

## Delivering Self-Service BI, Data Visualization, and Big Data Analytics

Our self-service tools empower Intel sales groups to customize their reports, rapidly analyze information, make faster, better informed decisions, and respond quickly to business opportunities.

### Executive Overview

**Over the last five years, Intel IT has evolved its approach to BI solutions for Intel's worldwide sales organization to enable rapid delivery of advanced self-service business intelligence (BI) and data visualization capabilities. By moving to a user-centered model and establishing stronger working partnerships with our sales groups, we can now deliver reports and dashboards to production in just two to four weeks—85 percent faster than in 2007.**

Our self-service tools empower Intel sales groups to customize their reports, rapidly analyze information, make faster, better informed decisions, and respond quickly to business opportunities. In addition, by being self-service, these tools free IT staff to focus on developing more powerful analytics capabilities, instead of having to respond to routine report requests.

To develop these tools, we took a four-pronged approach.

- Establish a partnership framework for working closely with our sales groups to ensure optimal prioritization and management in aligning data delivery to business value
- Adopt agile Scrum methodology for fast, iterative, and incremental software development for BI projects
- Enable agile data architecture to streamline processes for making new data available,

treating data as a product for self-service consumption

- Implement more intuitive self-service BI using the software tools our users prefer, enabling them to get the best and fastest results

Within the sales group, we are seeing year-over-year increases of 40 percent in utilization of our self-service BI solutions and reports. Our next steps include the addition of technologies for increasing the use of big data as part of our multiple BI data warehouse strategy and propagating the approach across all of Intel's business areas. Incorporating big data will enable business users to mine a broader range of data faster and more cost effectively. In addition, we are working on ways to more quickly deliver rich, consistent, and secure user experiences across a variety of form factors, particularly mobile devices.

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## IT@INTEL

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## BUSINESS CHALLENGE

**Intel works with enormous data sets and has a large global workforce. Together these factors create a demand for timely information to make more intelligent business decisions and take advantage of new and untapped business opportunities. For Intel IT, creating effective business intelligence (BI) solutions is a priority.**

Traditionally, Intel sales groups have depended on us to convert data into usable information for decision making. However, with increases in both the velocity and complexity of Intel's business over the last five years, demand for such information grew greatly. It became challenging to deliver reports, revise existing reports, and migrate data in a timely manner and to respond to other types of BI requests. The backlog in BI solution delivery averaged six months. In addition, the centralization of BI responsibilities and the resultant time lag and inability to perform within expectations negatively affected the use of BI within Intel.

Intel sales groups, which need to make decisions in a few days, not months, began developing their own methods for accessing and analyzing data. Circumventing Intel IT, these methods often employed dated or incomplete data, delivering inaccurate results. These self-directed approaches created additional work for Intel IT, particularly in troubleshooting and reconciling reports.

Realizing that traditional BI solutions and processes were not meeting our sales groups' needs, we sought to decentralize our BI solutions for these groups by enabling a self-service model. Instituting such a model required us to establish a deeper working partnership with our business customers. We wanted to ensure they were able to

access the best data using their preferred analytics tools. To do this, we needed to better understand how our customers work and what their requirements are. We began a five-year journey to improve this working relationship and develop self-service BI tools. In 2007, we started by analyzing the problem, focusing particularly on our business model and reports.

## Our Traditional BI Solution Development Model

Our former engagement process for BI tools and reports for the sales group followed the traditional "waterfall" software development lifecycle where all requirements are defined up front and a deliberate process is followed to completion. The process began with collecting detailed BI business requirements from our business users. We then worked toward getting the data to fulfill those requirements.

This data was typically located in disparate transactional and customer relationship management (CRM) systems. Making it accessible meant working through the various security layers protecting that data, as well as collaborating with data architectural review boards to model the data and move it into the enterprise data warehouse (EDW). Our information architecture at the time dictated that all data had to be placed in our EDW. For quality assurance purposes, we had to approve and govern all changes to the EDW.

Once the data was housed in the EDW, we established security and data governance processes to manage and control the information, ensuring its continuous security and accuracy. At this point, our professional IT developers began to create the different reports, dashboards, metrics score cards, and other necessary capabilities, all following the same waterfall path to production.

