Abstractization – A Fundamental Instrument for Describing and Modeling Software Systems

Dorin Bocu and Răzvan Bocu
Transilvania University of Braşov
d.bocu@unitbv.ro, razvan.bocu@unitbv.ro

Abstract

This paper aims to highlight the importance of modeling amongst the processes that may assure the success of an IT project. Also, the paper introduces a set of rules to follow, in order for the software system abstractization activity to have a positive outcome.

***Keywords**: intelligence, abstractization, modeling.*

1. Introduction

It is spoken a lot in the specialized literature about the importance of abstractization when modeling systems. Although there are numerous reasons to make out of modeling an activity in which rigour is efficiently combined with creativity, studies show that managers trade off the advantages of formalization, that are visible in the long term, by simply forcing the success of projects according to some risky development schemes, from the management's perspective. The urge towards a methodical abstractization approach is completely justified from a theoretical perspective, but also considering the successful examples provided by a series of reputable companies in the dynamic field of IT industry. The modernization of modeling paradigms, together with the modernization of the tools that automate the development (modeling, implementation, testing and documentation) is an irreversible process.

2. Remarks on some essential meanings of the word abstractization

Leaving aside the numerous meanings of the word abstractization in various fields, we would like to highlight some of its essential denotations and connotations.

Abstractization is a concept that may be characterized in the following terms:

1. Attribute of the human intelligence[1];
2. Method for the circumstantial explanation of the world[2] (MCEW);
3. Method for the circumstantial modeling of the world[3] (MCMW);

[1] Human intelligence can be synthetically described through the following capabilities: (1) Producing and manipulating the abstractization methods, (2) Producing and manipulating the abstractions, (3) Producing and manipulating of concrete things.

[2] The explanatory function of an abstraction depends on a series of factors: the general level of knowledge, the abilities of the abstraction's creator, the perspective from which the abstraction has been elaborated, the compromises of the assummed methodology.

4. Method to optimize the granularity of MCEW and MCMW.
5. Essential lever for broadening the human knowledge.

2.1. Abstractization. Attribute of the Human Intelligence

As an attribute of the human intelligence, abstractization is the key instrument with which human beings enrich and deepen their power of knowledge. Confronted with a qualitatively and quantitatively inexhaustible reality, the human being uses the abstractization power (methodical or in its naive flavours) in order to gain control over both quantitative and qualitative aspects. We may conclude that man's fight with the surrounding universe's infinity is, at the same time, action and goal.

As an action, this struggle developed its means through the diversification and refinement of the methods that allow for the reality to be represented at the power of the continuum, with the aid of discrete modeling and explanatory systems. The defining task of the man in this respect has always been essentially linked to the way in which he was able to operate with the concept of information.

Considering its role of primary element of the man-accessible universe, the information has been approached through representation models. Summarizing and making abstraction of the field of knowledge, these representation models have been:

- **Data and data structures (dedicated abstractization mechanisms for capturing the static circumstantial aspects of the information)**;
- **Data / data structures management systems (abstractization mechanisms dedicated to capturing the circumstantial behavioural invariants of the information)**;
- **The methods for restructuring the relevant objects from an informational point of view (mechanisms for abstracting dedicated to the proper capture of the asymptotic behavioural invariants of the information).**

Thus, the man's endeavour towards knowledge acquisition is centred on objects with informational load, which are visible through the data they record at a given moment, the method to update and traffic this data and the logic regarding the informational object's adaptation to new internal and external requirements.

Studied at a virtual microscope, an informational object is specified at a certain refinement level, if it is possible to associate a certain structure to it. In other words, the detailed perspective on a certain object is equivalent with the specification, using a certain granularity, of its structure.

Seen as a host, an informational object is considered to be reasonably specified if we can associate to it a certain interface. Consequently, the short-term behavioural modeling of an informational object implies its structure's specification, while modeling the asymptotic behaviour implies the specification of the techniques to restructure the interfaces.

The limits of the human intelligence already operate in a visible manner: the algorithmization of the interfaces restructuring process relative to the sophisticated informational objects is a challenge still too consistent in many respects.

---

[3] The demiurgical function of an abstraction is also dependent on some factors that are ennumerated in the footnote for MCEW.

As a goal, man's struggle with the qualitative and quantitative infinity of the surrounding universe is not an analysis object for this paper. Nevertheless, let us note that in the absence of a vision that integrates in a coherent manner the studied informational objects, we speak about successive development stages of the techniques that man uses to operate on the universe's qualitative and quantitative infinity, at the syntactic, semantic and pragmatic level.

