



UMT Consulting Group

Reporting with Microsoft Project Server 2010

Andrew Lavinsky, MVP (Project), PMP
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Microsoft®
Project Server 2010

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1. Foreword

It is an irony that the best thing Microsoft did to improve the reporting story in the 2010 product release was to remove one of the most popular reporting features in version 2007. “Deprecating” (in Microsoft parlance) the data analysis views from the latest release of Project Server unleashed a wave of innovation and exploration as organizations worked diligently to understand the expanded world of SharePoint Business Insights reporting tools, and the interaction of these tools with Microsoft Project Server 2010.

How can a popular feature be removed to improve the overall toolset? It was only after I started digging into the 2010 Business Intelligence (BI) story that I realized how much of a crutch those data analysis views truly were. Given those views, most organizations never explored the rich selection of reporting offerings available. Without those views, organizations were compelled to use the reporting tools embedded in the SharePoint Server platform.

I am as guilty of these failings as any other Enterprise Project Management (EPM) implementer. Data analysis was always good enough, and I never went out of my comfort zone to explore alternative reporting methods – until Microsoft Project Server 2010 was released. The genesis for this paper was back in January 2009, when I was asked to prepare a short presentation on the Project Server 2010 BI story. “Business intelligence,” I complained to a colleague, “what do I know about business intelligence?” After an appeal for a change in topic, and a firm denial from the organizers, I figured the best thing would be sit down and start firing up the search engine.

So I did. And then I did some more. Then I talked to the BI folks. Then I talked to the SharePoint Server folks. Then I went through recorded demos from any number of conferences. Then I started putting together my own demos. As I worked through all of this material, I began to blog it up in pieces and parts.

The end result: not only did I build up my own reporting repertoire, but I think I stumbled upon the very compelling story that Microsoft has to tell with BI in the 2010 product offering. (Not that they have not been communicating that at every opportunity, but it just goes to the old adage that you can lead a horse to water, but you can’t make him drink.)

A couple of months later, I was chatting with a longtime member of the Microsoft Project team about the new release. I asked him, “What, in your opinion, is the most compelling feature of this new product?” His response: “Individual dashboards.” That is an answer that I have thought about off and on since that discussion. Based on my experience with the SharePoint Server reporting platform, I find that I agree with that answer, albeit I might state it a little differently:



The most compelling story within Project Server 2010 is both *individual* and *individualized* dashboards. Not only can I now create a dashboard intensely focused on the data requirements of an individual, but I can empower individuals to create their own customized dashboards.

That is the reporting narrative that I hope this document contributes to.



2. Executive Summary

The reporting options available to organizations implementing Project Server 2010 are rich in both depth and breadth. Not surprisingly, the most difficult aspect of implementing these options has not been in the technical implementation – which for the most part with Project Server 2010 is very well documented both online and in print. Nor have the challenges lain in the design of the reporting structure, which has always been a perennial issue. No, the challenge that most organizations seem to be facing in the first year after the release of Project Server 2010 has been understanding when and how to utilize the myriad reporting tools now available.

This document is intended as an introduction to the reporting options available in Microsoft Project Server 2010 and SharePoint Server Enterprise. The target audience for this document is the power user, business owner or administrator new to Project Server 2010 and looking for a quick way to assess the reporting options available to the organization.

This document is not intended to provide a comprehensive technical description of each of those reporting methods. Each reporting tool has been documented in extensive detail in books or various online forums, albeit not often documented in the context of a Project Server deployment. Where possible, links to additional information have been provided.

Specific reporting examples have been cited to demonstrate the ease and flexibility of each reporting tool.

Introducing Microsoft BI Insights

The 2010 Microsoft BI offering, collectively referred to as Insights offers a diverse package of technologies for reporting against available data. The goal of the BI Insights package is to “Improving organizations by providing business insights to all employees, leading to better, faster, more relevant decisions.”

Most importantly perhaps, the Insights packages are geared to users throughout the organization, from the executive to the end user, the information worker in the trenches who may not have deep SQL development skills, but is more accustomed to analyzing information using the more common tools of Microsoft Excel, Visio and perhaps Access.

Picture if you will, the Insights offering as one of the grandest, most comprehensive Las Vegas-style buffets imaginable. Everything at the buffet is available on an all-you-can-consume whenever you want to consume basis. That essentially is the Microsoft BI Insights story. All of the data in the organization is



available in a form that is controllable by the consumer yet secured to the needs of the organization.

For an overview of the BI Insights offerings, please refer to this helpful downloadable poster:

<http://www.microsoft.com/downloads/en/details.aspx?FamilyID=fc97d587-ffa4-4b43-b77d-958f3f8a87b9&displaylang=en>

As stated above, Microsoft has done an excellent job with this release of providing extensive repositories of documentation on how to implement key features within the Enterprise Project Management solution space. For a comprehensive list of technical and business resources on implementing BI solutions with Microsoft Project Server 2010, please refer to this site:

<http://technet.microsoft.com/en-us/projectserver/ff513702>.

