IN-MEMORY DATABASES, INDUSTRY KNOW-HOW, AND USABILITY: WHAT REALLY MATTERS IN SUPPLY CHAIN PLANNING

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June, 2013

Table of Contents

Introduction: Is In-memory Database Technology Enough?

The current market attention around in-memory database technology is focused on the possibility that this technology is poised to disrupt key processes in the enterprise by supporting the analysis of unheard-of amounts of data at millisecond speeds. However, another viewpoint is also emerging in the enterprise software market: Is in-memory database technology merely one of many enabling technologies that provide a platform for innovation, as opposed to being the innovation itself? Is this new technological option, which isn't as new as many of its proponents would like the market to believe, really by itself as disruptive and game-changing as it appears to be?

The answer to this question isn't just a theoretical one. At stake is the larger question of what drives innovation in the enterprise, and how business consumers with a specific set of business problems to solve should approach the task of how to acquire and implement innovations that have the potential to significantly move the needle for their businesses. In other words, assuming that the acquisition of new technology for technology's sake is no longer permissible in today's business climate, what is the tipping point for a new technology, or any technology for that matter, that shifts it from an interesting technical concept to a must-have solution for a recognized business problem?

This larger question makes the issue of in-memory database technology all the more interesting, as the level of maturity of the solutions in the market today that are based on in-memory database technology varies greatly from one offering to the other. This means that customers are being asked to make business choices on a piece of technology that may or may not provide enough value to justify the expenditure, and they may even be making those choices based on a technology alone.

Enterprise Applications Consulting (EAC) was asked by one of the pioneers of in-memory database technology, Kinaxis Inc., to research the status and importance of in-memory computing in the market today. The goal of this effort was to help customers make better choices about the innovative products and technologies that are needed to stay competitive in today's global business environment, particularly in the supply chain planning market that represents Kinaxis' core market.

The results of this research showcase an interesting component to the classic innovator's dilemma: while in-memory database technology does provide orders of magnitude better performance and throughput for complex analytical processes, raw speed is not the most important factor in users' evaluations of the in-memory systems planning processes they have built on top of Kinaxis technology.

Indeed, EAC's interviews with RapidResponse customers show that the exceptional speed of in-memory technology, while extremely useful, is not as all-encompassing a selection criteria as the current market hype would seem to indicate. Other factors, such as user experience and usability, the overall quality of the analysis, integration technology, and domain-specific functionality, turn out to be at least as important, if not more so than in-memory technology.

From the perspective of Kinaxis' customers, raw speed, while seductive from a technological standpoint, isn't enough to fit the needs of companies that require cost-effective solutions to specific business problems. For those that are interested in results that are geared to their business problems, and can be made available in a very cost-effective manner, solutions like RapidResponse make much more sense than general-purpose in-memory database engines, precisely because they focus on delivering business outcomes, and not just net new technology.

This is particularly true in the Kinaxis RapidResponse customer base, a cloud-based in-memory planning engine that has been on the market for almost 30 years and is currently in use by about 100 customers. This longevity gives Kinaxis a breadth of customer experience that is unmatched by many of the current proponents of in-memory database technology.

The Customer Perspective:

What Makes RapidResponse Successful in an Enterprise?

An analysis of the factors that influence customer satisfaction in the Kinaxis customer base shows a clear conclusion. In-memory technology is *not* a primary factor in the relatively high degree of customer satisfaction that Kinaxis enjoys. In fact, while raw processing power is clearly an important part of how RapidResponse is used, speed is essentially an enabling technology that supports other reasons for using RapidResponse.

EAC's interviews with Kinaxis' customers show five primary factors in their use of RapidResponse:

1) **Planning and Analysis Quality:**
   Supports complex planning scenarios, product configurations, and business models.
2) **User experience:**
   Supports a wide range of users with minimal training and IT involvement.
3) **Ease of integration with ERP systems of record.**
4) **Ease of implementation, management and maintenance.**
5) **Ability to use RapidResponse as a general-purpose planning tool:**
   Useful for master data management, quality processes, S&OP, and others.