2.2. Abstractization. Method for the circumstantial modeling and explanation of the world

Regardless of the man's interest for infinity, the idea to embrace only the infinity with the hope of understanding at a certain moment what is happening in a certain section of the universe is not realistic. For the moment, the observation capabilities that a human being can exhibit, combined with the experimental and theoretical paradigms, that are effectively accessible in different environments, plead for the validity of that kind of research that goes from simple to complex, from part to whole, from approximation to the synthetic and integrative perspective.

Man does not have any chance to dive into the infinity. It is just offered with the eternal possibility to reflect according to an asymptotic perspective.

As a consequence, man needs techniques with which he may initiate explanatory endeavours, in which approximation plays a central role. The knowledge of complexity that transcends our possibilities to observe and quantify is performed in a progressive manner. The information is immanent in every corner of the universe. That is, it is related to the essence of objects that populate that universe. The access to this information may increase our influence relative to the respective objects. At this moment, the one that researches the universe faces two major problems:

- **The granularity of the accumulated knowledge, relative to the informational structure of these objects;**
- **The usage scenarios of this knowledge, in such a way that the small and big natural equilibriums will not be affected.**

In this paper, we are concerned with the problem of knowledge granularity, the problem of scenarios being, *ab initio*, sensibly more complicated, and having fewer chances to be solved, considering the level of self awareness of the mankind. The developments regarding the granularity of our knowledge have an immediate impact on the economic systems, around which the nowadays civilization is structured. The progresses regarding the eco scenarios for using the newly acquired knowledge have a long-term impact and, as a consequence, they receive support at the lesser extent from a strangled economical environment, due to its appetence to maximize the profit as quickly as possible, regardless of the consequences.

Therefore, what is the general framework in which there are registered progresses concerning the granularity of our knowledge on the universe? The answer refers, at the first stage, to the context displayed in Figure 2.

Figure 2 is an example of a tentative approach, featuring a certain granularity, regarding the importance of abstractization for the fulfillment of some explanatory and modeling approaches and, also, concerning the importance of the available means, in order to conduct abstractization exercises. A thorough analysis of the diagram presented in Figure 2 may occasionate the identification of the following messages:

- **Abstraction is a product that belongs to a specialist from a certain field (IT systems developer in Figure 2), with the help of whom it can be initiated a knowledge-acquiring or modeling process;**
- Making use of abstractions, together with abstractization as generating process, the effort to acquire knowledge is maintained in the area of the essential, between boundaries that are imposed by the granularity of the knowledge process;
- Abstractions are, at first, specified; as a consequence of their specification, it is defined an objectual universe, which contains objects of various types, relations established between these components, data about the creator of the universe (interface and implementation), data about the users of the universe (interface and implementation);
- Then, abstractions are safely stored through an adequate representation, which may be a coding system featuring a certain level of formalism (usually, a modeling or implementation language);
- Once the abstraction has been safely stored, it may be used in two ways: for solving a certain problem or in order to offer support for communication.
- The diagram also highlights the fact that the specialist that conducts the abstractization exercise has limited competencies, limited objective investigative means, and a motivation that is obscured by the immediate interest and by the logistics;
- In order to summarize, we make use of abstractization in order to initiate, to continue but, also, in order to grant a final and circumstantial shape to a knowledge-acquiring or modeling exercise.

2.3. Abstractization. Method to optimize reasoning

Curiosity and interest are two ancient generating factors of knowledge. Making them work is essential to maintain the hope in reliable results, both when speaking about short or long term. In the short run, as a general rule, it is usually necessary to deal with punctual problems. In the long run, the goal is represented by the progress of the general level of knowledge. Human thinking is based on some flexible foundations. These foundations generate the power of human reasoning to conquer the unknown but, also, the ambition of reasoning, possibly unbounded, to become more and more efficient.

We would not like to pass easily over the assertion made in the previous paragraph, regarding the idea that “human thinking is based on some flexible foundations”. This flexibility of the reasoning’s foundations is an exceptional attribute, which features a structural complexity that is yet insurmountable. In other, simpler words, it can be stated that human reasoning can be efficient both in endeavours that suppose objective and subjective restructuring. The fact that man uses its mind in order to understand the beauty and the utility of the objective nature, seems to be a truism. The fact that man insists on understanding and using the reasoning’s fundamental mechanisms, having a demiurgic goal after all, is not a truism any more but a race full of obstacles. This race is extremely difficult, with the man not being sure about the accuracy of the investigation and modeling means he makes use of.

Aware of the fact that the secrets of reasoning will not let themselves to be discovered too soon, the human being go on with his race to conquer the objective reality and, also, his extremely sophisticated race to gain control over the subjective reality.