For a review of reporting scenarios from across the entire Microsoft technological stack but not specific to Project Server, please review the TechNet Business Intelligence Hub:

<http://technet.microsoft.com/en-us/bi>.

Identifying the Available Data

Before selecting an appropriate tool, the organization must first define the informational constraints that it operates under. The requirements for data output must match the organizational commitment to data input. As an example, the organization may desire to create a report to highlight the resource constraints that are impacting project throughput. Culturally however, the organization has mandated that schedules will be strictly schedule driven and will not include level of effort estimates. Given those constraints, the organization may be hard pressed to develop an appropriate report.

Reporting requirements must be appropriate to the level of data included within the project schedules.

Project Details	Available Data
Schedule Only	Reports may be developed depicting schedule variance, milestones performed during specific time periods, and overall task lists. Specific numbers of projects within the portfolio meeting specific criteria may generate useful business intelligence.
Schedule & Effort	Reports may be developed including predicted work and utilization of specific resources. Constraints may be identified and used in optimization decisions.
Schedule, Effort & Cost	Reports may be developed that illustrate the cost of projects and resources. Cost constraints may be identified and used in optimization decisions.

Table 1: Identifying Available Data

Selecting an Appropriate Tool

Given the number of tools available and the sheer volume of information available online, where does an organization start when assessing which tool to use? See below for a synopsis of available tools, and when to use each one. Page number references within this document have been provided for each of the tools.

Tool	Description	When to Use
Microsoft Project Professional	The desktop client version of Microsoft Project provides a wealth of reporting tools – Timelines, Visual Reports, Reports, Export to Excel, Export to Access, and the ability to copy specific screenshots.	Use these tools when reporting is performed on a single project basis. Typically, these tools are used by the project manager to respond to ad hoc informational requests or to participate in a defined manual status reporting process.
Project Center Views (Page 12)	The default dashboard feature within Project Server, the Project Center allows for the rollup and graphical depiction of key metrics from within projects.	Use Project Center views when the organization has defined specific metrics that may be tracked in projects using enterprise fields. Project Center views should generally only be used for reporting when the organization has defined metrics, and enforces a strict project update process to ensure that the reported data is valid.
Excel & Excel Services (Page 27)	Excel provides an intuitive and familiar report authoring tool to the information consumers of the organization. Excel Services allows the reports to be published in a secure fashion for consumption by other users.	Use this tool when a number of information consumers have spreadsheet authoring skills, and desire the ability to manipulate standard reports to meet specific needs. Excel reports may be used for project or portfolio level reporting. Excel reports may yield minimal returns to organizations that have not begun tracking effort or cost estimates within projects.



Tool	Description	When to Use
Visio & Visio Services (Page 32)	Often underappreciated as a reporting tool, Visio provides an interface for producing unconventional reports with intuitive navigation. Visio Services allow the reports to be published in a secure fashion and be made accessible to users without Visio installed on their local machines.	Use this tool when a simple chart is insufficient for reporting purposes. For example, the report consumers may be looking for a more graphical depiction or navigational structure such as a timeline, geographical or organizational representation of project or portfolio level data.
SQL Server Reporting Services (SSRS) (Page 46)	Traditionally the reporting tool of choice for many organizations, SSRS typically requires skilled individuals to develop custom reports. With the latest offering of SSRS, users may download Report Builder as a tool to develop reports. While this new tool allows users to create reports easily, the interface is still not as intuitive as commonly used desktop reporting software such as Excel or Visio.	Use SSRS reports when there is a need for an automated distribution of reports on a regular basis, for instance a weekly e-mail comprising the status for all projects within a given portfolio. SSRS reports are also useful when attempting to develop reports pulling from both Project Server and SharePoint Server data sources. Generally, SSRS is to be used when the format of the report is static, and users are not expected to make changes other than controlling specific filtering parameters.
PerformancePoint Services (Page 52)	PerformancePoint Services allows users to assemble diverse collections of reporting assets into modular dashboards. The reporting assets may include SSRS reports, Excel reports, and native PerformancePoint reports. Each asset may be used individually, in a single dashboard, or in multiple dashboards.	PerformancePoint Services provides several points of functionality to the Project Server user. Use PerformancePoint Services when various reporting elements are expected to be used and reused as components within various, targeted BI dashboards. Also use PerformancePoint Services to quickly and easily display key metrics from projects in a Web-based interface. Note that these metrics are typically pulled from OLAP cubes, and as such may only be relevant to organizations tracking cost or effort within project schedules.