Undoubtedly, the speed with which RapidResponse can process complex data sets and deliver results clearly underlies these capabilities. Sub-second response time can allow planners to iterate through different scenarios and models in near real time, changing planning from a black box process that can take hours, into a collaborative, interactive process that can be done on the fly. Every customer EAC interviewed noted that the speed of RapidResponse was a key factor in its usefulness, even though most admitted that the specific technological underpinnings of RapidResponse that enable speed and throughput were unknown or not of particular interest.

Quality and the User Experience

Undoubtedly, usability and the quality of the analysis enabled by RapidResponse were by far the most important factors in its use. Underlying the quality issue is the fact that RapidResponse allows Kinaxis customers to dramatically extend their planning processes and do much more complex modeling and planning than they would be able to do with standard ERP-based planning tools. In the past, not having a "consistent and predictable environment" for analysis, according to the center of excellence manager at a global pharmaceutical company meant that "people didn't try things because they didn't think they were possible. Now we get more complex requests because we are more able to deliver on them."

The support for complex, comprehensive analysis is a key element in the quality issue. This is a function of RapidResponse's support for a wide variety of planning requirements that allow customers with highly variable demand requirements, complex product lines, or unusual supply chain configurations to do much more than with the other planning tools they are familiar with. Indeed, RapidResponse, according to Laura Dionne, the director of worldwide operations planning at TriQuint Semiconductor, is "an analytics engine, not just a planning tool."

TriQuint, a semiconductor manufacturer based in Hillsboro, Oregon, has customers that want the company to support their very high degree of demand variability – 60 percent or more – in highly constrained time windows. "We may only know that we won the deal a few weeks before production ramps, but we have to commit to capacity expansion nine months beforehand," explains Dionne. "RapidResponse lets us do scenario planning across the different products and see what would happen if we get to do five or ten of the 20 products we're bidding on."

Using RapidResponse, one of Dionne's strategic planning staff can run a dozen scenarios a day – scenarios that on another planning tool might individually take hours to complete – and "then sit in front of the vice presidents and say which products we should double down on and which ones we should avoid because they are resource hogs," said Dionne. "We give them a month by month projection of our product stock. Inventory becomes the result of a decision, not an input to the decision."

RapidResponse also allows TriQuint to expedite rapid change orders for its most important customers. "We were just in a situation where we needed to expedite an order for a large customer, and we were able to generate a new build plan in a matter of minutes," said Dionne.

This level of responsiveness – which is dependent on RapidResponse's specific supply chain planning functionality as well as its processing speed – doesn't just help TriQuint serve its customers. It also has an important impact on the company's employees. "It's that kind of real time analysis that helps the quality of the planning as well as the quality of the people we can retain," said Dionne.

Dionne is not alone in seeing that talent retention is highly correlated with her company's use of RapidResponse. This retention factor is a function of the usability of RapidResponse, of which the

spreadsheet user experience is an important starting point. For many users, RapidResponse's user interface is a welcome contrast to the often arcane user interfaces of major ERP systems. "The user experience is very familiar, and it is highly intuitive. That was a huge advantage for us," the pharmaceutical center of excellence manager noted. Laura Dionne agrees. "I never met anyone in planning who didn't know how to use Excel," said Dionne. This means that training costs are low and user acceptance is high. "I have never had a training class and I can do my own workbooks," added Dionne.

Usability is more than just a matter of a spreadsheet-like user interface, however. The ability for each user to run their own independent plans, as many times as they would like, without impacting other planners or live operational data, was another important factor cited by RapidResponse customers. And while RapidResponse allows individuals to be highly creative with their planning processes, it also allows a high degree of collaboration and visibility across the enterprise.

"We didn't have this collaboration before," said the pharmaceutical center of excellence manager. "Everyone was planning offline, and now it's happening in the system. We can run a connected supply chain planning process every month, from individual sites, to the regional level, and all the way to corporate."