The steps that have already been made by man in his race to gain control over the objective reality are impressive. The building process of the informational society is the ultimate example of maximal complexity in this respect. In order to maintain an ascending trend in this race, man produces, almost frenetically, paradigms and technologies. A synthetic presentation of the scheme according to which it is attempted to preserve the ascending trend is shown in Figure 1. It is itself a result of the abstractization effort and highlights several fundamental aspects for the knowledge dynamics in general:

1. **The occurrence of a problem may constitute the beginning of a knowledge process;**
2. **The resolution of a high-complexity problem may be facilitated by the elaboration of a theoretical paradigm, which defines the conceptual framework that allows for the respective problem to be correctly approached;**
3. **Any paradigm can be a starting point in the realization process of a technology;**
4. **Making a paradigm functional is a process mediated by the elaboration of the technologies that are based on it. Relating technologies to a largely or unanimously accepted paradigm is an important premise for its acceptance as standard.**
5. **The feedback provided by the utilization of technologies may impose periodical refinement activities regarding the paradigm to which these technologies relate. The refinement process stays efficient as long as the paradigm has enough development resources, which means that the paradigm's adaptation to new requirements may be conducted without abdicating from the inner core of the paradigm. Beyond the inner core of the paradigm there is improvisation, exercise that already prefigures an approach for elaborating a new paradigm.**
6. **Etc.**

The iterative character of the knowledge-acquiring process is obvious. It is also obvious the important role that abstractization plays in the effort to optimize human reasoning, that is the way in which man is able to solve the problems he has to face.

3. How can we do quality abstractization in the software industry?

3.1.Ten Rules to Follow

As we have already mentioned, the human intelligence can be synthetically characterized by the following capabilities:

- Production and manipulation of abstractization methods;
- Production and manipulation of abstractions;
- Production and manipulation of concrete things.

Obviously, the above list is an attempt to summarize the capabilities of the human intelligence, in such a way that we may advance with our endeavour to highlight the importance of the abstractization in research, modeling, but also in everyday life, for many of the situations.

In the above list, the items are placed in descending order, considering their degree of complexity in the real world. In other words, in principle, every human being has to possess some abilities to produce and manipulate concrete things. The quality of these abilities is dependent on the hereditary inheritance, but also on the instruction level of the individual. Even if not all the people produce abstractions, the majority manipulate them, with various goals. In essence, every word can be considered as being the results of an abstractization process, having as goal the association of a certain semantic to a specific notation. Moreover, the abstractization effort in the case the vocabulary of a natural language is enriched is collective and is rolled out according to rules that are difficult to algorithmize. Thus, it can be stated that every human being that speaks has connections with the world of abstractions, without being aware of it.

The power of a man's intellect begins to exhibit in a creative way in the moment when the abstractization becomes one of his systematic preoccupations.

It can be stated without hesitation there is no progress regarding knowledge without methodical abstractization. The naive variant of abstractization can be assimilated to the psychological state of reflection. Instructed in various environments or just by the rich school of life, man is not able to fully understand what happens around him without allowing himself to reflect from time to time, with certain regularity. Although we are aware that reflection may produce results whose brightness competes with those of the methodic abstractization, in this paper we shall try to describe at least a part of the logistics and techniques man uses in order to do methodic abstractization.

Therefore, being perfectly aware of the difficulties regarding the elaboration of some success scenarios in the field of abstractization, we shall try in this paper to highlight the foundations of a successful abstractization methodology in the software industry. Let us study the list of elements that are mandatory in order to do quality abstractization:

1. **The adoptation of a formal representation style of the models resulted from the abstractization process;**
2. **The adoptation of the iterative style of abstractization;**
3. **The constant promotion of incrementality in the abstractization process;**
4. **The clear definition of the modality in which it is operated with the concept of model and, as a consequence, with the principle of modularization;**
5. **The systematic promotion of the distinction between static and dynamic in the process of abstractization;**
6. **The systematic promotion of scalability and interoperability of products that result from the abstractization effort;**
7. **The regular but careful usage of abstractization patterns;**
8. **The elaboration of flexible scenarios in order to realize the automation of abstractization during those stages and sections of them that support automation;**
9. **The elaboration of metrics for the evaluation of different features of the abstractization effort;**
10. **The rigorous testing of the abstractization effort's products.**

These are ten commandments whose compliance may significantly increase the chances of success of any explanatory or modeling approach, which is associated to an IT project.

