Solution Systems: Beyond Data Warehouse and Management Information System

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Abstract

In this study/paper, I will give a short overview about the idea of a Solution System. After the introduction about excesses by using data warehouses and management information systems - a lack of analysts and the question, if we can generate decision out of our companies' data without the human as the main source of error – I have added a first look at different kinds of problems. It is explained that a computer can only generate solutions, if all necessary data and parameters of influence are available as digital data inside the computer system. By the example of Fuzzy Logic it is shown that some kinds of subjectivity are able to be stored in an abstracted digital way, so that they can be used inside a computer system. I also demonstrate that such methods will move problems from a category of higher complexity into the category where it is much easier to solve a problem by an automated system. In a next step the question about responsibility is discussed and it will be shown, that it might be possible to manifest the human will by defining ranges of security. Finally there is a look on the interdependency between complexity and cost and the question, if the idea of Solution Systems might be usable will be answered.

1. Introduction

It is a fact that after many years since data warehouse systems are mentioned to be a standard in business, there are still business people who are quite sure that generating thousands of sheets of paper each day would help them in doing their job or would have anything to do with data analysis. A service company from Germany sells maintenance to hospitals in that form that the economic data of their clients is "analysed" in some way and compared to other hospitals data. They generate reports of about 50.000 pages (DIN 476 / A4) even for one small hospital. It seems to be clear, that this is not state of the art. No one will read such a lot of paper. But even in the field of grocery there are examples, which show that the basic idea of data warehouse, decision support systems and other related systems are not always understood [Len2001]. One reason for such an economic "abyss" might be that there is a lack of analysts who understand analytical systems and who are able to construe/ interpret economical ratio systems, statistical results or any aggregated output of an analytical system. Searching the internet about the phrase "lack of analysts" will result in a large amount of mostly business related articles that refer on this problem. A batch of 50.000 pages of data is still one more data cemetery. It can support a competent manager only in this way, to stop such a kind of unusable analysis immediately and save the money. What we need is information and results! Actual analytical tools are able to generate a lot of information out of our companies' data plants, but as discussed above, it is not sufficient to generate information. We also need employees who understand what the system tells them and who are able to transform this information into decisions. But if a computer based analytical system delivers the information which is needed by humans to make decisions then why can a computer system not make the decision by itself? Would it be possible to simplify some kind of decision making so that a computer would be able to do it? These are questions which will be discussed in the following study.

2. Digital Availability of Data as a Basic Requirement

While speaking about decision making, solutions and automatisation of problem solving, we first need to look at some business problems. In the introduction there are two examples where people print high amounts of paper. What is their intention for doing that? Supposing that this is not only for the show, they try to get information out

of this paper mountain. Especially, they will try to get information which can be used for making decisions. Believing that this printed information is the basic of decisions which will be made by a human there are two possible general scenarios:

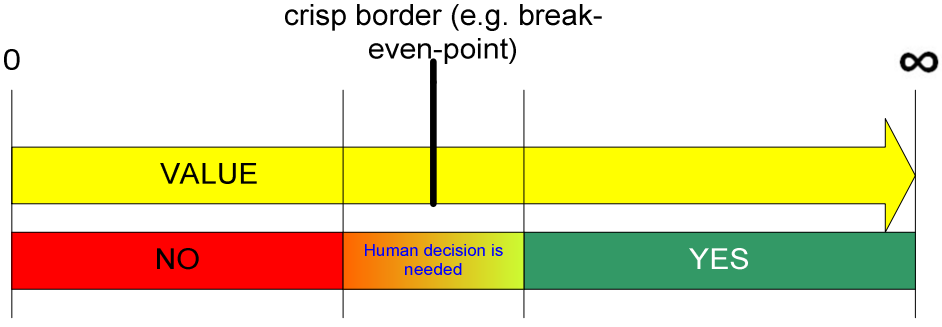
- The decision is based on the printed information and at the same time on other information, someone's experience, different influences or parameters which are not available in the computer system.
- The decision is based only on the information which is available in the computer system.

Facing the first kind of decision it is clear that is a complex process to find a solution. But we can't say in general that it would be impossible to solve such problems by a computer, because modern technologies like Fuzzy Logic can handle with subjectivity [see Muk2001] in this way that human preferences are transformed into mathematical formulas and curves – the so called Fuzzy Sets. Let us think about these types of problems, which seem to be less complex: The problems/decisions of the second group does not need external data such as all data which is necessary for decision making are available in the computer system.
This excludes also questions which can be answered by several alternatives, if human experience is needed to choose one.