Tool	Description	When to Use
The REST API (Page 66)	The REST API is a powerful tool for dynamically extracting information from published Excel reports and then embedding that information in web sites, Word, or PowerPoint documents.	Use this tool if the organization requires the routine production of Word or PowerPoint artifacts consuming project or portfolio level data. This tool allows the user to embed dynamic data in Office documents for use in such artifacts as routine status reports or monthly resource reports.
External Content Types (Page 74)	External content types are configurable by using SharePoint Designer, and allow the surfacing of database data directly into SharePoint Server. This potentially makes the data more accessible, and subject to the default SharePoint Server search process.	Use this tool in conjunction with the SharePoint external list feature to surface Project Server data in the form of SharePoint lists. This model may be appropriate to organizations that have grown accustomed to providing key information to stakeholders via SharePoint lists or who need to give users the ability to create and save custom views of project data.
Power Pivot for Excel PowerPivot for SharePoint (NA)	Introduced with the 2010 release, Power Pivot consists of both a SharePoint Server application to generate list data feeds and an Excel add-in. Power Pivot pulls data from SQL Server databases and SharePoint lists and easily aggregates it into a single table. (Power Pivot was deemed out of scope for this document.)	Use this tool when multiple SharePoint lists must be combined with Project Server data to generate a single data set for reporting purposes. For example, use this tool to combine a list containing a project narrative from team members with project data – or if project level metadata has been extended from Project Server into secure SharePoint lists.

Table 2: Reporting Tool Selection Matrix



3. Project Center Views

When many Project Server users think of the term “dashboard,” the first thing that comes to mind is the Project Center views. These views roll up project data into a single, easy-to-use format — without requiring any custom development efforts.

Most organizations that implement Microsoft Project Server will start with a dashboard of key metrics displayed in Project Center views. Although the tool comes with a number of views defined, and defining a new view is not difficult, these views present a tremendous challenge to the organization. Project Center views are predicated on the assumption that the organization has defined specific metrics that may be applied to all projects. In turn, this assumption is based on the requirement that all project managers follow the same schedule development and update processes.

Item	Project Center Views
Subcomponent of	Microsoft Project Server
Reporting Level	Portfolios, Programs
Use When	The organization has defined specific metrics that will be used to assess specific project portfolios and captured those metrics in the form of enterprise fields. The organization has also implemented strict processes to ensure that the data in the project plans is valid and up to date.
Technical Skills Required	Ability to develop enterprise custom Project Server fields.

Table 3: Project Center Views

Project Center views are arguably the most important feature within Microsoft Project Server, and thus they represent the essential starting point for many of the server based reporting capabilities.



The screenshot shows the Microsoft Project Server 2010 Project Center view. The interface includes a top navigation bar with Site Actions (New, Open, Update List), Browse, and Projects tabs. Below the navigation is a toolbar with icons for New, Open, Update List, Build Team, Resource Plan, Project Permissions, Check in My Projects, Close Tasks to Update, Project Site, Zoom In, Zoom Out, Scroll to Project, View (Outline, Filter, Group By: Workflow Phase Name), Data (Custom Fields for Plan, No Filter, Group By: Workflow Phase Name), Export to Excel, Print, Subprojects, Share, Show/Hide, and Project Type. The main content area displays a grid of project data. The grid columns include Project Name, Start Date, Finish Date, P1BenefitYr1, P1BenefitYr2, P1BenefitYr3, P1BenefitYr4, and Total Benefit. Two rows are highlighted in yellow: 'Workflow Phase Name: 3. Plan' (Start: 12/21/2009, Finish: 7/7/2011) with a total benefit of \$5,456,000.00, and 'Workflow Phase Name: 4. Manage' (Start: 8/4/2009, Finish: 2/14/2013) with a total benefit of \$16,158,000.00. The left sidebar lists categories: Projects (Project Center is selected), Approval Center, Workflow Approvals, My Work (Tasks, Timesheet, Issues and Risks), Resources (Resource Center, Status Reports), and Strategy (Driver Library, Driver Prioritization, Portfolio Analyses).