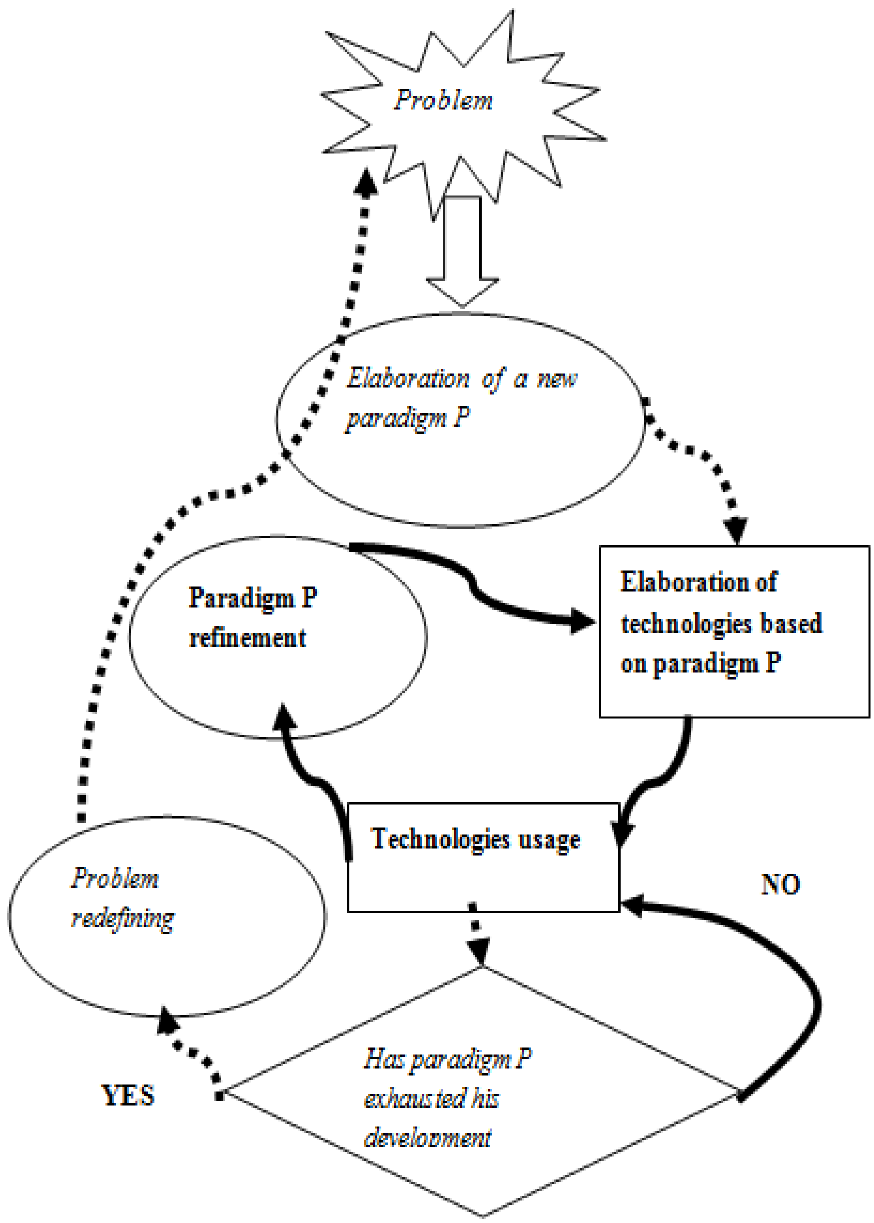

Figure 1. The double spiral of knowledge progress related to any field of knowledge.