Ease of Integration with ERP Systems of Record

The built-in integration to major ERP systems like SAP is a key selling point for RapidResponse's customers, all of which are extracting data from their ERP systems to be used for planning. This has been a major design point from the beginning, and as such RapidResponse supports direct integration to SAP and Oracle, as well as a wide range of integration protocols and data sources (see *RapidResponse and the Role of In-memory Technology,* below.)

This direct integration is a key element in the use of RapidResponse across a wide swath of manufacturing companies using an equally broad set of ERP packages. RapidResponse "partners very nicely with our ERP system," said TriQuint's Dionne.

This ease of integration not only helps get the data into RapidResponse, but it also allows companies to run relatively lean ERP environments without having to configure them to support complex planning requirements. The fact that non-ERP data may also factor in the plan means it usually makes more sense to use a third party tool like RapidResponse than to bring data from outside the ERP system into that system's planning environment. "Half the information we need isn't in the ERP system anyway," said Shellie Molina, the vice president of global supply chain at First Solar, Inc., a producer of photovoltaic systems based in Tempe, AZ.

Ease of Implementation, Management and Maintenance

The ease of use of RapidResponse extends to the overall management of the product, and for many customers this ease of manageability is a welcome relief to the complexity of their ERP systems. This was very much the case at the pharmaceutical manufacturing company, which initially tried to use a planning tool supplied by their ERP vendor. "We tried to make that work for a year," said the company's senior manager of strategic planning. "It was too support-intensive, it took eight hours to do a run, and someone had to man the desk to make sure the processes ran correctly."

Implementation and set-up was another area where RapidResponse excelled. "We were trying to do inventory projection in our ERP systems," said Dionne of TriQuint "Our people were programming it for six months (in the ERP system); we had it in RapidResponse in three days."

"It's relatively cheap to run," added Dionne. "You don't need someone with a big SAP or Oracle background."

One of the unusual values of using RapidResponse is that the accuracy and rapidity of the analysis allows business users to see potential anomalies in their data and understand whether the anomaly is caused by a shift in some internal or external factor, or if it's due to bad data. This lets users, such as those at First Solar and other companies, play an important role in data quality by seeing anomalies and running additional scenarios to determine their origin. "My team has become the guardians of the master data," said Molina.

RapidResponse is used by the pharmaceutical manufacturing company in a similar way. "We can use RapidResponse to identify inconsistencies," said the company's center of excellence manager. "It can tell us the difference between a data and a supply problem."

This ability to use RapidResponse to manage data quality is essential to ensuring that planning isn't just happening more rapidly, but with the highest possible standards for quality. "The moral of the story is that faster data that isn't accurate data isn't useful," said First Solar's Molina.

Ability to Use RapidResponse as a General-Purpose Planning Tool

The successful use of RapidResponse for supply chain planning and in increasingly important domains, such as sales and operations planning, has led customers to explore expanding its use as a more general-purpose planning tool. Shellie Molina of First Solar has been pioneering the broad use of RapidResponse across her company. "I'm still focused on the planning side, but at the end of the day, we could use if for project management, engineering design, even a quoting tool," Molina said. "It's a tool for changing your business." TriQuint's Dionne also sees a broader applicability for RapidResponse across the company. "We've only harnessed five percent of what is possible," she said.

RapidResponse and the Role of In-memory Technology

The customers' viewpoint that in-memory technology is only a small part of the total usefulness of RapidResponse is reflected in a look at the technical underpinnings of the product. (See Figure 1.) While the core of RapidResponse is its in-memory database, which runs on Windows Server and can store and process 4 terabytes of data in memory, this processing and storage engine is encapsulated in a comprehensive, cloud-based platform that supports the much broader business and technical functionality of RapidResponse.

