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ОБОСНОВАНИЕ ВЫБОРА СПОСОБА ПРИОБРЕТЕНИЯ ПРОГРАММНОГО ОБЕСПЕЧЕНИЯ: КОНЦЕПТУАЛЬНОЕ ОПИСАНИЕ ПРЕДМЕТНОЙ ОБЛАСТИ

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Аннотация

Исследование посвящено разработке концептуального описания предметной области задачи принятия решения относительно выбора способа приобретения программного обеспечения для предприятия на основе методологии концептуального анализа и проектирования. Данный подход позволил оценить многовариантность возможных ситуаций для принятия решений, выделить субъект, основные действия, поддействия, объекты, компоненты действий и их свойства.

Ключевые слова: концептуальное описание, программное обеспечение, предметная область, принятие решения, способ приобретения программного обеспечения, SaaS.

SELECTING THE WAY OF SOFTWARE ACQUISITION: CONCEPTUAL DESCRIPTION OF THE SUBJECT AREA

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Annotation
Research is devoted to the development of conceptual description of the subject area of decision-making on selecting the way of software acquisition for enterprise on the basis of the methodology of conceptual analysis and design. This approach allowed to estimate the multivariance of possible situations for decision making, to identify the subject, main actions, subactions, objects, action components and their characteristics.

Keywords: conceptual description, software, subject area, decision-making, way of software acquisition, SaaS.

Introduction.

In today's increasingly complex environment, business leaders have to make decisions about information technology (IT) management and selection the way of IT acquisition.

Typically, deciding on the method of purchasing software the following alternatives are considered: purchasing a licensed version of the software, developing IT in-house, using free OpenSource software products, or using SaaS technology ("Software as a Service"). SaaS is a network-based software deployment model that makes software fully accessible through a Web browser.

However, the alternatives of choice (OpenSource and developing IT in-house) we will not consider further due to the fact that the task of selecting the method of purchasing software involves comparing analogue software products in terms of functionality and additional properties. For example, comparing licensed software and OpenSource is difficult, since the OpenSource does not provide maintenance. The same drawback can be attributed to software products developed in-house by the company's IT specialists.

Therefore, for objective reasons, we will limit ourselves to two alternatives: purchasing a licensed version of the software and using software as a service (SaaS technology).

In this regard, the development of conceptual description for decision-making problem concerning selecting one of two ways of software acquisition (licensed software or SaaS solution) is proposed.

Discussion results.

The methodology of conceptual analysis and design is based on the idea of analyzing and designing the construction of domain models and knowledge bases in the form of a system of invariant constructs, in other words modeling and setting a method for model integration into a single conceptual structure [1]. The domain model can be represented in the form of specially related constructs, their descriptions, as well as relationships between them.

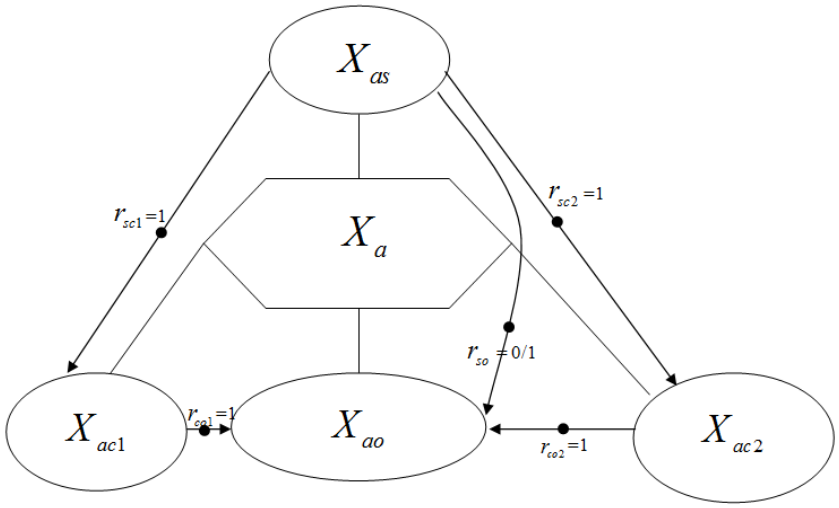
The result of the conceptual analysis is a conceptual model giving an exhaustive description of the subject area in the context of subject interests [2].

In order to build a domain model for decision making problem concerning selecting the way of software acquisition, we will use the technique proposed by L.S. Bolotova [1].

The original decision (*d*) is considered as an action that has the following structure: the subject of the action - the action - the object of the action - the components of the action required to implement the decision. In our case (selecting the way of software acquisition) this structure will take the following form:

- the subject of the action - an analyst (expert);
- the action – to make a decision;
- the object of the action - the way of software acquisition;
- the action components influencing the decision (availability of information: direct and indirect software costs, expected economic effect from implementation, cost of invested capital, etc.); the chosen method for assessing IT efficiency: standard methods for assessing the economic efficiency of IT investments, calculating the economic value added, return on assets, total cost of ownership, calculating the return on investment, etc.).

