Business Models and Substantiation Rules: Towards Implementation with Specific Expert Systems

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Abstract
The modeling of the future of human society has a close connection with the modeling of the business ecosystem, of the economic entities present within it, with the strategic trends according to which it evolves intrinsically and extrinsically, with the direct and indirect repercussions that follow. Systemic economic processes involve the development of several management decisions at the three identifiable organizational levels: entry-level, middle level, and top management. The purpose of the research presented in the scientific communication is to implement the concepts and paradigms taken from Artificial Intelligence, expert systems, their adaptation, and strategic operational flexibility to solve the specific challenges of modern business models. Choosing specific concepts and paradigms for this type of operation is preferable to be made closest to the specificities of classical human thinking. Business models generating economic performance and superior added value facilitate the interaction between the human decision-maker (systemic manager) and the corresponding software tool, the decision-maker understanding and using the advantages offered by it. Another approach is that in which it is necessary to understand and analyze why a particular decision that leads to a certain systemic operation of the economic organization studied was generated, the answer to the question "why?" becomes relevant, that is the solution made available to the human decision-maker. This type of approach, with the help of Artificial Intelligence paradigms, becomes operationally and strategically reliable, only if it conforms to human thought and reasoning. The research method is structured in two planes, the first one that presents and describes the scientific-theoretical foundations used, the second the applicative transposition, at the operational-strategic level presents the procedures and algorithms considered representative in the case of expert systems specific to business models. The final results of this type of systemic approach, the extraction, the description, and the resulting conclusions are presented. The last motivation is that related to utility and effectiveness issues, operational experiences of this type, induce, at the level of the decision-making manager, strategic resolution processes with a very high degree of efficiency, systemic algorithms generating economic performance being subsequently developed and transposed strategically.

Keywords
Artificial Intelligence; business models; expert systems.

Introduction

The challenges to which modern economic organizations are systemic, and, upon careful observation a multitude of common points are identifiable between the business models addressed and the technological systems. Within the latter, engineering sciences have solved much of the problems arising by promoting innovative concepts and paradigms, transposed operationally under the name of Expert System (E.S.), these are high-performance computer applications that incorporate the professional knowledge of a human expert, simulating operationalized reasoning (Nilsson, 2009; Nilsson, 1998) to achieve solutions in certain areas of expertise, the human expert being defined as a high-class specialist for certain well-defined areas (Baader, 2003). These facilities are offered by Artificial Intelligence. Expert Systems are proactive, intelligent responses that help to develop managerial decisions within economic organizations, at different systemic levels. One could notice a very important area of applicability for a wide variety of business models.

Expert systems are practical software tools, which carry out systemic processes of knowledge and data analysis, develop algorithms and procedures (Pearl, 2009) specific and adaptable to the business models for which they are intended, obtain concrete results, beneficial to all the decisive levels of the economic organization for the challenges that come from the ecosystem in which it is positioned. From an operational and strategic point of view, an expert system is a proactive software structure (Jackson, 1998), based on the search, analysis, and processing of the knowledge base, by methods specific to reasoning paradigms.

Two disjunct but complementary hubs are structurally identifiable:

(i) Algorithms, procedures, and programming technologies, this assembly enables the use of an extended volume of knowledge, as well as inference with the latter;

(ii) Applicative, practical methodologies offer access to this type of concept, paradigms, and rational approaches.

Within an expert system "rationality" and "knowledge" are treated separately. Their intertwining and complementarity for a good strategic operational functioning, are essential. The entity (singular or team) that decides to implement an expert system at the organizational level, has a clear picture of the problem of the organizational business model, an innovative concept, that of the "knowledge engineer" (software specialist, data analysis, and interpretation) appearing, certain knowledge bundles are reformulated, made flexible, available to the implemented computer application. The operational-strategic tools specific to expert systems are chosen according to the business model addressed, the knowledge base that is viewed, captured, represented, we note that their use generates much faster calculation speeds and implicitly the resolution of decisional processes.