## **TOO MUCH DEMAND, TOO FEW RESOURCES**

We followed this lengthy, labor-intensive process for each sales report. Over time, as our user community grew to several thousand users and with only a finite set of IT resources to serve them, we began to fall months behind. Even when we re-prioritized critical reports and dashboards, moving them up in the queue, delivery time was still several months.

Other policies were causing delays as well. We required suppliers to be on their next software version before we used the current one. This usage model ensured that Intel sales groups worked with software versions that had been field tested. With our limited resources and suppliers making fast iterations in software versions, we could not keep up. One particular supplier issued a new version of its data visualization tool almost every month. Keeping up with this product alone required nearly constant evaluation.

## **REPORT LIMITATIONS**

In addition to our slow waterfall process, our reports had limitations. They were typically built to answer specific questions but were unable to provide insight into related, follow-up questions. We could often trace this shortcoming to an inadequate description of requirements in our information-gathering stage. Sales groups would fail to communicate the full range of information they needed, how they wanted it to be visually represented, and the capabilities they expected in the reports and dashboards. In addition, our documentation often failed to adequately query and capture business requirements.

For example, we received a request for a list report providing revenue for the current quarter. After creating the report, we learned that what the user actually wanted, but had failed to describe, was a report showing revenue for all four quarters over the past several years. The users also hadn't

mentioned needing the ability to drill down into that information, perform year-over-year and quarter-over-quarter calculations, plus sort, filter, and display the information in a visually appealing way, thinking these were standard report elements.

As a result of these communication challenges, we began to request extremely detailed documentation from our sales groups to ensure we understood their needs. This process resulted in further implementation delays and frustration. Users began to conclude they could create spreadsheet macros and charts faster than filling out our documentation. In addition, they wanted more than our one-way solutions for working with information. They wanted ad hoc reporting—the ability to create customized queries to drill down into information.

## **AD HOC QUERY AND ANALYSIS TOOLS**

As a quick fix, Intel IT provided the sales groups with several ad hoc query and analysis tools, enabling faster access to data and more versatile reports. Although these tools helped, our lengthy process for funneling data into the EDW still remained. Lacking data, the ad hoc tools went unused.

A usage analysis we conducted confirmed these problems. Only one in four Intel IT professional reports was being used. Often by the time we finished a report for a business user, the report was no longer relevant to the business need.

## **Spreadmarts and Other Workarounds**

At this point, we began to notice a shift in report requests. Instead of a specific report containing specific data, the sales groups wanted list reports containing all the columns and tables in the EDW. Using these reports, sales groups could move the data into their own report and then extract that data into a spreadsheet. The months Intel IT spent developing a specific report proved futile as users themselves found ways to simply export data into a spreadsheet.

Intel sales groups also began performing massive macro mashups of local data with corporate data extracted from Intel IT's professional list reports to create spreadmarts. A spreadmart is a reporting or analysis system running on a desktop spreadsheet and performing tasks normally done by a data mart or data warehouse. Users in sales groups collaborated within these spreadmarts across drive shares, providing access to each other's drives over the network. This approach created spreadmart silos that helped one individual or small team but not the overall sales group or company. Users also often misused the data because they did not fully understand it. This led to calls to IT to help troubleshoot, tying up our report staff.

Two examples help illustrate the problems Intel IT faced.

- A sales group comparing their own calculations to Intel IT reports noticed discrepancies. In most cases, the sales analysts' calculations were incorrect because they did not fully understand the underlying metadata, data model, source systems, and other factors. In several situations, analysts exported these miscalculations into their spreadmarts, further compounding the error. It took Intel IT weeks to troubleshoot and fix these errors.
- Seeking to take advantage of the latest data, a sales employee using the report scheduling capabilities within an off-the-shelf BI platform set a report to rerun every minute. What the employee did not know was that the report's source data was refreshed only weekly and each report instance took three minutes to execute, significantly tying up the job queue. The employee shared this "best practice" with an entire department, which led to a massive utilization spike similar to a denial-of-service attack on the BI platform.

## LOCAL DATA MARTS

Another popular workaround involved hiring consultants and suppliers to create local data marts for a sales group's respective business departments. The sales group then used extract, transform, load (ETL) processes to connect to the EDW and replicate information into these data marts. This process resulted in heavy data traffic between the data warehouse and the data marts. It also resulted in many redundancies, particularly in the duplication of ETL processes within the same sales group and project. This ETL replication caused data-latency issues that resulted in data mismatches between what was in the EDW and the information these groups used to create reports off their local data marts.