Thus the initial solution can be expanded into a decision tree, at each level of which you need some knowledge. In fact, we have formed a metastructure of certain kind for the considered solution (Figure 1):



X_{as}– analyst, X_a– make a decision, X_{ao}– way of software acquisition, X_{ac1} – information, X_{ac2} - method for assessing IT efficiency, r_{sc1} - guided by, r_{sc2} - chooses, r_{so} - has chosen, r_{co1} - for, r_{co2} - with help.

Figure 1. The structure of the subject area of the decision-making problem concerning selecting the way of software acquisition

The two parts are clearly distinguished in the decision [3]:

1) functional-target part - "analyst - make a decision - way of software acquisition" ("subject-action-object");

2) supporting part - "analyst - make a decision - (availability of information, the chosen method for assessing IT efficiency" ("subject-action-(component 1, component 2)").

These two parts form a single structure, which can be formally represented as [4]:

$$d_i = \{X_{d_i}, R_{strd_i}, R_{semd_i}\}, \quad (1)$$

where X_{d_i} - objects of the subject area; R_{strd_i} - structural relations in the structure of the subject area; R_{semd_i} - semantic relations in the structure of the subject area.

A single solution turns into the structure shown in Figure 2 after identifying the necessary properties (*p*) of objects of the subject area.

Figure 2 shows that all elements of the conceptual structure of a single solution have their own set of properties forming a set of its concepts. Moreover, there are relationships between the properties of concept objects.

On the basis of each d_i, we can calculate the power of the set of possible situations for making a decision, determined by this structure:

$$N_{d_i} = k_1 * k_2 *\ldots* k_s * 2^t, \quad (2)$$

$$N_{d_i} = 2 * 2 * 2 * 5 * 5 * 5 * 5 * 5 * 5 * 5 * 5 * 2^6 = 2 * 10^8, \quad (3)$$

where $k_1, k_2, \ldots, k_s$ - the number of possible values for each property; t - the number of relations participating in this structure [5].

Thus, there are $2 * 10^8$ possible situations in this structure.