Figure 1. RapidResponse Architecture
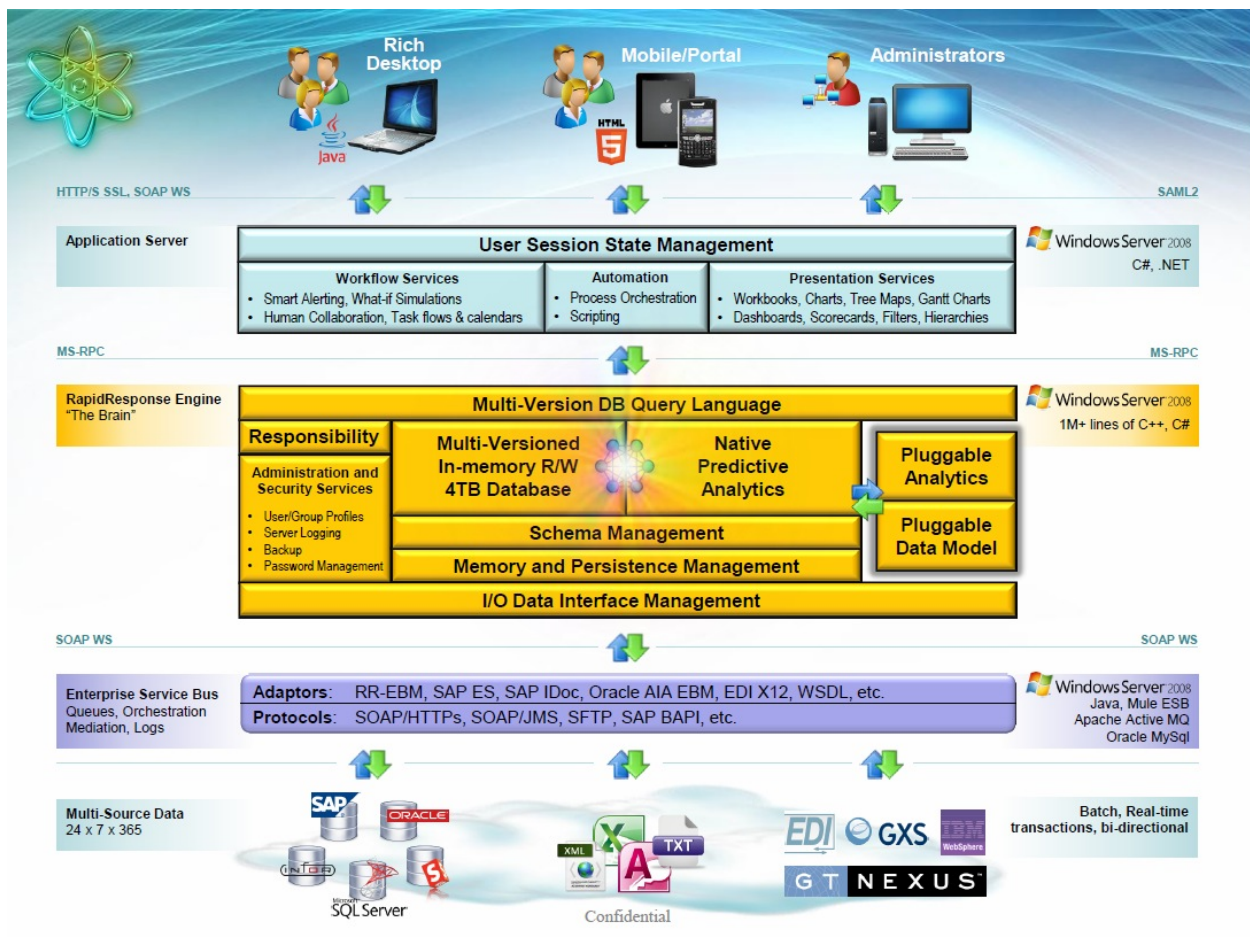
Source: Kinaxis

As noted above, RapidResponse's underlying platform supports a wide range of adapters, data sources, applications servers, and integration protocols, enabling bi-directional integration with ERP and other

systems, including data from SQL databases and spreadsheets, as well as via protocols such as XML, EDI, and others.