## Acknowledging Complexity

One particular IT-specific problem contributing to our challenges in BI solutions development was our belief that BI tools and data were too complex for business users. Based on our observations, we thought giving users control of the tools would lead to problems and help calls to Intel IT. We knew that our data warehouse structures and metadata were not designed for self-service. They were constructed for IT developers. We did not have the semantic data, data organization, and the contextual information necessary for ad hoc querying and easy consumption by the business.

Nevertheless, our studies showed that users within sales groups were adept with off-the-shelf BI products, spreadsheets, and spreadsheet plug-ins. Some spreadsheet macros these users created rivaled the coding our IT software development teams created. The list reports these users requested were also an admittedly smart way to avoid the performance challenges in trying to use data structures defined specifically for IT-created reports and not intended for self-service.

## SOLUTION

**After acknowledging that our BI solution delivery process designed to provide a specific report no longer met the Intel sales group's needs, we set out to enable a user-centric model superior to what these groups could create themselves. We needed to make data readily available in forms the sales groups could understand. And we needed to free these groups from spending hours developing their own BI solutions to instead using our more accurate tools to analyze and visualize data, make fast, intelligent decisions, and grow Intel's business.**

Our solution to providing faster access to data and implementing intuitive self-service tools took a four-pronged approach, which consisted of implementing the following components:

- Partnership framework
- Agile Scrum methodology
- Agile data architecture
- Intuitive self-service BI and data visualization tools

While none of these components alone is particularly unique, we believe our innovation lies in the implementation of all four components as a comprehensive approach.<sup>1</sup>

## Partnership Framework

In 2007 and 2008, Intel IT started a program to "walk a mile in the business analyst's shoes," observing how our analysts actually use our tools, technologies, and solutions. Our goal was to understand how to better meet user needs.

<sup>1</sup> A podcast describing Intel IT's four-pronged approach to implementing intuitive self-service BI tools is available at [www.intel.com/content/www/us/en/it-management/intel-it-best-practices/inside-it-self-service-business-intelligence-podcast.html](http://www.intel.com/content/www/us/en/it-management/intel-it-best-practices/inside-it-self-service-business-intelligence-podcast.html).

For example, an IT staffer shadowed a sales business analyst who needed sales figures to compare actual sales with targets for an upcoming meeting. Working side-by-side with the analyst, the IT staffer saw the type of obstacles business users faced. Data naming conventions did not clearly indicate what the data represented, and there was no glossary or data dictionary. The staffer found an existing published report that had the needed target data, but it was in a different data model than that of the current sales information. To get the job done, the IT staffer did just what our business users had been doing: he moved the data from both models into a spreadsheet.

In designing self-service BI solutions for Intel's sales organization, we decided Intel IT needed to forge a closer, more trusting relationship with Intel sales groups. To build this partnership, we created a framework designed to encourage conversations and alignment. Building this alignment was essential in moving to a user-centered perspective. To hand data and tools to the user, IT needed to start by learning firsthand what users need to be effective.

Through our partnership framework (see Figure 1), we now manage and prioritize projects and deliverables with our business users according to business value. The framework guides the overall process, helping players know their roles and responsibilities at each stage. The framework is composed of four tiers.

- **Tier 1 - Executive Sponsors Forum.** Our executive sponsors provide top-down direction. They drive corporate strategic objectives through the Management Review Committee, review the direction and priorities established by that committee, and help remove major business roadblocks.
- **Tier 2 - Management Review Committee.** This committee includes the directors responsible for each line of business and each technical group.

The committee addresses any business, technical, or collaboration challenges that arise. The committee also establishes and drives cross-organizational partnerships and strategies, allocates resources, and makes decisions about licensing purchases, new capabilities, and tools.

- Tier 3 - Worldwide Program Office.** This office is responsible for assembling the integrated worldwide roadmap that determines our scope of work for the Intel sales organization. The roadmap is based on business priorities and includes metrics for usage, adoption, performance-to-delivery schedules, and other success indicators.
- Tier 4 - Business Intelligence Competency Center (BICC).** Like many IT organizations, we have established BICCs for each line of business, as well as an overarching BICC for the entire sales organization. BICCs have data stewards, architects, and analysts who participate in our Business and Technical Communities of Practice. This participation enables them to hone their data and analytics skillsets to improve report performance, align data from different systems, and manage

controlled vocabularies. The overarching BICC manages the integration of all metrics and determines the division of goals among business lines.