The different concepts and paradigms specific to each software solution (programming languages), try to improve the computing power of the machine (computer) used, the development of a computer solution being based on the idea that the symbols processed are alpha-numeric, logical, texts or other. These are physical symbols, commonly found within the business models implemented and operationalized for the economic entities studied. Modern Expert Systems (Pearl, 2009) specific to economic applications, backed by latest generation hardware architectures that utilize state-of-the-art, top tier technologies, improve and sometimes even optimize the resolution of the challenges that come from the current ecosystem.

Inferential systems based on rules such as "General Problem Solver (G.P.S.)" find their usefulness in developing business models. Thus, a rigorous analysis of how intermediate targets are reached is carried out. The paradigms introduced are motivated by a target to be reached, thus replacing a lot of inferences that are difficult to justify. Such an approach is made in the form of recursive deduction, which offers expert systems used in economic models the ability to generate a very high degree of efficiency. The concepts and paradigms commonly used operationally are specific to inferential strategies, in the framework of the approach using Artificial Intelligence tools, these are neuro-mimetic algorithms similar to human reasoning (Geffer & Bonet, 2013).

In this paper, we try to highlight the concept of "inference" as that logical operation of deriving a statement from another statement that admits reasoning with the value of truth, verified, due to a connection with other reasonings considered with the logical value of truth. To address the challenges from the business ecosystem, the modeling of decision-making processes developed by experts is based on a finite set of rules, similar to those used by G.P.S. This is the way expert systems specific to business processes are created, to achieve competencies comparable to human ones.

Starting with their large-scale use in engineering sciences and processes our idea is the extrapolation of this type of approach and systemic piloting to business processes as well, from an application of Artificial Intelligence to a highly globalized and dynamic economy. We promote the idea that data knowledge and not necessarily algorithms are those factors that guarantee the intelligent behavior of an operational-strategic software (Dechter, 2003). A systemic approach with the help of expert systems provides certain resolution tools for the challenges arriving from the business ecosystem, in which the conclusions reached are well structured and reasoned by diagnostic analysis and data interpretation. This has a decisive role in the elaboration of the strategic operational decision by the human decision-making manager, regardless of the internal organizational level on which he/she is positioned - entry, middle, top level.

A way of strategic operational analysis, understanding, and transposition of business models is provided by the approach which makes use of *inference through recurrence* (Pearl, 2009).

Operationality, identification of the targets in the business ecosystem

In the case of business models aimed at achieving a final business target it is recommended to apply the totality of possible rules in the back (retroactive) direction, this process guarantees the identification of intermediate targets in the business ecosystem. The process thus induced is an iterative one, intermediate targets (under the objectives of the model) are always reduced, which leads to systemic retroactive chaining of the rules used, the process comes to an end when no rules are any longer applicable to the multitude of "operational route", intermediate targets.

In theory, any economic organization is structured on three decision-making levels: entry-level, middle level, top level (Geffer & Bonet, 2013); a representative, recurring procedure, solves the challenges that arise from the business ecosystem and is representatively presented as follows:

$R2, Target \rightarrow \{SB1 = superior\ decision - making\ level\ (?y, Decision1)$
$SB2 = equivalent\ decision - making\ level\ (?y, ?x)\}$
$R1, SB1 \rightarrow \{SB2 = equivalent\ decision - making\ level\ (?y, ?x)$
$SB3 = equivalent\ decision - making\ level(?w, Decision1),$
$SB4 = higher\ decision - making\ level(?y, ?w)\}$

We note that under the (intermediate) targets positioned in this last business ecosystem, they are possibly entirely satisfied within the informational database specific to the economic organization, move to a process of substituting the variables involved, as follows

$E1: \{?y = Decision2, ?x = Decision1\}$
$SB2 \rightarrow$
$E2: \{?y = Decision3, ?x = Decsion4\}$
$SB3 \rightarrow \{?w = Decision2\}$
$SB4 \rightarrow \{?y = Decision3, ?w = Decision2\}$