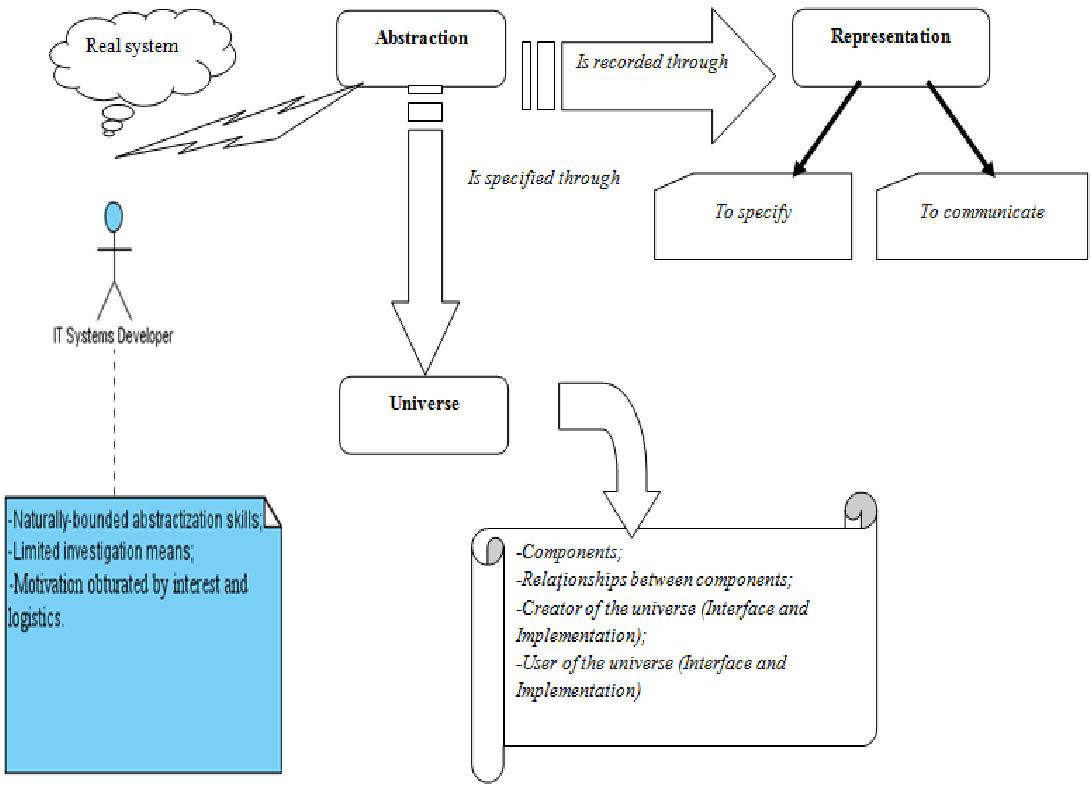

Figure 2. The general frame for assuring the granularity of that kind of knowledge, which is oriented towards the explanation and modeling of the universe.

3.2.The formal style for models representation

The practical experience proved that in spite of the critiques that the formal representation style of the abstractization effort's products faces, it is preferable to the representation that is based on improvisation or local representation standards. The industrialization of a certain representation style claims, at the same time, the appeal to formalism and the stimulation of the intuitive availabilities of the individual that studies or models.

Formalization is absolutely necessary if one is looking for automation, be it on segments, relative to the abstractization process.

Preserving the contact with the intuitive availabilities answers to a legitimate request of the majority of persons that are involved in explanatory or modeling endeavours: the human being's contact with reality is quicker and more persistent if it is sustained by his intuitive capabilities.

Once adopted, a formal representation style also becomes a tool for making the communication between the actors of a complex abstractization exercise more efficient. The specialized literature in the field of software engineering is very convincing in this respect.

3.3. The iterative style of abstractization

Although there are exceptional situations, in which certain specialists are able to abstract to the finest details from the first attempt, the current practice is represented by the iterative resolution of a certain problem. Thus, different professions or activities employ, not always consciously, iterative techniques having two goals: **the resolution of a punctual problem and the optimization of the resolution method for a punctual problem**.

We shall refer, in the beginning, to the resolution of a punctual problem, with the goal to obtain some immediate practical results. Considered in this hypostasis, the iteration guarantees the maximization of the expected results as a consequence of the problem's resolution. As an example, building a high-complexity software system is very likely to succeed, provided it is built according to an iterative model. Wherever there is high complexity, there are obstacles whose working around is of a higher degree of certainty if the spiral model is adopted. It involves the same problem to be approached in several rounds, each round benefiting from the results of the previous round, but also having specific goals. The Archimedes' spiral, presented in Figure 3, expresses in a suggestive manner the nature and the content of an iterative procedure for solving a problem. P_0, P_1, ... represent different stages through the problem resolution process. Practically, P_0 can be assimilated with the problem's formulation, and the generating scheme for the stages P_i , where i>0, is:

$$P_k = Iteration_{k-1}(P_{k-1});$$

$Iteration_{k-1}$ is the activity inside which a certain abstractization type is rolled out, which targets the transformation of stage P_{k-1} in stage P_k. It can be observed that the bigger the contact zone of an iteration with the problem's universe, the greater the index of the iteration is.

The most elegant expression of this abstractization can be found in mathematics in the form of some iterative schemes for solving some numerical problems.

In order to summarize, the iterative abstractization style may lead us to a reasonable solution for a problem, leaving, at the same time, the door open for future approaches. One of the clear advices in the Archimedes' spiral refers to the fact that, **in principle, we may iterate endlessly, which does nothing but confirms what has already been stated: our knowledge, at a given moment, is approximate**.

Concerning the method for solving a punctual problem, we can mention the fact that its optimization is conducted, in principle, iteratively as well, with the remark that instead of operating with a system whose structure concerns us, we operate with methods that realize their investigation and modeling.

While for the punctual resolution of a problem it is applied a recipe, for the optimization of a resolution method we are obligated to seek for a better recipe to solve a punctual problem.