### Agile Scrum Methodology

Scrum is an agile framework for completing projects where work is divided into two-to-four week iterations called sprints (see Figure 2). We adopted this software development lifecycle model to address our needs for faster solution delivery and greater flexibility in responding to the business need and delivery of BI solutions and reports. Intel IT already uses Scrum successfully to speed up other application development projects.

In contrast to waterfall software development, Scrum assumes change is normal and often good. The methodology promotes frequent dialogue with users for timely feedback and help in prioritizing changes. By teaching our IT teams to develop in increments, Scrum helps us reduce the time between when a user makes a request and seeing the result.

Agile development is a difficult paradigm shift to master at first, but once adopted and in practice, our teams have flourished and become enthusiastic about the approach.



Figure 1. Intel IT uses a partnership framework to work with Intel sales groups to prioritize, design, and implement business intelligence projects.

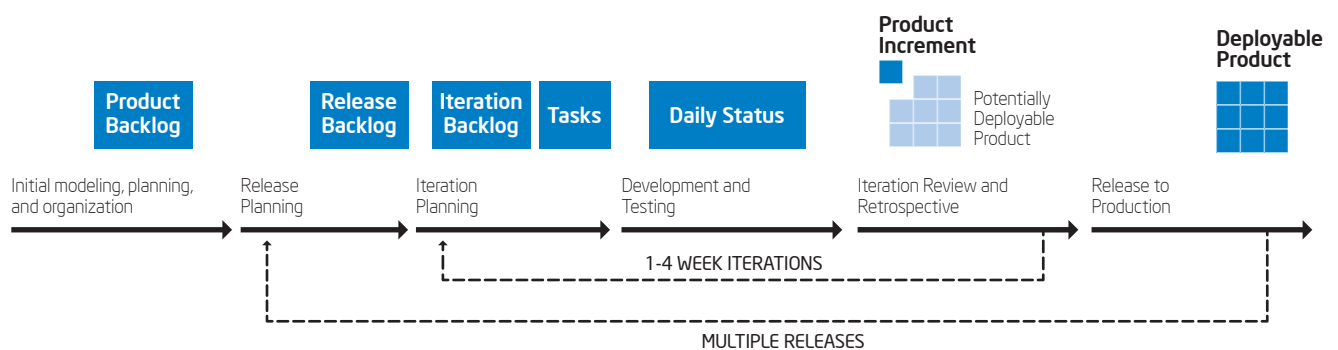


Figure 2. Intel IT uses Scrum methodology to deliver iterations of business intelligence solutions in just two to four weeks.

Our Scrum process for self-service BI is based on the Scrum Alliance’s methodology<sup>2</sup> and works as follows:

- A product owner creates a prioritized requirements list called a product backlog.
- During sprint planning, the team pulls a small piece, called a release backlog, from the top of that list and decides how to implement it.
- The team operates in sprint mode with a defined amount of time to complete the work. Teams meet each day to assess progress in a daily Scrum. A Scrum Master keeps the team focused on its goal.
- The sprint ends with a sprint review and retrospective in which the team demonstrates the completed work to stakeholders and reflects on what changes they can make to improve the process for the next sprint.
- As the next sprint begins, the team chooses another piece of the product backlog and begins work.
- The cycle repeats until enough items in the product backlog have been completed, the budget is depleted, or a deadline arrives.

As a result of using Scrum, we are seeing an 85-percent reduction in delivery time on bringing working reports and dashboards to

<sup>2</sup> For more on this methodology, see: [www.scrumalliance.org/learn\\_about\\_scrum](http://www.scrumalliance.org/learn_about_scrum).

production. We achieve this improvement by using Scrum for agile data architecture (see next section), followed by Scrum development of the components needed within the data model to support the report. We then build the remaining report elements necessary to meet user acceptance. The result is a better focus on the highest priority needs and requirements. This methodology also enables us to maintain a sustainable pace instead of trying to deliver reports within impossible deadlines.

### Agile Data Architecture

The use of spreadmarts and departmental data marts by Intel sales group demonstrated that it was not realistic to funnel data through our EDW before enabling business users in sales to access the information. We needed to treat data as its own product for self-service, make data agile—available in days not months—and deliver it in formats our business users could readily understand.

To develop an agile data architecture that would accomplish these goals, we made three key changes.

