu object. In order to satisfy this purpose, at the meeting of the debtor (popescu, ionescu) occurs the binding of the variable X to the name1 object.

The following basic programming principle in PROLOG is applied:

The knowledge base is inspected to meet the goal. After each goal fulfillment, if the purpose contains variable names, it is attempted to resolve it in order to find all solutions that satisfy the purpose. As facts are used to meet the goal, they are "marked". Before resolving the goal, the variables are unbound from the values obtained, after which the knowledge base is inspected from the last mark of the mark in order to obtain another possible link [4], [6].

The presence of the anonymous variable on the place of an argument states that it does not concern the value of the argument but only the existence of such a value.

4. Conclusions

If an enterprise is expected to be able to obtain economic benefits in the future but is not controlled by legal rights or physical custody, it is considered that it does not have sufficient control over those results in order to recognize the intangible asset. An enterprise could benefit from a portfolio of clients or a qualified team of staff. While it may be appreciated that there is a high probability that clients in the portfolio continue to seek professional services from the respective enterprise or that the group of specialists continue to offer its services in the absence of legal or physical custody of clients or staff, The enterprise has insufficient control over the estimated future benefits determined by their presence, and the conditions for recognizing them as assets are not met [1], [3]. The expert systems may help to evaluate the assets of a company by using a number of scenarious and the results of these simulations are stored in a knowledge database. The usage of such database may increase the number of scenarious and the changes of values and parameters inside the PROLOG programing language helps to obtain various results that can help the management of a company to take the right decision in the current economic environment.

References

[1] L Kaufmann, Y Schneider, "Intangibles: a synthesis of current research", Journal of Intellectual Capital, 2014;
[2] J Guthrie, R Petty, K Yongvanich, "Using content analysis as a research method to inquire into intellectual capital reporting", Journal of Intellectual Capital, 2015;
[3] Luiz Antonio Joia, "Measuring intangible corporate assets: linking business strategy with intellectual capital", Journal of Intellectual Capital, 2016;
[4] B Lev, JH Daum, "The dominance of intangible assets: consequences for enterprise management and corporate reporting", Measuring Business Excellence, 2015;
[5] Parsaye K., Chignell M., "Expert systems for experts", John Wilez, New York, 2014;
[6] Weiss S. M., Kulikowski C. A., "A practical Guide to Designing Expert System",
Chapman and Hall Ltd., London, 2015;
URI: http://www.expertsystem.com
URI: http://www.sciencedirect.com
URI: http://ecomputernotes.com
URI: http://www.acronymfinder.com/Database-Systems-for-Advanced-Applications.html