Layered around the data engine is support for memory and schema management, as well as native analytics that are driven directly off the in-memory system. There are over 140 prebuilt analytics for supply chain management and sales and operations planning. The engine also supports queries from third party BI and analytics tools. Furthermore, sitting on top of the RapidResponse stack are workflow, process orchestration, and presentation services that help with collaboration and overall usability of the results.

It's no accident that the bulk of the data represented in Figure 1 is the supporting technology for the in-memory database engine. This ratio of in-memory database technology to supporting technology is very much in line with the distribution of factors relating to customer satisfaction with RapidResponse. The customer interviews show that the support for issues such as user experience, quality, and collaboration are more salient than the underlying database engine, and while it's clear that a great user experience is important to overall user acceptance, that experience is less useful if the underlying database is slow and unwieldy.

In fact, Figure 1 represents a relatively advanced evolutionary view of what happens to an in-memory database technology after several decades in the field, being used by real customers to solve real problems. As usage became more widespread, and Kinaxis' experience delivering advanced planning tools grew, the key differentiators for RapidResponse shifted from in-memory technology to a robust set of services that turn a general-purpose in-memory database technology into a highly focused tool for advanced planning. Along the way, RapidResponse brought on support for a broad mix of technical capabilities including bulk data loading, data compression, and historical database views, as well as functional capabilities such as complex supply chain planning, predictive modeling, alerting, and collaboration.

The result highlights why the interplay of technology and business functionality is an absolute necessity in order to deliver value to core business processes. Given a general-purpose in-memory database engine, it's possible to envision a company – or more likely, a systems integrator – building the advanced supply chain planning tools needed to make use of this technology. However, the cost of building, maintaining, and upgrading that environment would be greater than most companies could bear, and the likelihood is slim to none that such a purpose-built system would be able to support the breadth of technical and business functionality that Kinaxis has been able to deliver with RapidResponse. By building a comprehensive functional and technical layer around its in-memory database technology, Kinaxis has been able to provide a user experience that is both more functional and more cost-effective than would be possible if a company started from scratch with a general-purpose in-memory database.

Conclusion: Speed Matters, But It's Not the Only Thing

It would be misleading to completely dismiss the value of RapidResponse's relative speed. Every RapidResponse customer interviewed by EAC reported that the speed of analysis allowed for a significant change in the overall planning process. The ability to do multiple MRP runs in seconds as opposed to hours is the most commonly cited advantage to using RapidResponse, and the ability to do this rapid planning in a collaborative environment makes RapidResponse even more valuable.

Even more important than speed is the ability to make more rapid, and more accurate, decisions, and, indeed, every conversation with a RapidResponse customer revolved around this issue. "Our planners have much more time to evaluate the data and make decisions," is how the pharmaceutical center of excellence manager put it. "The tool is no longer a hindrance to the planning process."

This in turn allows RapidResponse customers to more rapidly identify problems and their resolution, and to see that not just in terms of raw turn-around speed. "What I didn't expect was how agile we could become," stated Laura Dionne of TriQuint. "You are only limited by your creativity."

The fact that creativity is the limiting factor in RapidResponse's use, and not usability, quality, complexity, integration, or speed, speaks to the completeness of RapidResponse as a product. Rather than a general-purpose in-memory database system, Kinaxis has built a planning and decision-support system that is easy to deploy and use in a variety of supply chain and S&OP functions. Further, RapidResponse can be extended to other planning and project management functions, limited, as Laura Dionne said, only by the customer's creativity.

This is how technology should be deployed, as well as marketed. And while it's possible to accuse Kinaxis of false modesty in not fully engaging in the market hype around in-memory computing, the fact is that RapidResponse has been about much more than in-memory computing for some time. Raw speed is important, but as Shellie Molina from First Solar puts it, "I am looking for a product that is fast and easy to use. How Kinaxis does it? I'm indifferent."

Sometimes a little indifference goes a long way.