Project Name	Start	Finish	P1BenefitYr1	P1BenefitYr2	P1BenefitYr3	P1BenefitYr4	Total Benefit
Workflow Phase Name: 3. Plan	12/21/2009	7/7/2011	\$0.00	\$0.00	\$2,715,000.00	\$5,456,000.00	
Asset Tracking System	5/11/2010	12/2/2010	\$0.00	\$0.00	\$265,000.00	\$614,000.00	
Employee Retention Tracking System	2/10/2010	7/13/2010	\$0.00	\$0.00	\$265,000.00	\$614,000.00	
Finance Tracking System Development	5/25/2010	3/9/2011	\$0.00	\$0.00	\$265,000.00	\$595,000.00	
Ledger Tracking System Upgrade	2/8/2011	7/7/2011	\$0.00	\$0.00	\$250,000.00	\$600,000.00	
Network Application Architecture Dev	8/4/2010	1/3/2011	\$0.00	\$0.00	\$890,000.00	\$1,205,000.00	
Payroll System Upgrade	3/1/2010	6/11/2010	\$0.00	\$0.00	\$250,000.00	\$600,000.00	
Router Benchmark System Upgrade	12/21/2009	7/13/2010	\$0.00	\$0.00	\$265,000.00	\$614,000.00	
Travel Management System	1/4/2010	6/3/2010	\$0.00	\$0.00	\$265,000.00	\$614,000.00	
Word Processing System Upgrade	4/21/2010	11/9/2010	\$0.00	\$0.00	\$265,000.00	\$614,000.00	
Workflow Phase Name: 4. Manage	8/4/2009	2/14/2013	\$0.00	\$0.00	\$9,360,000.00	\$16,158,000.00	
Asset-Change Ownership	8/26/2009	2/3/2010	\$0.00	\$0.00	\$440,000.00	\$585,000.00	
Company Portal Database Migration	12/23/2009	7/15/2010	\$0.00	\$0.00	\$510,000.00	\$725,000.00	
Compliance Database System Implement	10/12/2009	2/18/2010	\$0.00	\$0.00	\$440,000.00	\$700,000.00	
Content Filtering Firewall Design and	9/8/2009	3/30/2010	\$0.00	\$0.00	\$440,000.00	\$500,000.00	
Corporate Web Site Infrastructure A	10/2/2009	3/5/2010	\$0.00	\$0.00	\$320,000.00	\$610,000.00	
Expand raw material acquisition vendor	8/10/2009	12/21/2009	\$0.00	\$0.00	\$620,000.00	\$740,000.00	
General Ledger (GL) currency update	11/27/2009	4/27/2010	\$0.00	\$0.00	\$390,000.00	\$640,000.00	
Health Assessment Reporting Tool	8/21/2009	12/7/2011	\$0.00	\$0.00	\$60,000.00	\$675,000.00	

Figure 1: The Project Center View

Organizations wishing to use the Project Center view as an enterprise-wide dashboard of projects should define key characteristics to be tracked and develop custom formulas to roll up those characteristics to the project level. Additionally, organizations using the Project Center view must implement strict policies around schedule development and updating to ensure that the data represented is uniform. For example, many organizations require the reporting of finish variance on key phase gate milestones for each of the projects in the portfolio. To ensure that the dashboard is accurate, each of the project schedules must have the same phase gates identified. Each project manager must then use the same update methodology to ensure the displayed finish variance is accurate.

Tips and Tricks: Project Center Views

Many organizations choose to display a key project date in the Project Center view. This date may be a go-live date, an in-service date, or a federally mandated milestone. To roll this level of task data up to the Project Center level, create a task-level custom flag field to identify the key activity. Create a task-level date field, and configure it to display the task finish date if the custom flag field has been set to yes. Configure the new date field to roll up as the “maximum” to all summary tasks.

Finally, create a custom project-level date field and set it to equal the task level date field. This will roll up the milestone date to the Project Center view.

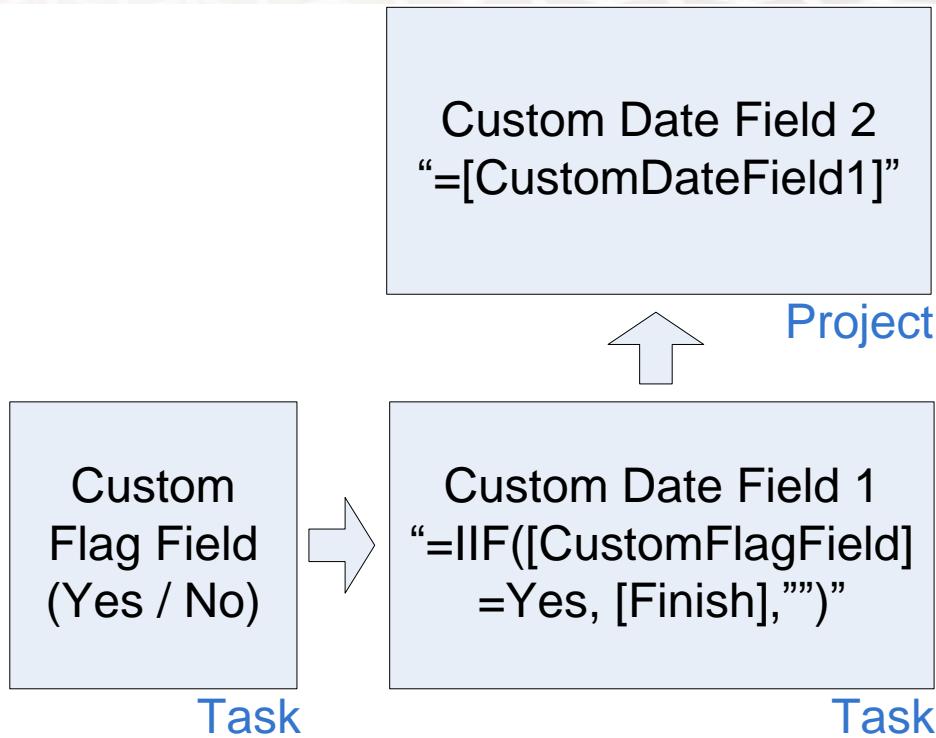


Figure 2: Adding a Milestone Rollup Date to the Project Center

Add the project-level field to a Project Center view.