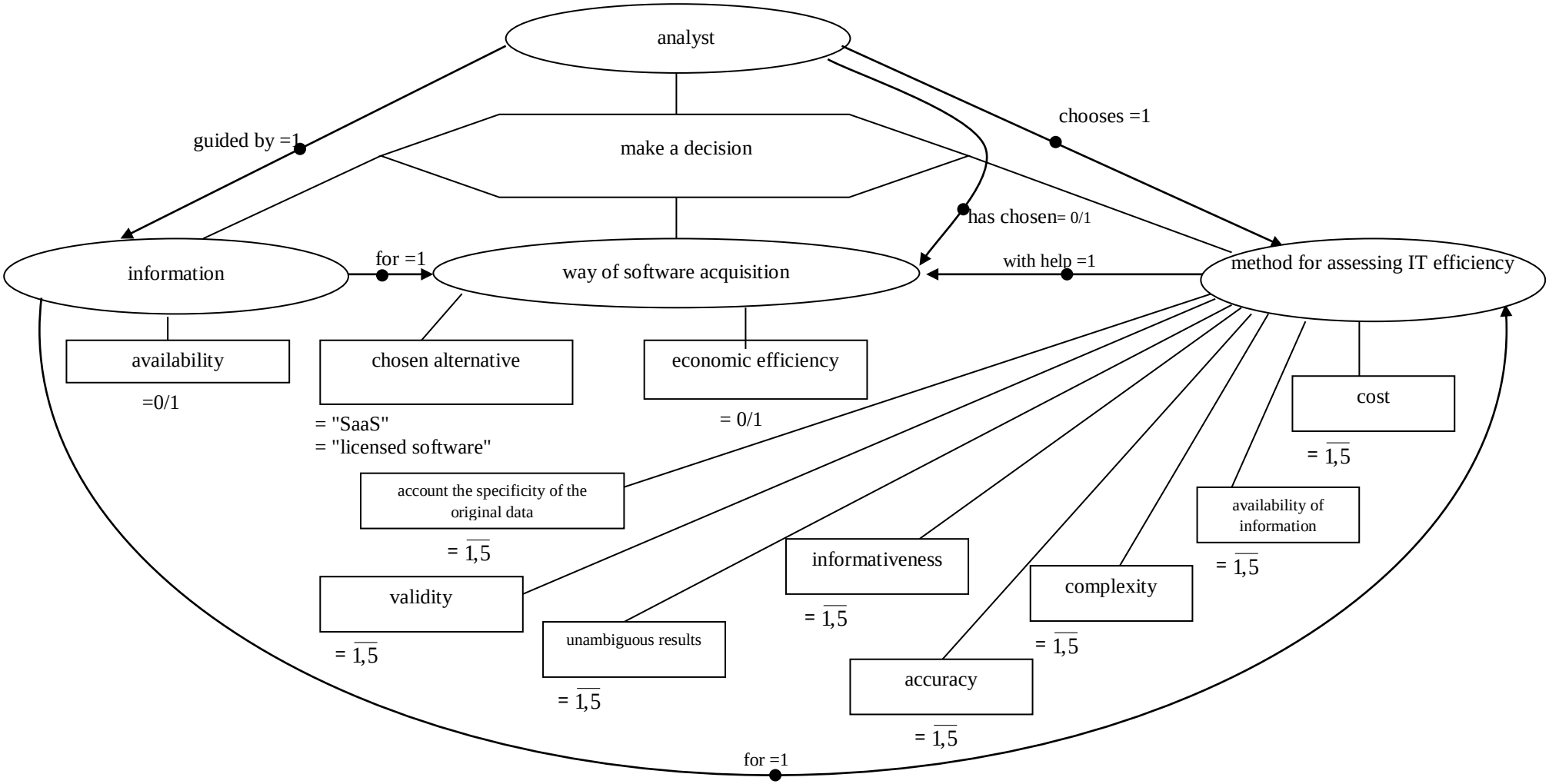


Figure 2. The structure of the subject area of the decision-making problem concerning selecting the way of software acquisition (indicating the properties of objects)

At the same time, in the structure of the subject area of the decision-making problem concerning selecting the way of software acquisition (Figure 2), the construct "make a decision - way of software acquisition" includes a number of lower level constructs. This is due to the fact that the action "make a decision" is complex and consists of a sequence of simpler actions:

- determination of the economic criterion for selecting the way of software acquisition;
- selection of methods for assessing the IT efficiency;
- information gathering;
- analysis of the effectiveness of alternatives;
- choosing an alternative way of software acquisition.

Thus, the structure of the subject area of the decision-making problem concerning selecting the way of software acquisition can be represented in the form of a detailed structure (Figure 3). The decoding of designations to Figure 3 is shown in Table 1.

We summarize and calculate the power of the set of possible situations for making a decision based on Figure 3:

$$N_{d_i} = 2*2*2*5*5*5*5*5*5*5*5*5*2*2*2*2*2*7*4*2^{11}=5{,}73*10^{12}, \quad (4)$$

Thus, the proposed conceptual structure of the subject area of the decision-making problem concerning selecting the way of software acquisition is complex and has more than $5{,}73*10^{12}$ possible situations for making a decision.

Conclusions.

In general, the following main advantages of the methodology of conceptual analysis and design can be identified.

Firstly, this methodology allows you to form the conceptual framework of the information space, within which processing information and deriving solutions will be carried out.

Second, the conceptual analysis and design methodology assists experts in presenting their knowledge in a constructive way that they did not have before starting work.