The two possible substitutions offer, in a certain mix, two ecosystems that allow the deduction of the solution sought:

$$E1: \{(?y = Decision2, ?x = Decision1) \wedge (?w = Decision2) \wedge (?y = Decision2) \wedge (?y = Decision3, ?w = Decision2)\}$$
$$E2: \{(?y = Decision3, ?x = Decision4) \wedge (?w=Decision2) \wedge (?y=Decision3, ?w=Decision2)\}$$

We notice that the first of the two tackled environments is "contradictory", so it is not reliable as a solution, the procedure, therefore, offers as a result, .$?x = Decision4$

The information flow used between the business model's components includes a recurrent inference engine, in which we distinguish, “rule bases", "databases", the processes including, "tracked target pairs, rules", "choice", "appropriate pattern (paternal match)", “waiting queue", "substitution of variables", "implementation of a new ecosystem".

In the case of modern, optimized, and dynamic business models, we find that recurring procedures and algorithms (retroactive chaining), have an increased degree of complexity for an economic process, depending on the intermediate targets pursued and the ecosystems addressed. If each intermediate target is systemically isolated, there is a risk of solving more than necessary, which implies increased costs and allocations of time, only one of the economic ecosystems generated must be uniquely satisfied (Krzysztof, 2003). If each ecosystem is approached and treated in isolation, the activity is repeatedly operationalized for each intermediate target that occurs in more than one ecosystem.

Improving the structure of the inference algorithm, for the corresponding business model, intends to traverse the totality of operational environments (ecosystems), verifies the paradigm in which the ecosystem contains only variable substitutes so the procedure used can be stopped at any time. If not, it must go through all the ecosystem's targets to allow unification with a sentence used in a database or be reduced to other sub-objectives.

The logical-operational structure of such an algorithm for business models is presented below:

$$Recursiveness\ procedure\ (R, F, B)$$
$$envs < -\{initial - objectives\} = B$$
$$repeat$$
$$e < -first\ (envs), envs < -stays(envs)$$
$$if\ all\ targets\ of\ e\ are\ reached\ then$$
$$instant\ return\ \big(targets\ (e), unifiers\ (e)\big)$$
$$for\ all\ targets\ b \in e\ do$$
$$for\ all\ sentences\ p\ contained\ in\ the\ base\ of\ F\ do$$
$$if\ U < -UUNIFIER(p, b) \neq ECHECthen$$
$$add\ (e \backslash b) \cup U\ to\ the\ queue\ envs$$
$$for\ all\ rules\ r\ in\ the\ R\ rule\ base\ do$$
$$if\ U < -UNIFIER(right\ (r), b) \neq ECHECH\ then$$
$$add(e \backslash b) \cup instantly(left(r), U) to\ the\ queue\ envs$$
$$until\ envs = void$$

Decisional conditions, rules involved

It is noticeable that within business models, forward or backward chaining (recursive) is made after a set (group) of rules such as:

$$most\ expensive\ (?x) => more\ expensive(?x, ?y)$$

this type of approach uniquely uses recurrence mechanisms, since forward chaining requires (induces)unification with an infinite number of functional entities.

$$high\ level\ decision(?x, ?y) => decision\ preparation\ (?x)$$

process with a high degree of similarity, chaining, systemic interconditionality takes place, in this case, in the operational structure before.

The managerial decisional practice induces the conclusion that recursive systemic processes offer a better solution, for clearly defined business models for a final organizational target and the crossing of a string of intermediate targets, often found in diagnostic analysis processes and strategic planning. We notice that a lot of rules are involved in achieving the same intermediate target (operational-strategic route), thus the hypothesis arises that each working hypothesis requires a disjunct analysis, so a lot of underlying targets are determined by the rules used must be determined. Expert systems, flexible and adapted to modern business models, with the totality of the conditions imposed on them, require the development of "meta-rules", these are the ones that develop the rules specific to organizational operationality (Goldberg, 1989).