- We applied learnings from the workarounds our sales groups had devised, particularly the use of data marts and spreadmarts.
- We applied Scrum methodology, similar to what we employ in our software development, to data architecture.

- We added new semantic layers with more intuitive naming schemes for Intel sales groups.

Figure 3 shows the implementation of the agile data architecture, using the data marts and spreadmarts already used by Intel sales groups.

### DATA MARTS AND SPREADMARTS

To minimize the governing process and the long lead times required for EDW use, we followed the precedent of our sales groups and implemented data marts for specific data, such as sales and marketing activities. We also recognized the usefulness of spreadmarts, particularly for the data mappings and custom hierarchies needed to meet local, geographic, and departmental needs. These spreadmarts provided our geographic groups and departments with ways to customize existing data to make it fit their unique business needs. Since this data is needed for self-service BI and was already in spreadmarts, we decided to include it. Going forward, our transactional and BI systems will need to meet the needs of a global-geographic model that will enable sales groups in any region or department to manage their unique business needs more effectively.

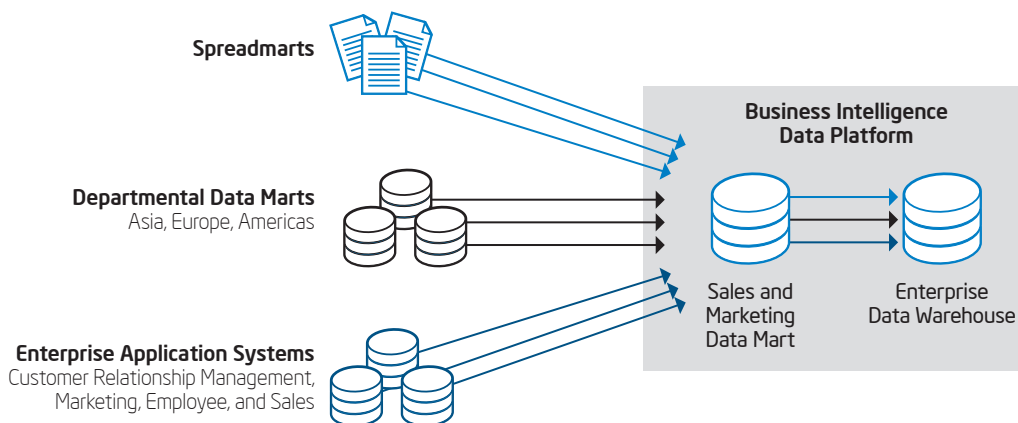


Figure 3. To implement agile data architecture, Intel IT included the data marts and spreadmarts that Intel sales groups already used and preferred.



### LEAN DATA GOVERNANCE

To further speed data availability, we employ lean data governance. The data architects on our agile project development teams serve as members of the BICC's data operations team. Having data architects serve on both teams streamlines the process for adding and modifying data within our data marts. What used to require extensive documentation and funneling presentations for approvals across several review boards and councils now requires only a conversation.

Our approach to agile data architecture differs from our previous enterprise data approach in other key ways as well.

- **Improved data collaboration.** Data stewards, subject matter experts, data architects, and data analysts all collaborate as a data operations team within the BICC.
- **Strategic EDW usage.** Only data identified as necessary to share across the enterprise is moved into our EDW. Our primary focus is delivering the data needed immediately by our business users, generally through a data mart. This approach significantly reduces IT time and effort.
- **Design from the ground up for self-service.** Self-service data is now our priority. We design the system from the

start to enable Intel sales groups to perform data exploration quickly and easily on their own.

### THE SEMANTIC LAYER

An important element of our agile data architecture and self-service strategy involved taking existing data subject areas and packaging them into a semantic layer targeted at Intel sales groups and the way they think and work. This semantic layer represents corporate data designed so our sales groups can access data autonomously using common business terms, such as "sales order," without having to know the underlying implementation details (see [Figure 4](#)).

The semantic layer also provides technical mapping, so the user does not have to worry about data that exists in multiple places—a common occurrence in a company our size.

We found the semantic layer challenging to implement. We had massive data stores in technical locations with esoteric names devised by IT staff, not Intel sales groups. These sales groups told us that prior to analysis, they spent much of their time just finding the data they needed and then scrubbing it—detecting and correcting corrupt or inaccurate records.