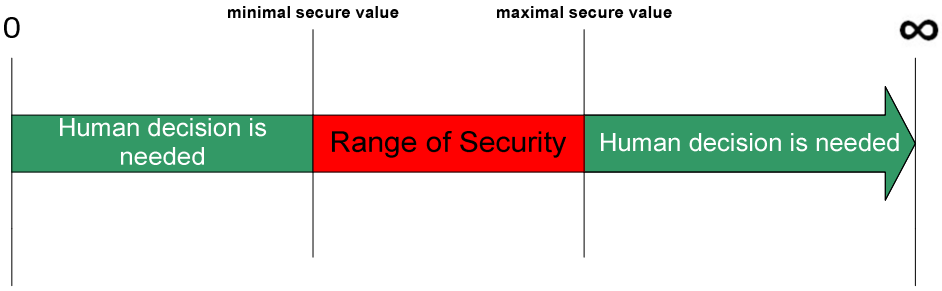
What kind of problem would be a member of this second group? If we have a question, to which only one exact answer is possible, like a mathematical calculation, and this result could – without any kind of transformation - be used to solve the problem, it would be easy to generate such a solution. Especially in the area of PPS and Logistics in general, such an idea might be useful. In this way, it would be possible to enlarge a data warehouse system or even a management information system by a level which uses information, calculation, verified and aggregated data to generate a solution. Such a solution might be an order, a production plan or even a shift plan. A business problem however would be implemented into a Solution System, the main condition by realising such a project is that all necessary parameters for the decision/solution are available in a computer system.

3. Responsibility

As nice as the idea looks like, that our computer knows all parameters of a business problem and generates a solution, there is another question which cannot be ignored: Who is responsible [Len2006] for a decision/solution?
If we think about management and decision making [Gre2004] and if we ask at the same time, what are we do and why we do that, we find several definitions in the classical management literature which look very similar. The managers' jobs are planning, organising and controlling [Woe2000]. Even if sometimes leading [Pi$2000] or other items are added to these basic items, the meaning over all keeps the same. Drucker [Dru1993] declares on a more abstract level, that "whatever a manager does, he does it through decisions". A decision is a kind of acting. Acting is mentioned to be something which has any kind of after-effect. So, if we agree that making decisions is targeted on causing after-effects, we now have to care about the question of responsibility.
A computer as a conscience-free machine can not be responsible for any acting. It can not be brought to court, if anything went wrong. In the previous chapter we discussed, that we can only generate decisions/solutions, if we have all necessary data in our computer system. But how can we define responsibility into a computer system? Thinking about the mode of operation of Fuzzy Logic, where subjectivity is translated into data, which can be used for calculations, the way how to handle responsibility might be an analogical one. The approaches of management by exception and management by decision rules would explain how such a kind of Solution System might work. Management by exception defines landmarks. The employee is free in doing his job as long as he or any of his results does not cross one of these predefined landmarks. Management by decision rules uses also predefinitions to define e.g. for different possible values/results of a problem the mode/manner how to react [TE2008]. The following two examples will explain how these approaches can be a benefit for a computerized Solution System [Len2007].



Picture 1: Acting is predefined according to a value / mathematical result.



Picture 2: The system is free to act inside a predefined range

It has been shown, that the question about responsibility is not an argument against building a Solution System. By defining ranges it has been proven, that the human will can be defined as a parameter of a computer system and therefore the human always keeps the overall control on such a system.

4. Complexity and Cost

As discussed in a previous Chapter, the problems which have to be solved by a Solution System can be more or less complex. If we think e.g. on this example of a shift plan, preferences of the employees has to be defined in the system as well as legal restrictions on statutory working hours or definitions about flexitime. Practice shows, that such a system might have hundreds of restrictions. But thinking about the alternative of solving it by a hand-drawn Gantt-Chart, the benefit of such a system will be obvious. Benefit is one of the most important items while talking about solutions system, because such a system causes cost. If we have only to calculate an average of some values and can use this as the basic data of our decision, this will not cause high cost. But remembering our shift-time-problem, it is a question which needs to be solved by linear optimisation [see Dan1963, Gre1985]. In other cases it might be necessary to create problem-related algorithms which use mathematical values and several restrictions to create the solution. A case like this might be the calculation of a batch size or the automated order of a calculated amount of raw material.
But it doesn't really matter if the way of solving a problem is more or less complex; we have to care about the economical principles: Our benefit have to over-compensate the cost [Woe2000]

5. Conclusion

First it is shown, that we can get much more benefit by the use of today's computer technology than just printing endless lists or even just generate some information by aggregation or by simple statistics. By adding the level of Solution System to common data warehouses or management information systems, we get the chance to generate solutions which can directly start events e.g. orders. In such a system, the human overall control is ensured by predefined values and ranges, the so called ranges of security. Even if there are many problems which have to be made by human beings because of reason in areas like ethics, conscience, experience or other items, which can't be reduced to zero and one or to any mathematical curve and even if there are other items, which would cause more cost then benefit if transferred/reduced to a computer's logic, it is proven that it would be possible to build Solution Systems for different aims. Some areas where such Solution Systems can be used are e.g. to generate orders, to build shift or production plans, to lower cost in a company's stock or to optimise delivery plans. There seems to be many areas where it might be a benefit to unburden people from repeating boring jobs and to improve the quality of decisions by exact calculating mathematical algorithms.

6. Critical Review

A paper of a few pages, can only describe a meta-level of such an idea like the Solution System. Many questions are not discussed, yet. Therefore it would make sense to create a model which includes - abstracted to an upper level - classes of solutions and perhaps a catalogue of questions to answer in general the main question if the answer of any special problem can be found by a Solution System. It still needs more applied research. The

chance to optimise a bright spectre of working cycles inside companies claims more attention to this field of science/research.

7. References

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