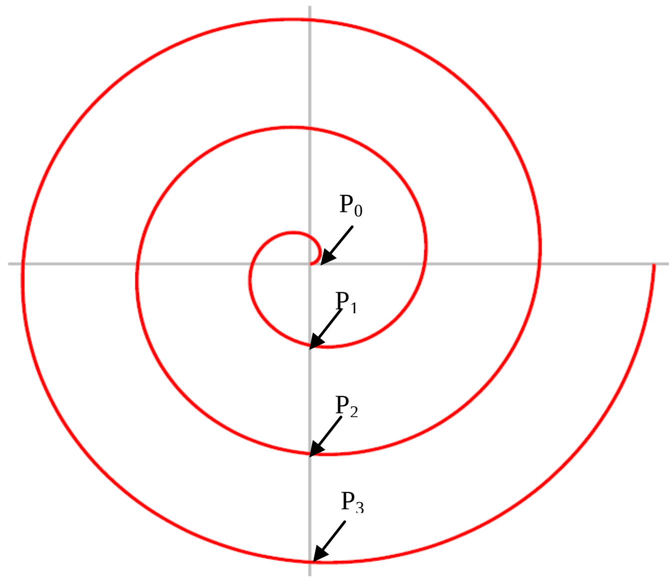

Figure 3. Iterations for solving the problems, abstracted in a subtle manner by the Archimedes' spiral.

3.4. Incrementality of the abstractization process

Abstractization is, invariable, an activity that involves significant nervous expense. The involvement in activities that suppose significant nervous expense may be the outcome of an assumed contract (in this case abstractization is an **obligation**) or may be an exercise that is sustained by the scientific curiosity (in this case abstractization is a **personal desire to acquire knowledge**).

In any of the hypostases, the methodic progress of the abstractization effort is the ingredient that may fuel or accelerate the abstractization process. In other, simpler words, the **energy with which human beings get involved into solving a problem is amplified, at each iteration, by the generation of a concrete proof regarding the utility of the problem's resolution**, which is designated in this paper by the concept of abstractization process **incrementality**. Software industry may benefit, in theory, from the advantages of incrementality, at least on the following well connected layers: **psychological motivation of the development effort, the management oriented on the rigorous measurement of a project's evolution, the consolidation of trust and active participation of an IT project beneficiary**. The specialized literature but, also, the effective industrial environment value development models with remarkable virtues concerning incrementality, such as prototyping and IBM RUP.

3.5. The concept of model and the principle of modularization

The activity of abstractization does not have too many in common with driving, for example. It is true, in order to be a good driver it is not enough to get the driving licence. The necessary skills in order to cope successfully with the normal or exceptional traffic situations are developed through continuous and diversified exercise. After a certain amount of time elapses, the driver acquires some automations, which may contribute to an acceptable comfort of the driver's job.

In abstractization exercises, automations are not enough in order to cope with all the challenges. Among these challenges, we highlight two as being essential: **dealing with the unknown** and **efficient representation of the data regarding the unknown**. In fact, it is all about two activities whose complexity shouldn't be put under discussion in this paper. It is certain the fact that, given the generic limits of the man, the complexity of these activities may be "softened" if we resort to a series of supporting tools / ingredients. We consider the essential list of these tools / ingredients is composed of:

1. The concept of model;
2. The principle of modularization;
3. The thorough knowledge regarding the domain of the researched problem.

The concept of model is transdisciplinary, even fundamental for knowledge in general, but also for the quality of the activities through which man targets the enrichment of the cultural deposit of the humanity.

The concept of model is simultaneously a product of the abstractization but also an abstractization tool.

In the long run, the concept of model is an emblematic product of the abstractization effort that belongs to researchers and creators from anywhere. There is no branch of scientific knowledge or of art not to resort in a way or another to the concept of model. It can be characterized as courageous any attempt to define the concept of model. More precisely, it is a difficult enough probe of abstractization. Following, let us see several possible approaches.

The concept of model designates, generally speaking, a way for representing and researching the studied reality.

The concept of model designates, in the software engineering, the main refinement and aggregation tool regarding the structure of a problem's solution.

It is obvious the fact that at various abstractization levels, we operate with various flavours of the concept of model. Whatever the model we refer to is, it will necessarily display an **interface** and, optionally, it may provide an associated **implementation**. These two components of any model are essential in order to solve two problems: **the model integration in a wider system of models** and **the docking of the model to the technological reality of a given moment in time**.

The interface is the expression of its creator's wish to benefit from a certain break in his relation with a certain model.

The implementation is the expression of the creator's wish to adapt the elaborated model to new requirements, without impeding on the comfort of the model's beneficiaries.