The fundamental function consists in identifying solutions, expert systems, in this approach having three fundamental functions identifiable, as follows:

(i) Identify the ability to generate questions to the user if the available information is insufficient, to answer the challenges;
(ii) Providing explanations of the reasoning that allows a conclusion to be drawn;
(iii) Identification of mechanisms for handling information with a quantifiable level of decision-making uncertainty.

Approaching business models with the help of expert systems

In the case of approaching business models with the help of expert systems, the totality of intermediate targets to be achieved in the systemic process for the final target are identifiable, with the help of sampling and interpretation mechanisms of data considered relevant. The vulnerability of this approach stems from the induction of significantly high costs for this kind of approach; to lower, even optimize them, the expert systems applied in strategic operational practice must operate only with the strictly necessary quantity for the inducted handling. Expert systems used in business models have as their specific particularity procedures and algorithms enabling the appearance of an explicit request for informational complements (Geffer & Bonet, 2013). By exemplifying, we approach an expert system that signals the errors of the human decision-maker, in generating the decision in the case of organizational financial flows.

The economic organization's diagnosis session uses at the beginning numerous initial information such as the name of the economic organization, the economic history (balance for the last few years), (percentage) posting within the business ecosystem, visible trends identifiable at the organizational top management level.

Based on these well-defined concepts, the expert system adapted to the business models develops hypotheses when financial losses can be foreseen, proposes tests and measurements that must confirm or disprove the operational paradigms in which we position ourselves, the implemented expert systems must have heuristics that avoid unsustainable costs, generate financial optimization processes, even reach groups of operationally executable tests together, it is difficult to obtain a significant amount of information based only on the "question-answer" system (Sowa, 1983).

A very reliable way of solving is to provide from the beginning all the necessary information after the initiation of a "questions-answers" program, to end-users, from the beginning of the operation, having at its disposal all the necessary and sufficient information to respond to the challenges coming from the business ecosystem, the vulnerability that arises is reduced to the problem of bias for a graphical interface.

Justification of the decision-making process, the systemic strategic operational activity

Whether they are used directly or are just "useful helpers", for the human decision-maker, the expert systems practiced by the organizational top management, generate important consequences in the systemic strategic operational activity, any errors in the operational implementation of the chosen expert system having possibly significantly affected economic results. We believe that the human decision-maker who interferes with the expert system must continuously check the data provided by it in an operational flow and also have an overview of the machine-assisted systemic processes, with the induced algorithms and procedures (Nilsson, 2009).

The decision-making conclusions induced by the expert system must be rational and managerially justifiable. In the case of systems structured with the aid of rules, each decision-making conclusion generated is supported by a chain of rules starting from the information initially provided by the beneficiary user. This set of rules, in natural language, represents the justification and argumentation of the results obtained. In practice, it is a dialogue process in which intermediate targets, appear one after the other chain, the result of reaching a final, main target, argues the necessary systemic interrogations (Rossi, van Beek, & Walsh, 2006).

Below are some arguments of the expert system on the question,"*WHY*?"

Question WHY?

In this series, *how many* competing economic organizations ?

typical question

∗ *WHY* (*motivating the question for the user*)

[*Why is it important to determine the number of competing economic organizations*?]

the expert system reformulates the question in natural language

[1.0]*This identifies possible significant vulnerabilities for the adopted systemic business mod*

It has already been established that

[1.1]the data are taken from the business ecosystem

[1.2]*the competing economic organizations i greater that two*

Therefore, *if*

[1.3}*the number of competing economic organizations which were positive for*

ECONOMIC ORGANIZATION − 1 *is greater than two*

Then

there is a suggestive evidence that there is a significant vulnerability

associated with this occurence of competing economic organizations

ECONOMIC ORGANIZATION − 1

[*RULE* 049]

The WHY question enters a repetitive cycle, the explanations provided are tested as arguments

∗∗ *WHY*

WHY *is it important to determine if there a significant vulnerabilities*

[2.0]*This will help to determine a diagnosisfor which*

the decision must be examined and possibly modified

If the explanations generated by the expert system for the question "*HOW* ?" are desired, it has the following structure:

$* \ HOW[1.1] user's\ request\ for\ information\ [1.1] delivered\ by\ the$
$previous\ question\ WHY$
$How\ is\ determined\ that\ data\ are\ taken\ from\ the\ business\ ecosystem$
$the\ expert\ system\ reformulates\ the\ question\ in\ natural\ language$
$[3.1] RULE\ 001\ was\ used\ to\ conclude\ that\ there\ is\ a\ suggestive\ evidence\ that\ data\ was\ taken\ from\ business\ ecosystem$
$HOW[3.1](\text{Another user request})$
$[How\ was\ RULE\ 001\ used]$
$It\ has\ aleready\ been\ estabilished\ that$
$[4.1] the\ site\ of\ competing\ is\ one\ of: those\ sites\ from\ which\ the\ business\ ecosystem\ depend\ upo$
$[4.2] the\ method\ of\ approachis\ one, recognied\ method\ of\ approach$
$[4.3] it\ is\ not\ known\ whether\ the\ cade\ was\ taken\ the\ approach$
$Therefore$
$there\ is\ strongly\ evidence\ that\ the\ approach\ was\ taken$
$from\ business\ ecosystem$
$[RULE\ 022]$

Inference within economic models

In the strategic, systemic operational processes applied to economic models (Pearl, 2009) it is possible to reach the hypothesis that a conclusion is conditioned by a working hypothesis (logical-proposition approach) that is false, a rule of the type:

$$quantitye_{low} \wedge \neg => duty - free$$

We identify that this rule cannot be a Horn clause, i.e. an approach to letter disjunction, with at most one positive letter. Table1 details the types of Horn clauses ad the related disjunction and implication forms.

Table 1. ***Type of Horn clauses and mathematically related disjunction and implication forms***

Type of Horn clause	Disjunction form	Implication form	Read intuitively as
Definite clause	$\neg p \vee \neg q \vee ... \vee \neg t \vee u$	$u \leftarrow p \wedge q \wedge ... \wedge t$	assume that, if *p* and *q* and ... and *t* all hold, then also *u* holds
Fact	*U*	$u \leftarrow true$	assume that *u* holds
Goal clause	$\neg p \vee \neg q \vee ... \vee \neg t$	$false \leftarrow p \wedge q \wedge ... \wedge t$	show that *p* and *q* and ... and *t* all hold[note 1]

The logical approach, no inference process can lead to a specific conclusion.

It is impossible to tackle the rule of operationality without demonstrating the reverse, this approach is known in specialized literature as the "*Principle of Logical Denial as Failure*" (Pearl, 2009):
$If\ the\ inferential\ engine\ used\ for\ the\ business\ model$
$cannot\ prove\ p, then\ we\ assume\ \neg p\ is\ true.$

We identify a second challenge that occurs at the level of the operationalized business model, there is no (middle) way of knowing when a p hypothesis is reached, it is possible to follow the erroneous paradigm in which the procedure finds no active inference, but logical statements must be interpreted:

$$\neg p => q$$
$$\neg q => p$$

The use of the first rule implies that the second rule is never used, so logically$\neg p \ and \ q$; if the second rule is used we conclude that $p \ and \ \neg q$, a reverse situation from the first tackled case.

This type of approach is directly related to the fact that negation explicitly generates a non-monotonous character that is not identifiable in classical logic, a sentence with the value of truth, true, can subsequently become false.

Non-monotonous inference for economic models

Addressing the economic problem with the help of inference concepts and paradigms are based on true considerations, (Geffer & Bonet, 2013) always growing monotonously, so we are dealing with a monotonous logic, but from day-to-day practice, it is known that human thinking is most often non-monotonous; for example, if the conclusion $Org = economic \ organization$, that $operational \ (Org)$ is totally reasoned, so the rules are :

$Economic \ organization => Operationality$, if this rule is not correct it is replaced by:

$$economic \ organization \wedge \neg \ operational \ department - removed \wedge \neg \cdots => operationality$$

A useful formulation for an operationalized economic model is that of "fault logic", in this case, the rules include negative conditions:

$$economic \ organization \wedge \neg \ abnormal => operational$$

The inference process takes place in the absence of explicit knowledge of the negative conditions if the assumption that such a condition is not satisfied is deductible, the inferential system must modify the conclusions and all the conclusions that have gone from here for a correct validation process of the reasonings carried out, so that they remain valid.