Site Actions ▾ Browse Projects

New Open Update List Build Team Resource Plan Project Permissions Close Tasks to Update Check in My Projects Project Site

Zoom In Zoom Out Scroll to Project Outline View: Milestone View Filter: No Filter Group By: No Group Export to Excel Print Subprojects Time with Date Change

Project Navigate Data Share Show/Hide Project Type

	Project Name	P1 Gate Review	P2 Gate Review
Projects	IT Vendor System Rollout	11/1/2010	5/31/2014
Project Center	Hub Upgrade	9/1/2010	3/31/2011
Approval Center	Data Exchange and Integration	8/1/2010	12/31/2010
Workflow Approvals	Print Advertising Campaign System	8/1/2010	5/31/2011
My Work	Production Tracking Dashboard	8/1/2010	5/31/2011
Tasks	Software Security Audit	8/1/2010	1/31/2011
Timesheet	Acquisition Target Analysis	7/1/2010	10/31/2010
Issues and Risks	Catalog Publishing	7/1/2010	12/31/2010
Resources	New Office Development	7/1/2010	10/31/2010
Resource Center	Operations Management	7/1/2010	9/30/2010
Status Reports	Software Testing Architecture Upgrad	7/1/2010	12/31/2010
	Voice Recognition Software	7/1/2010	11/30/2010
	Merger and Acquisition Deal Room	3/1/2010	8/31/2010

Figure 3: Displaying Milestone Rollups in the Project Center



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For complex Project Center views including totaled fields, dynamic filters based on the current date, or the ability to create personal settings, consider implementing a SharePoint external list as described on page 74 of this document.



4. The Project Server Database

Project Server data is stored in a series of SQL Server databases. To generate more sophisticated reports in Excel, Visio, PerformancePoint Services, or other reporting tools, the user must gain a certain basic familiarity with how the data is structured in the database.

The data itself can be separated into two main categories: OLAP and non-OLAP data. Generally, SQL Server tables are suitable for providing a snapshot of the project or resource data as it is right now. OLAP data is more appropriate for providing a snapshot of the data right now and then allowing a comparison of the same data over time — for instance, resource availability over the next three months, or the actual cost of all projects on a monthly basis for the last six months.

The OLAP data is kept in an instance of SQL Server Analysis Services and may be consumed via any number of reporting tools. The non-OLAP data is stored in the SQL Server instance.

Tables

Project Server data is stored within four SQL Server databases: Archive, Draft, Published, and Reporting. Microsoft only supports reports that use data from the Reporting database. For a detailed description of the Project Server 2010 database schema, please refer to the following Project Server 2010 Software Developer Resource Kit available here:

<http://www.microsoft.com/downloads/en/details.aspx?FamilyID=46007f25-b44e-4aa6-80ff-9c0e75835ad9&displaylang=en>