Through our partnership framework, we worked—and continue to work—directly with the sales groups to develop and maintain a semantic layer and intuitive naming schemes. For Intel IT, the complexity in implementing this layer lies in the need to map it to internal and external data.

Sharing in the development of the ongoing naming process, Intel sales groups can now quickly find the data they are looking for and perform data analysis. Such semantic layers and shared naming responsibilities will continue to grow in importance as the amount of our data and our number of storage locations increase.

### Intuitive Self-Service Business Intelligence and Data Visualization Tools

For optimal performance and results, self-service BI needs to do more than supply business users with tools to analyze data and create their own reports. Acceptance and widespread usage require that the data be designed for self-service use and that our professional BI solutions be designed to provide an optimal user experience in terms of performance, interactivity, and accessibility with a wide range of devices.

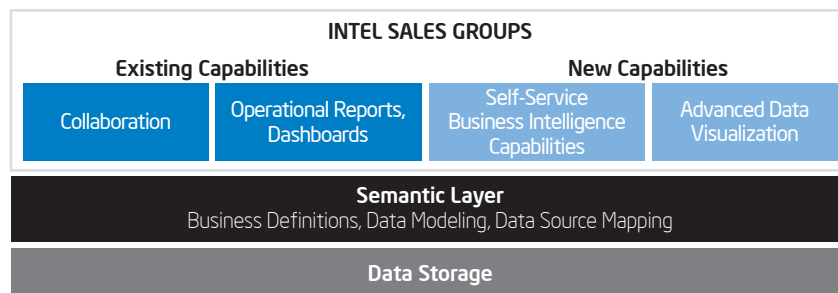


Figure 4. A key piece in our agile data architecture is a semantic layer that provides naming schemes using common business terms that Intel sales groups use.

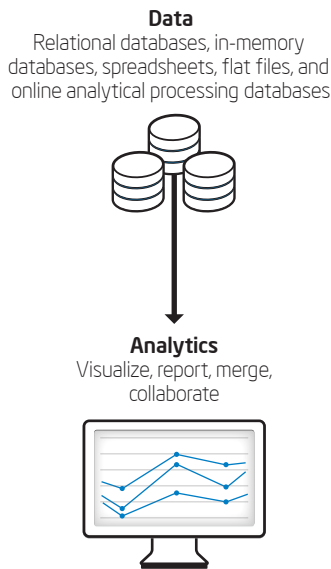


Figure 5. Through our observation of Intel sales groups, Intel IT recognized the importance of designing self-service BI solutions that enabled access to sales and marketing data through familiar tools for collaboration, visualization, data merges, and reporting.

In developing self-service BI solutions for Intel sales groups, Intel IT began by defining three service levels for accommodating the needs and BI experience of users in groups with BI tools. These levels differ in the degree of enterprise integration and the desired level of self-service. We define these service levels as follows:

- **Provisioned.** Advanced business users with mostly local data sources and low enterprise integration requirements receive an environment provisioned with the minimum information they need to create an ad hoc reporting solution for themselves. This high degree of self-service enables quick turnaround for both IT and the user.
- **Standalone.** Business users who need to perform ad hoc analysis on a mix of local and enterprise data receive a provisioned environment with the necessary security, semantic layer, and recommendations on the best containers from which to pull data. IT works closely with the user at each development stage to ensure the solution meets user requirements.
- **Integrated.** Business users who need traditional BI solutions to drive a business process reengineering effort or other large-scale effort may request a comprehensive solution. Intel IT develops a provisioned environment, security, a semantic layer, connectivity to recommended containers, full reports and dashboards, some self-service BI capabilities, and user training. Agile Scrum methodology and data architecture enable us to provide these reports faster than in the past, but this service level still requires the most lead time and work.

### DEVELOPING SELF-SERVICE BUSINESS INTELLIGENCE APPLICATIONS

After we defined the service levels, we began to design and implement the solutions. Having observed Intel sales groups, we determined

that our self-service BI applications needed to provide several essential capabilities.