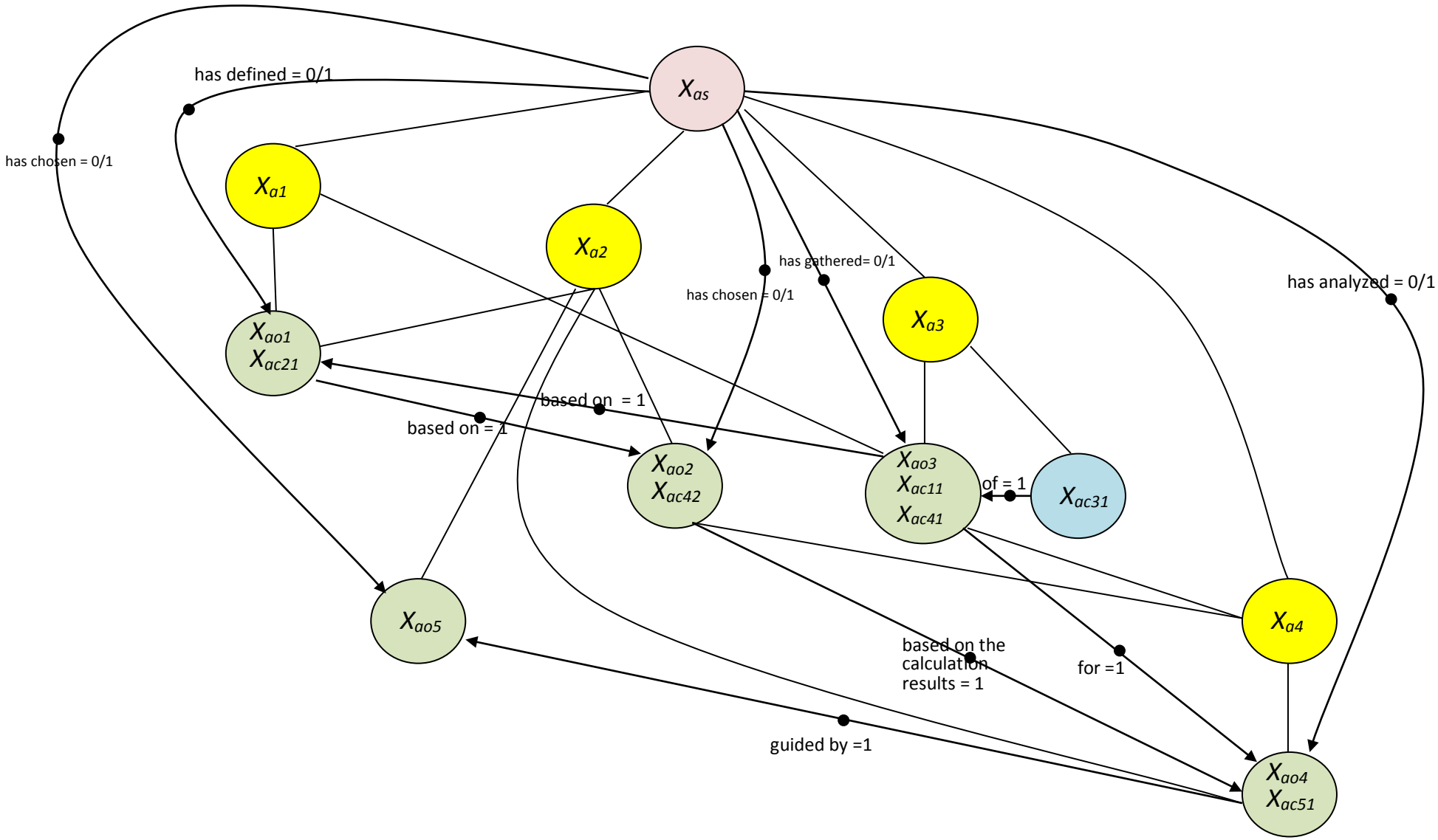


Figure 3. The conceptual structure of the subject area of the decision-making problem concerning selecting the way of software acquisition

Table 1 – Object properties and action components with their decoding

The code in Figure 3	Item type	Decoding	Object properties / action components		
			Designation	Name	Value
X_{as}	subject	Analyst	X		
X_{a1}	action	Define			
X_{a2}	action	Choose			
X_{a3}	action	Gather			
X_{a4}	action	Analyze			
X_{ao1} / X_{ac21}	object / component	Economic criterion for selecting the way of software acquisition	p_{o11} / p_{c211}	costly	= 0/1
			p_{o12} / p_{c212}	profitable	= 0/1
			p_{o13} / p_{c213}	comparative	= 0/1
X_{ao2} / X_{ac42}	object / component	Method for assessing the IT efficiency	p_{o21} / p_{c421}	unambiguous results	$= \overline{1,5}$
			p_{o22} / p_{c422}	account the specificity of the original data	$= \overline{1,5}$
			p_{o23} / p_{c423}	complexity	$= \overline{1,5}$
			p_{o24} / p_{c424}	accuracy	$= \overline{1,5}$
			p_{o25} / p_{c425}	informativeness	$= \overline{1,5}$
			p_{o26} / p_{c426}	validity	$= \overline{1,5}$
			p_{o27} / p_{c427}	availability of information	$= \overline{1,5}$
			p_{o28} / p_{c428}	cost	$= \overline{1,5}$
$X_{ao3} / X_{ac11} / X_{ac41}$	object / component/ component	Information	$p_{o31} / p_{c111} / p_{c411}$	availability	= 0/1
X_{ao4} / X_{ac51}	object / component	Effectiveness of alternatives	p_{o41} / p_{c511}	efficiency of licensed software	= 0/1
			p_{o42} / p_{c512}	efficiency of *SaaS*	= 0/1
X_{ao5}	object	Way of software acquisition	p_{o51}	licensed software	= 0/1
			p_{o52}	*SaaS*	= 0/1
X_{ac31}	component	Sourse of information	p_{c311}	external	= "market reviews" = "analytical articles" = "statistics" = "Internet" = "custom reviews" = "experts" = "other external"
			p_{c312}	internal	= "financial statements" = "statistics of production, sales, quality" = "previous research reports" ="other internal"

Practice shows that the conceptual structure can be obtained for any other subject areas, which will differ from each other in the presence and number of action components and connections.

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Оригинальность 85%