The relation between continuous and discontinuous is handled by those who abstract through adding intelligent meanings, among some other things, to the relation established between the interface and the implementation of different models.

The principle of modularization is omnipresent in all the explanatory and modeling approaches conducted by man.

As a genuine instrument for progressively taking over the complexity of the studied reality, the principle of modularization is nothing else but an abstractization method, which is featured by objectives, requirements and specific exigencies.

The decomposition realized through mapping on the problem domain (in the hypothesis this is well shaped), the minimization of the dependencies between the components obtained this way, the maximization of the cohesion between a component's resources, represent three pathways that can be followed when we wish to realize a quality modularization. Obviously, the concepts of model and module may be, in many situations interchangeable, in the context of the approaches presented in this paper. An example of polyvalent usage of the two abstractions that are named in the software engineering model and module is represented by the modeling language UML.

The thorough expertise in the researched problem's domain is, pure and simple, an important premise of an abstractization approach with notable results**.**

If the problem domain is optimally structured, then the suggestion to map ourselves on its structure is the best choice.

If the problem domain has a precarious structure, then before it is being modeled, it is necessary a laborious activity regarding its organization and modernization.

3.6. Static and dynamic in the abstractization approach

While the interface can be considered as a guarantee for a model's stability, its implementation invites us in the changing world of its behaviour. What the hand of the model's creator produces is as stable or everlasting as its polymorphic usage is assured both punctually and asymptotically. Thus, the models' creators are confronted, in various ways, with specific antagonisms in the relation between the structure and the behaviour of a system.

The man's capacity to specify models featured by a stable structure and adaptive behaviour to new requirements is arguable. At the moment, it seems reasonable for us to look for intelligent answers for questions like: **how should the structure of a system be specified in such a way that it can be associated with complex behaviours at reduced costs?** This question is at the attention of all those who conduct abstractization efforts, both inside some disciplines and outside their boundaries.

Therefore, an attentive observer analyzes a system from two perspectives: **its evolution in time and space and its development from a structural point of view**.

The evolution of a system in time will invariably send us to the decryption of its behaviour.

The development of a system from a structural point of view is a problem for the resolution of which, the ability to see optimal interfaces is essential.

Finally, we should mention the fact that in the modeling activity, in general, it is reasonable for us to capture the structure in such a way that the behaviour capturing effort is simplified.

Scalability and models interoperability

The space-time and structural dynamics of the models that are elaborated by man, continuously and more and more pressing raises two problems, which condition the gain in quantitative and qualitative complexity of these models: the scalability of these models and their interoperability.

In various fields, scalability is that property of a system to support without perturbations a higher load volume, or to allow its increase or extension. As a consequence, the processing capacity of the model has to be implicitly flexible (being able to cope with significant load volumes without changing the model's structure) and explicitly flexible (being able to cope with structural changes, which corresponds to the addition of new components to the model). According as the insertion of intelligence in the models elaborated by man becomes more and more consistent, it has to be expected the preoccupation for scalable models elaboration will gain always clearer shapes, in theory and practice.

The interoperability of the elaborated-by-man models is already a current preoccupation. The problem is this interoperability is not realized with intelligent means, but through the addition of conjunctural capabilities to the models. In other words, the elaboration of models with extended interoperability possibilities is a direction in which there are expected extremely intense abstractization approaches.

3.7. Abstractization patterns

It is a vast and currently intensely expanding subject. It was born from the natural wish of the specialists to permanently store not only data about the studied systems, but also the valid schemes used for their modeling. A few reasons: in order to avoid reinventing the well designed wheels, in order to cut costs, in order to conduct a systematic insertion of fiability, to make an intelligent step forward in the process of design automation, etc. The stake is significant, as it can be noticed. Nevertheless, the ability to abstract, acquired following some significant learning and accommodation efforts to the real world, is not a good that is kept away from normal ageing and wear. Man is continuously defining new targets, also regarding the abstractization. Especially from this perspective, it is possible to have with the abstractization patterns a relation whose costs subtracted from the profit may force us to temporarily deal with losses.

The natural question for someone who studies abstractization patterns from this perspective would be: “What is the optimal way for permanently storing an abstractization pattern?” **Optimality refers to the way we separate what is invariant from what is conjunctural in such a pattern**.

3.8. Automation of the abstractization

The dream, which is more and more intensely fueled by the man's imagination, but also by his wish to shorten the time elapsed for the realization of the IT projects, is to transfer on the computer's shoulders as much of his capabilities as possible.

Everything is routine work for the man has been or is currently about to be automated.