We note that the withdrawal process must follow the succession (chain) of inferences identified a certain fact.

There is an operational possibility for this type of treatment to be automated, which in scientific literature is called the R.M.S.: Reason Maintenance Systems (Sowa, 1991). In the approach by classical logic, the number of facts identified always increases monotonously, so we identify a monotonous inference. In opposition, the inference engines are the ones that offer the possibility of withdrawal of facts, in this case, we affirm that these processes are non-monotonous.

Maintaining systemic consistency within business models

The systemic approach to consistency for business models involves two aspects considered relevant:

(i) Representation of economic facts allows the expression of the uncertainty faced by the business model, in the case expressing the uncertainty for the validation of a sentence is desired;

(ii) The manner of addition and sampling, to eliminate useless statements within the database is observed, this procedure must maintain the consistency of the group, the assembly.

Operational application for business models

Within a consistent maintenance system applied to business models, (Nilsson, 1998) each logical sentence, becomes a node that is endowed with an explicit state, which conditions its logical credibility, in one of the two options, IN or OUT; the first position demonstrates that the inferential engine demonstrates the sentence, as premises or the consequence of a premise, the second position shows that the inferential engine does not have enough information about the veracity of the sentence.

The reasoning maintenance system (R.M.S.) opts in its operationality for different attitudes, according to the nature of the node treated:

$$= (OUT\ n), \big(OUT\ (NOT\ n)\big) :$$

$$the\ system\ knows\ nothing\ about\ the\ veracity\ of\ n$$

$$= (IN, n), \big(OUT (NOT\ n)\big): the\ system\ perceives\ n\ as\ true$$

$$= (OUT\ n), (IN (NOT\ n): the\ system\ perceives\ n\ as\ false$$

$$= (IN\ n), \big(IN\ (NOT\ n)\big): contradiction$$

A node marked with IN is withdrawn, when this node becomes OUT, a consistency maintenance algorithm, it must be ensured that all the resulting statements are also withdrawn. If a node marked by IN is identifiable as having become contradictory, this indicates that a contradiction with the previous ones, which allowed the node to be identified.

In order to be able to resume this type of approach, specific to business models, each node within an R.M.S. contains "justifications" indicating the totality of the inference routes by which that node is inferred.

The justification has the following operational structure:

(i) The rule that generated the associated sentence at the node, as a conclusion.

(ii) The nodes are used to meet the conditions imposed by that rule.

To improve the effectiveness of tackling business models with the help of Expert Systems, an R.M.S. explicitly maintains the connections between any identifiable node and the subsequently induced consequences, it is representable by a list as follows:

$$(\frac{IN}{OUT} < sentence >< justification >)$$

Several justifications are admissible within the operationalized business model, they are added at the end of the list, the same sentence can be inferred after several inferences (Pearl, 2009).

The rule that enables the analysis of the operationality of an economic organization is in the form of:

$$ECONOMIC\ ORGANIZATION - FUNCTIONAL$$
$$(IN\ economic\ organization(?x)?j1) \wedge (OUT\ abnormal\ (?x)?j2 =>$$
$$(IN\ operationality(?x)\big(OPERATIONAL\ ECONOMIC\ ORGANIZATION?j1\ (OUT?j2)\big))$$

If we note the justification of the two conditions with A and B, then:

$$OPERATIONAL\ ECONOMIC\ ORGANIZATION\ A\ (OUT\ B)$$

justifying the conclusion resulting from the application of the rule.