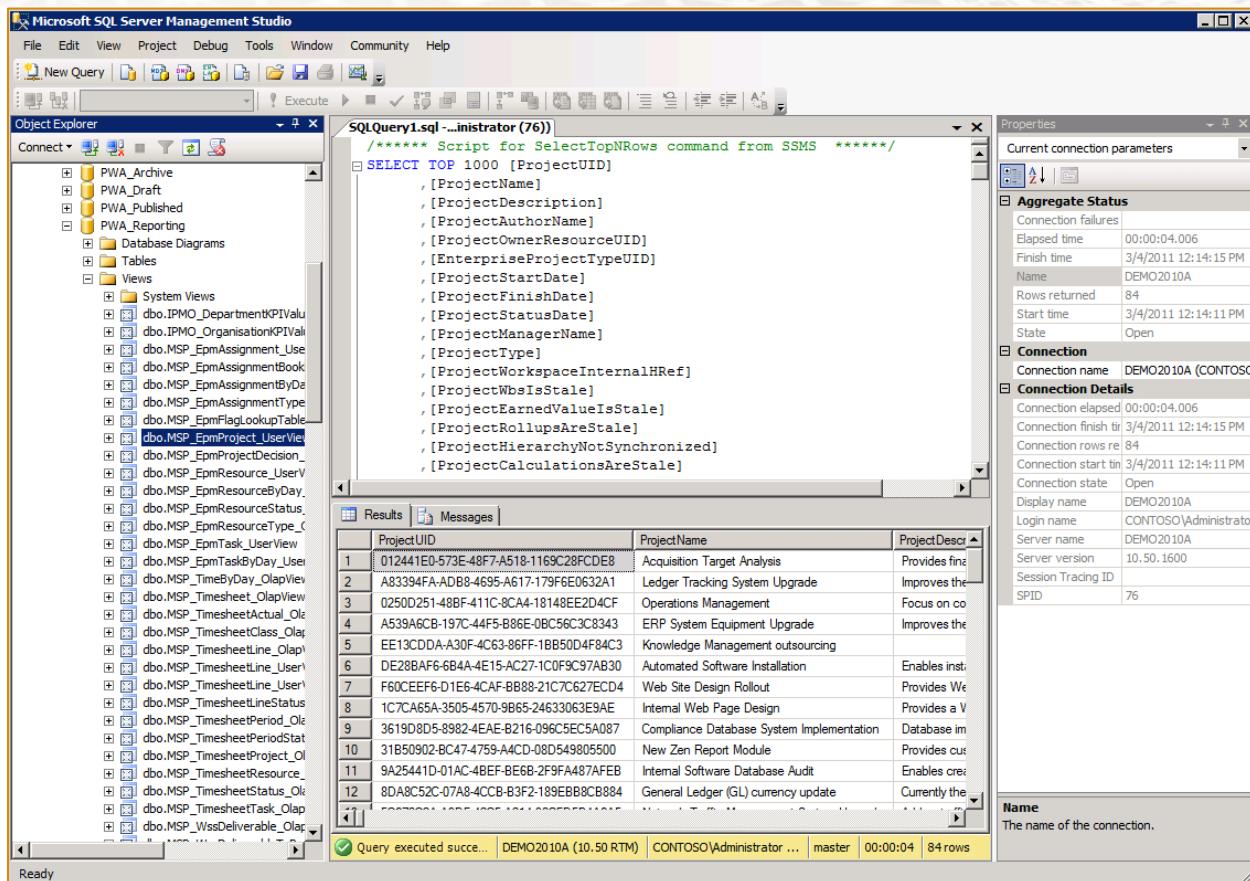


Figure 4: Navigating the Project Server Database

Note that almost all of the custom fields appear in the View tables indicated with the “userview” suffix. Multi-value fields do not appear in those tables, and as a result, multi-value fields are often much more difficult to incorporate in standard reporting tools than the more traditional single-value fields as they require personnel with experience writing SQL queries to export to various reporting tools. Organizations should be mindful of this fact when defining the enterprise custom fields to be used within the system.

Tips and Tricks: Reporting Against the Database

It is sometimes challenging for report authors to determine in which table a specific field is located. The online database schema referenced above provides information on how to find fields. Users may also refer to this helpful field finder tool developed by Treb Gatte of Microsoft Project Experts:

http://reportmode.com/psrdb_reference.



Users not familiar with using SQL Server management tools may consider using Excel data connections to gain visibility into specific database tables. To connect an Excel table to SQL Server, open a new file in Excel and select New Connections from the Data tab. Select the “From Other Sources” option and then “From SQL Server.”

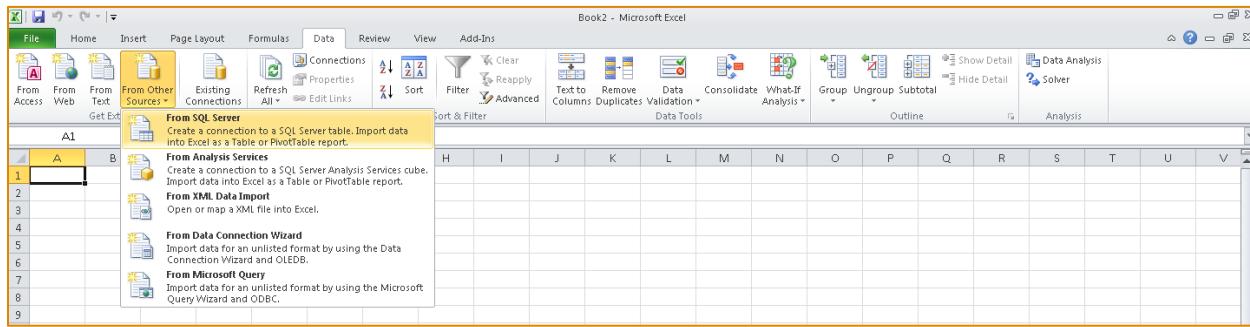


Figure 5: Connect Directly from Excel to the SQL Server Database

Select the appropriate database and table. After some practice, it will be easier to define the appropriate data table, but most report authors tend to start with the MSP_EpmProject_UserView table. This data set includes almost all of the project-level data and includes both the predefined fields as well as the custom non-multi-value fields defined within the organization.