The difficulties appear at the moment when we direct our attention towards the activities that require creativity spikes. Even if some progresses will be registered regarding the computer-assisted design of the general framework for the abstractization activities, man's contribution will be, for many years to come, the key to the full success regarding the abstractization. It seems to be simple to simulate many of the human capabilities, sometimes we even succeed in this endeavour, but we definitely fail when we forget or we try, without touchable results, to reconstruct the ensemble. The ramifications of the human capabilities to abstract are multiple and too difficult to manage at the actual level of comprehension exhibited by the human reasoning.

3.9. The usage of metrics

This problem of metrics is a spacious field of study for specialists, whom we would need in order to periodically evaluate the quantitative and qualitative progresses generated by the abstractization efforts. In this respect, we talk about the fact the elaborated models by specialists during the abstractization process have to be compared with some existing standards in the field. The definition and the *de facto* acceptance of these standards in the software industry, together with the constructive attitude of the management regarding the usage of standards are two variables that may positively influence on the quality of abstractization. Unfortunately, there are numerous situations in which metrics specification represents either an open problem, either an unsatisfactory solved problem or a problem that should be simply avoided. The absence of some firm metrics is a destabilizing factor for the projects in which the production discipline is considered to be vital. On the contrary, for the projects in which creativity is an essential ingredient for their success, metrics do not constitute a priority. Even if we concluded that metrics are necessary for the success of the projects, the difficulties regarding their specification and implementation can easily become a discouraging factor. Any abstractization effort that looks for the resolution of the problem only, without to critically examine the degree of fulfillment of some qualitative requirements, may hide surprises for the author of the approach, for the team he is part of and also for the beneficiary.

A fact is absolutely certain regarding metrics: there are not universal metrics, every domain of activity should instrument the necessary efforts for finding feasible and adaptive metrics.

3.10. Rigorous testing of the models

In connection with the problem of metrics, it is raised the problem of rigorous testing of the models elaborated in the process of abstractization. Without testing these models, we can bring important bad turns to some valuable ideas concerning the abstractization. Models testing should focus on both the macro aspects of the models and their implementation details. Consumer satisfaction may be affected if the testing is instrumented superficially. Practically, any abstractions that anticipate an operational component of a certain product, has to be tested, in such a way that the abstractization efforts will not be accompanied by the snowball effect regarding the abstractization errors accumulated at various levels. Specialized literature grants a special importance to the problem of testing, considering it as the essential lever for the quality assurance in a company that develops software systems. As a consequence, the management exhibits a larger and larger and more applied openness towards the development models that put a special accent on testing and on the technologies that automate the testing activity.

4. Conclusions

In this paper, we tried to present a series of personal considerations relative to one of the important problems on which depends, practically, the understanding of the mechanisms according to which human mind works, when it has to deal with problems and find solutions for them. Our assumed intention, mainly drafting a research plan regarding the role of abstractization in the explanation and modeling of systems, can be, undoubtedly, criticized and improved.

Leaving aside all the potential criticism, we are left with the faith that a so important lever for any researcher's or normal individual's reasoning has to be studied, explained and, as much as possible, operationalized, with the goal to push the knowledge-acquiring adventure as deep as possible inside the core of the unknown.

References

[1] D. Bocu, "Iniţiere în ingineria sistemelor soft reale", Editura Albastră , Cluj-Napoca, 2001

[2] D. Bocu and R. Bocu, "Preliminary Remarks Regarding the Impact of the Modeling Languages towards the Quality Standards in the Software Industry", International Journal of u- and e- Service, Science and Technology, Vol. 2, No. 2, June 2009, pp.1-11.

[3] Bocu D. , "About the Abstraction of a Software Systems Solution", Proceedings of the 25th International Conference on INFORMATION TEHNOLOGY INTERTFACES, June 16-19, 2003, Croatia, pp.621-625.

[4] Krogstie, J., Opdahl, A., L., Brinkkemper, S.," Conceptual Modelling in Information Systems Engineering", Springer-Verlag, 2007.

[5] Gesler E., "Knowledge and Knowledge Systems:Learning from the Wonders of the Mind", IGI Publishing, New York, 2008.

Authors

Dorin Bocu is a professor of Computer Science at Transilvania University of Brasov, Romania since 1990. He is a PhD in mathematics at the Transilvania University of Brasov, Romania. Currently he concentrates on topics around software engineering, IT project management and Intelligent computational systems.

Răzvan Bocu is an assistant teacher of Computer Science at Transilvania University of Brasov, Romania since 2005. He received his PhD in Computer Science from the National University of Ireland, Cork, in 2010. He currently focuses on the following topics: bioinformatics and large networked structures, object oriented programming, software engineering and computer networks.