Operationalization of the statement algorithm and withdrawal of the statement, business models

A consistent maintenance system is correlated with an inferential engine which implies that all the assumptions hosted by the database are operationalized with R.M.S. that is initialized operationally with the help of two facilities:

(i) If a sentence is inferred by means of an inferential engine, R.M.S. adds as a node within the database if it does not yet exist; it must be put in the IN state and installed with the justification corresponding to the new type of reasoning;

(ii) If they identify a contradiction the withdrawal of a fact is desired, the node must be brought into the OUT position.

Each operation initiates the "Consistency Maintenance Algorithm", which has a propagation effect within the databases used for the business model approached.

The structure of the algorithm used has the following composition:

- (i) A node for a sentence becomes an argument for a new justification, otherwise, we create a new node N to which we associate this justification, the state of the node is IN or OUT, according to the statement made;
- (ii) We develop a string (list), L containing all the consequences of N;
- (iii) For all nodes in list L, the justifications for identifying a validity independent of N are re-evaluated, if the totality of these nodes are invalidated they are taken to the OUT position and the recursive property of the consistency maintenance procedure is applied, otherwise, if the valid justification exists, we mark that node with IN;
- (iv) We check if there are contradictions if a node allows the deduction of a "nogood" node we identify a contradiction, the expert system used detects a contradiction, until a "nogood" node becomes IN, which signals that the inferential engine must withdraw the nodes to position us in an OUT state;

The main feature of the consistency maintenance algorithm is that of propagating the changes of a node with the consequences arising from this, this process may become costly if that node has a large number of underlying consequences.

Hypotheses for general argumentation

A R.M.S. is likely to be used to demonstrate the transitivity of the engagement rule, as follows:

$(1) A => B\ (premise - initial\ condition)$
$(2) B => C\ (premise - initial\ condition)$
$(3) A\ (hypothesis)$
$(4) B (modus\ ponens\ (1),(3))$
$(5) C\ (modus\ ponens\ (2),(4))$
$(6) A => C\ (conditional\ proof\ (5)(3)(1)(2))$

Conceptually rules of inference are used to infer conclusions such as “modus ponens”, where "A" and "if A then B" are given, then "B" must be inferred". A similar process may be developed, even if the operationalized derivatives are of increased complexity. Another approach is structured on assumptions offered by a process of "indirect proofs": the opposite of the desired target (goal) is assumed, a logical contradiction that appears within the business model implemented is sought. In the computer structure below, we see an example for the previous statements:

$(1) A => B\ (Premise)$
$(2) B => C\ (Premise)$
$(3)(NOT(A => C)(Indirect\ proof\ assumption)$
$(4)(AND\ A\ (NOT\ C)(Equivalence\ 3)$
$(5) A(remove - and\ (4))$
$(6) B(modus\ ponens\ (5)(1))$
$(7) C\ \left(modus\ ponens\ (6)(2)\right)$
$(8)(NOT\ C)(remove - and\ (4))$
$(9) CONTRADICTION((7)(8))$
$(10)(A => C)(Indirect\ proof\ (1)(2)(9))$

The role of expert systems in the development of the managerial decision for business models implemented within economic organizations, together with modern solutions, such as E.R.P. and C.R.M. becomes practically a performance and systemic growth vector (Dechter, 2003).

Conclusions

In this article, we have reported that systemic economic processes involve the development of several management decisions and the use of Artificial Intelligence in software implementations to assist human decisions needs specificities close to classical human thinking.

We analyzed the question "why?" this is relevant and important and we have presented in short some related solutions made available to the human decision-makers. Such an approach, with the help of Artificial Intelligence, is operationally more reliable and is conformal and closer to human reasoning. We discussed and exemplified decision-making approaches specific to the expert system and the rationale behind such approaches, with different paths for implementation, starting from mathematical formalisms. We showed that maintaining a systemic consistency within business models is an important issue to be taken into account and a consistency maintenance algorithm has been reported. Overall, the paper provides several arguments for achieving more performance and systemic growth by the use of expert systems to support managerial decisions in economic organizations.

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