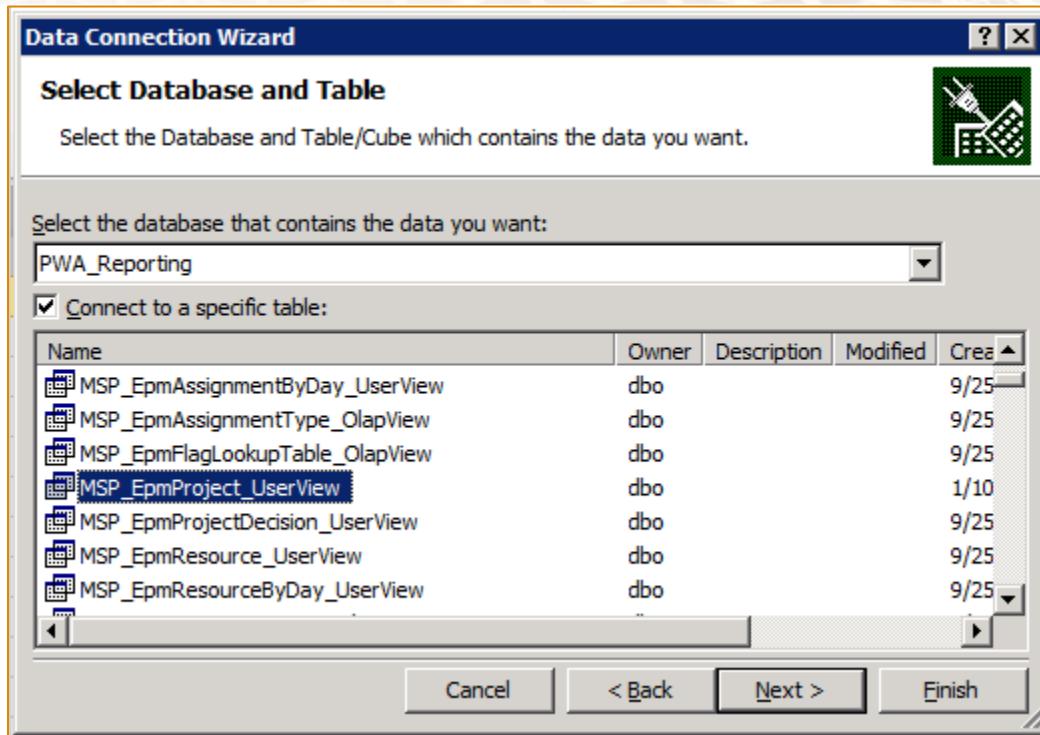


Figure 6: Select the Database Table

Insert the data into Excel. This replicates the SQL Server database into an Excel workbook and may be used for general analysis purposes.

A	B	C	D	E
1 ProjectName	ProjectDescription	ProjectAuthorName	ProjectStartDate	ProjectFinishDate
2 New Zen Report Module	Provides customized reports to extract financial, inventory, and management information systems.		12/29/2009 8:00	6/4/2010 17:00
3 Compliance Database System Implementation	Database implementation that organizes data in the database model and manages factors such as security and compliance.		10/12/2009 8:00	2/18/2010 17:00
4 Payroll System Upgrade	Improves the existing payroll system with enhanced reporting and enables integration of the payroll system with other HR systems.		3/1/2010 8:00	6/11/2010 17:00
5 Acquisition Target Analysis	Provides financial analysis of a target company that an organization wants to acquire.		7/5/2010 8:00	10/6/2010 17:00
6 ERP System Equipment Upgrade	Improves the existing enterprise resource planning system to include additional product tracking and reporting features.		7/19/2010 8:00	12/14/2010 17:00
7 Ledger Tracking System Upgrade	Improves the existing system for tracking budgeted and actual financial data to produce financial reports.		2/8/2011 8:00	7/7/2011 17:00
8 Operations Management	Focus on continuous improvement issues, team issues, process issues and data analysis.		7/15/2010 8:00	9/23/2010 15:00
9 Knowledge Management outsourcing			1/13/2011 8:00	6/10/2011 17:00
10 General Ledger (GL) currency update	Currently the GL only accepts US dollars. The system will be updated to accept multiple currencies.		11/27/2009 8:00	4/27/2010 17:00
11 Auditing Services Training	Offers training services on auditing services, internal auditing services, inventory audits, statistical sampling, and risk assessment.		7/5/2010 8:00	9/13/2010 15:00
12 Automated Software Installation	Enables installation of operating systems, applications, drivers, and packages by using the "Install" feature.		9/6/2010 8:00	3/25/2011 15:00
13 Web Site Design Rollout	Provides Web page design, animation, and professional search engine optimization.		8/17/2009 8:00	1/11/2010 17:00
14 Localize partner website for EMEA	Enable the partner website to support EMEA languages.		10/25/2009 8:00	3/19/2010 17:00
15 Network Traffic Management System Upgrade	Adds a traffic monitor and manager to the existing system. The traffic monitor oversees traffic flow and monitors network performance.		12/11/2009 8:00	5/18/2010 10:00

Figure 7: Review Inserted Data

For more information on modifying the data set displayed within the Excel report, please see the section on ODC files on page 20 of this document.



OLAP Cubes

OLAP cubes provide the capability to analyze and drill into Project Server data. Within Project Server 2010, each department may have its own set of OLAP cubes – which may then be surfaced by using Excel, Visio, PerformancePoint Services, or other reporting tools. OLAP Cubes are configured in the Server Settings, and once configured, may be accessed by using any of the identified reporting tools.

Note that any custom fields developed by the organization must be added to the OLAP cube configuration and the cube must then be rebuilt before those fields are available for report writing.