- The ability for users to produce their own ad hoc reports, dashboards, and custom calculations and tailor these tools to their own needs, including the ability to drill down, sort, filter, slice, change colors, and modify charts
- The ability to merge functions in order to blend corporate data with local data on laptops and spreadsheets to consolidate, integrate, and analyze large datasets spread across two or more data sources, as well as publish and share results with their teams and stakeholders
- Rich visualization tools that help users explore data

The most common tool that has all of these capabilities is a spreadsheet application that provides a highly capable user layer and works with a wide range of advanced visualization tools for looking at ranges, trends, or other results. Plug-ins increase the power of such tools. Some spreadsheet plug-ins provide powerful data mashups and data exploration tools that allow users with no specialized BI or analytics training to develop data models and calculations and then share them using shared document libraries. Other BI software suppliers offer solutions that enable our IT staff to develop advanced tools for connecting users to disparate data and enabling them to build their own reports.

We found the best BI solutions for utilizing local and enterprise data were those that offered users integration touch points with spreadsheets or other applications they favor for visualization and collaboration (see Figure 5). These familiar applications enable users to not only easily explore data visually, but also take any existing reports, as well as other data sets, combine them with the other data, and do further mashups and visualizations. They are also able to export anything created in other platforms to their spreadsheets and other favored application.



## DATA VISUALIZATION

In this era of big data, data visualization is a growing field. Data visualization, an established data integration technique, is a critical BI component for enabling users to see trends, patterns, and other relationships that can provide actionable intelligence.

As cited earlier, Intel sales groups primarily use spreadsheet tools and plug-ins for data analysis and visualization. To support these tools, we are working to develop templates with sets of dimensions and data from which users can select to make a report, and analyze and share results. We plan to use data virtualization to provide integrated data access to the virtual views of data across multiple, disparate internal and external data sources. We plan to enable data virtualization through middleware that connects to data sources, executes queries to retrieve requested data using pre-defined views, combines the data with other data, abstracts and transforms the data to conform to the business information need, and then delivers the data to user applications. For business users, this approach can make working with data using their visualization tools as easy as using a drag-and-drop operation.

In addition to our business uses, we plan to continue to evaluate new visualization-based data discovery tools that help deliver greater insights to the business. As we have learned during the process of developing self-service BI, to enable greater business agility, these data visualization tools must be easy to implement, integrate with existing business applications, and require no extensive training.

## Key Learnings in Implementing Self-Service Business Intelligence

Through our experience developing self-service business intelligence (BI) for Intel's sales organization, we have identified the following elements as crucial to success.

- **Executive support within the targeted business areas.** Self-service solutions demand a higher level of engagement and ownership from a business group. Executive champions play an essential role in promoting cooperation and the sharing of any independently developed data that could help the greater business.
- **Establish a partnership between IT and the business.** Customer groups and IT need to collaborate to deliver an intuitive, useful self-service solution. As a partner, we believe IT's primary mission is to equip business users with the tools, data, and infrastructure they need to be successful in self-service BI in the users' environment.
- **Data quality and stewardship.** Data governance becomes especially important as more business groups are enabled to use specific data through self-service solutions. Ongoing data quality checks and data security processes must be identified to ensure the data is accurate, up-to-date, and secure. IT is an important partner in helping business groups understand where data quality issues already exist or can arise.
- **Standardization of metrics and establishment of a business glossary and data dictionary.** Business groups need flexibility when tailoring performance indicators and measures to their needs. However, shared data used in key corporate measurements must be managed to avoid miscommunication and cross-business confusion. Corporate standard key performance indicators should be defined and a business glossary and data dictionary provided to users.
- **Joint governance and change management.** Joint governance of BI by business and IT is essential. As part of the governance model, organizations should define change management processes and address any compliance needs. Appointing data stewards within the business, who work with IT data analysts in developing common data definitions, is a best practice for effective governance.
- **Use self-service where it fits.** Not all areas are suited to self-service. Some operational, tactical, and managerial areas require a standardized format. We believe IT still has an important role to play in developing professional reports and dashboards while maintaining the infrastructure self-service solutions operate on. The difference between IT-developed reports and dashboards and business-enabled self-service BI must be defined before launching the self-service strategy. Typically, it is recommended that IT should develop reports that will be widely used across organizations to ensure standardization. In addition, IT should enable reports for statutory and compliance purposes.

