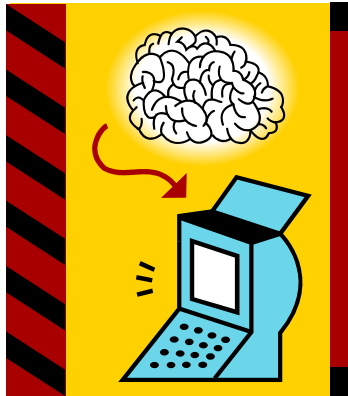


Supply Chain Intelligence Machine (SCIM)

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The word “intelligent” is used commonly to indicate how well a software package was designed to respond to different conditions. The more conditions it is *programmed* to handle, then the more, so is claimed, intelligent is the software package. Although this is a valid position at a rudimentary level, however it is not what we refer to as intelligent systems. One of the ways that man differentiates itself from machine is that our reactions are unpredictable even with seemingly the same input conditions are received. For example, a cup of coffee might be a lot more desirable in the morning than just before going to bed! Or in some cases, one decides to quit drinking coffee and shows no more desire. Our reactions and/or our problem solving abilities are formed as a result of our personal experiences and ability to change our “reaction” based on new information. This allows us to get *better* as we experience different outcomes under different circumstances. This is the kind of behavior which makes us more *intelligent*. One could argue that, there is yet another level of intelligence, what is commonly referred to as “out-of-the-box” thinking, where we come up with solutions that we have not necessarily seen or experienced before. We could have many different definitions of intelligence, however, intelligence is a *moving target*. As soon as a machine can do it then it is no longer intelligent! In some instances, we relate ability to learn as intelligence. An example of this would be that if a certain airline is always late then you may stop using its services, or a machine is constantly breaking down, then you change the maintenance routine or fire the maintenance crew!

The last examples illustrate couple of interesting areas. Firstly, the ability to see a trend. Secondly, decision made to minimize the undesired behavior and thirdly the nature of decision made. The latter is extremely important since it opens up a whole new science of causality. In other words, based on our own experience, we may make assumptions as to what the cause is and therefore act in a way to remove the cause to minimize its impact. The latter implies that we have capability to build certain mental models of the world based on our experiences and use those pre-existing models to relate to the cause of the problem. Hence decision to fire the maintenance crew!

Finding causes or causality is in general an intractable problem to be solved by computers. That explains why we have teams of researchers and people to understand the cause of airplane accidents, diseases and weather changes, just to mention a few.

What has all this to do with supply chain? Supply chain system are living and dynamic systems which are no different from any other system that exhibits different behavior depending on various input conditions. Since many of the inputs are randomly defined, systems may not be able to react accordingly. Even more importantly, systems may be designed and configured to behave in a way that is perceived to be the real world at certain point in time. However, the real world changes all the time. For example, customer demand changes, supplier delivery performance may not be the same all the time, machine breakdowns may vary depending on usage, changes in weather can impact absenteeism and availability of operators, certain regions may be experiencing much lower inventory levels than others and so on. An intelligent supply chain machine, would learn from its experiences and it will use this information in

order to have a more realistic understanding of what is going on and therefore making better decisions. The key word here is *learning* or *adapting* to its environment. Let's use a simple example to illustrate this. Supposing a supplier commits to delivering a Widget within 10 days. After a while, we can pick up a trend that shows, on average they are delivering in 8 days. This is an extremely valuable information that could potentially reduce the inventory holding cost by 20%. It can also improve your own delivery performance, since orders can be scheduled sooner because the Widgets are available sooner. So a simple observation of the trend can reduce cause and improve delivery performance. How would the system recognize this? Well, let's divide the supply chain systems in to two categories: with memory and without memory. The old generation belong to the latter with no memory. A Supply Chain Intelligent Machine or SCIM has memory, much like a human, and uses it to remember and detect trends, analyze data and change its own behavior accordingly. As with any other intelligent being, you do not have to trust the judgement of the system. In our example here, it may be simply a fluke that the supplier has been delivering earlier for 3 months, or it maybe the case that during certain seasons, the supplier has the extra capacity and other seasons it does not. But this does not make the system any less intelligent than a person who has been on the job for the same amount of times. In both cases, human or system, there is either a lack of enough time to see the real trend, or a missing piece of information. In both cases, they could alert you of the trend and then you can *train* them on the desired behavior. The ability to be trained is another aspect of an intelligent machine. The training could come in the form of rules (of thumb) or expert advice given to an apprentice which gets better over time.

In summary there are certain characteristics that we look for in order to call the system more intelligent, or as we call it the next generation of supply chain solutions, SCP 5G©. These are

- It has memory
- It detects trends and informs
- It has a model of the world in which it is operating (in this case supply chain model) AND it has the ability to change it
- It learns from the trends and from user inputs (rules or advise)
- It knows when to invoke the rule
- It knows when a rule is no longer applicable
- It can predict or learn about *potential* causes (not always with certainty)
- The desired performance of the system gets better over time
- It organizes the knowledge that it has (not just information) in a way that can be uncovered in more detail step by step. (the distinction between knowledge and information is vast, dictionary content is information, speaking a language is knowledge)

At Adexa, we have been focused on the next generation (SCP 5G©) of solutions that exhibit above behavior. An important component of SCP 5G© is SCIM, or Supply Chain Intelligent Machine. The ideas described in this paper are further extended in other Adexa whitepapers including Self-repairing and Self-Improving Supply Chains as well as Risk Management strategies which enable Adexa applications to automatically identify weak links in the supply chain and either warn the users or correct the problems. For more information on this topic the reader is invited to find related papers on www.adexa.com or send an email to info@adexa.com.