## RESULTS

**Implementing a self-service BI program for Intel's worldwide sales organization has dramatically reduced our report backlog. Today Intel sales groups regularly meet with us to plan and prioritize requirements, achieving much closer alignment in fulfilling their objectives. This approach is enabling our BI solutions for these sales groups to move at the speed of business and help them identify opportunities faster and reduce their time to market.**

Our results include the following:

- The overall release development time for our BI solutions for the sales groups has been reduced by 85 percent. We have gone from a six-month average release cycle in 2008 to an agile process involving two sprints averaging from two to four weeks. Adopting Scrum methodology, which enables IT teams to develop solutions in increments, was a key factor in achieving this time reduction.
- Utilization of our self-service BI tools has increased by 40 percent, and utilization of the BI reports has increased 40 percent year over year.
- We have seen an adoption rate of 100 percent for Scrum methodology for BI solution delivery to Intel sales groups and established BICCs for 100 percent of our programs for these groups.
- As a result of our efforts to reduce our report backlog for Intel's sales groups, our self-service BI program is freeing up significant IT resources. Our staff now has the time to work on critically needed or enterprise-wide solutions that many business groups will use, instead of working for months on siloed efforts that serve only a particular sales group.

## NEXT STEPS

**Addressing Intel's BI needs through a centralized EDW is no longer a viable solution. Today we are moving to a multiple data warehouse strategy, as well as improving the business user's experience with better application design.**

On one end of the spectrum, we are using small data marts as part of our self-service BI agile data architecture. On the other end, Intel IT is deploying solutions such as Apache Hadoop\* and extreme data warehouse appliances to handle the large volumes of structured and unstructured data that cannot be managed with traditional relational database methods. For self-service BI, we are starting to look into ways to apply big data analytics for use cases such as customer analytics that require processing more than a terabyte of data each per day. Our major focus is on data visualization techniques for turning the processed data into actionable intelligence.

We are also starting to investigate ways to more quickly deliver rich, consistent, and secure user experiences across a variety of form factors. Mobile form factors are of particular interest because of their widespread use throughout Intel. These form factors, such as smartphones, are best suited to the display of key performance indicators, dashboard components, or summaries, as opposed to full reports. Many suppliers we use are working on solutions for providing rich and consistent experiences across multiple form factors, browsers, and operating systems.

A key part of our effort to develop multi-platform solutions will employ Intel IT's new 5-Star Application Certification Criteria

for delivering new and improved user experiences. Following its criteria will help ensure development of multi-platform applications with all the essential capabilities. These capabilities include the following:

- Security and audit compliance for protection of data and identity
- User experiences designed to make applications intuitive and easy-to-use
- Platform flexibility to ensure accessibility on the user's platform of choice
- Device optimization to enable applications to take best advantage of a device's capabilities and features
- Interaction and evolution future-proofing to enable applications to support emerging devices and interactions such as voice, touch, and gesture recognition.

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## CONCLUSION

Our four-pronged approach to delivering self-service BI to Intel's worldwide sales organization is delivering significant benefits to Intel IT and our business users. From dramatically reducing our report backlog to enabling us to deliver working reports and dashboards to production in just two to four weeks, we are seeing great benefits working as a close-knit team to deliver BI at the speed of business. Equally important, we are seeing less wasted effort and higher utilization of the BI services we deliver.

We believe we will achieve the best return on investment through the BI solutions that give our business users the greatest control in working and analyzing the data they need to run and grow the business. Some ways we see to further improve the effectiveness of BI solutions include proactive monitoring for usage and

results, integration of best-in-class data visualization tools, implementation of best BI practices, close working relationships with suppliers in addressing gaps in connectivity and usability, and applying the learnings from fellow travelers in the BI world.

A key element in our self-service BI journey continues to be the willingness of business groups to work with us in allocating the resources and skills critical to supporting a self-service framework. The participation and expertise of the business user plays an important role throughout the process, ensuring the delivery of intuitive self-service BI tools that enable our business users to be self-sufficient in accessing and working with corporate and local data anytime, anywhere, without delay.

To maintain such a high level of organizational support and adoption, we continue to actively educate our user community on the development, use, and benefits of our self-service BI solutions. Through internal product demonstrations, proofs-of-concept, and showcasing the “art of the possible,” we plan to educate other business groups throughout Intel that could benefit from this approach to self-service BI.

## ACRONYMS

BI	business intelligence
BICC	Business Intelligence Competency Center
CRM	customer relationship management
EDW	enterprise data warehouse
ETL	extract, transform, load

## FOR MORE INFORMATION

Visit [www.intel.com/it](http://www.intel.com/it) to find white papers on related topics:

- “Using a Multiple Data Warehouse Strategy to Improve BI Analytics”

For more information on Intel IT best practices, visit [www.intel.com/it](http://www.intel.com/it).

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