Tips and Tricks: OLAP Cubes

Excel allows users to add custom calculated fields to most pivot tables. When the pivot table is created from a SQL Server Analysis Server connection, however, that feature has been disabled. This affects the user ability to add data calculations to reports. For example, a user exports the timephased actual work and work fields to an Excel pivot table, then attempts to calculate remaining work over time, in essence creating a burn-down chart. That calculated remaining work column may not be created as part of the pivot table as the source data is tied to a SQL Server OLAP cube.

To enable calculated fields in an Excel-based PivotTable, users may download and install the free OLAP Pivot Table Extender tool from CodePlex: <http://olappivottableextend.codeplex.com/>

ODC Files

ODC files simplify the report authoring process by allowing personnel with technical skills to collect specific columns from any number of database tables, add filters and joins as required, and then provide the data sets for less technical personnel to develop reports as needed.

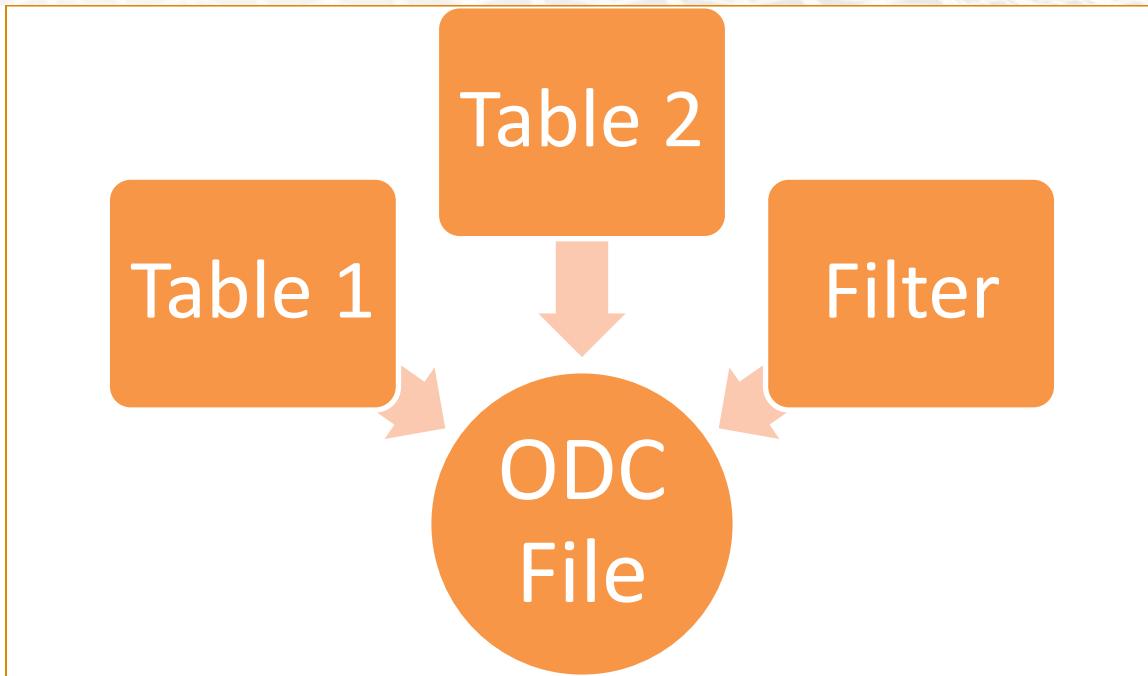


Figure 8: ODC Overview

Project Server comes with a number of sample ODC files located in the Business Intelligence Center. Each of these ODC files may be copied and then customized to the needs of the organization. Report authors may also open the ODC files within Excel and review the settings to identify appropriate syntax and query structure.



Site Actions ▾ Doc Libr

Business Intelligence Center > Data Connections > English (United States) > All Items - Contains ODC, UDC and PerformancePoint data connections

I Like It Tags & Notes

Project Web App Home Search this site... ?

	Type	Title	Name	Description	Modified	Modified By	Keywords
Dashboards	<input type="checkbox"/>	DEMO2010A - ProjectServerDemo	DEMO2010A - ProjectServerDemo		3/18/2010 7:17 PM	SHAREPOINT\system	
Documents	<input type="checkbox"/>	Project Server - Deliverables	Project Server - Deliverables	This is the Office Data Connection for Project Deliverables reporting. This content is generated automatically by Project Server and may be replaced by future patches and service packs.	9/25/2010 12:37 PM	SHAREPOINT\system	Deliverable,Project Server,Reporting
PerformancePoint Content	<input type="checkbox"/>	Project Server - Issue Data	Project Server - Issue Data	This is the Office Data Connection for Issues reporting. This content is generated automatically by Project Server and may be replaced by future patches and service packs.	9/25/2010 12:37 PM	SHAREPOINT\system	Issues,Project Server,Reporting
Recycle Bin	<input type="checkbox"/>	Project Server - Project And Task Data	Project Server - Project And Task Data	This is the Office Data Connection for Project and Task reporting. This content is generated automatically by Project Server and may be replaced by future patches and service packs.	9/25/2010 12:36 PM	SHAREPOINT\system	Project,Task,Project Server,Reporting
All Site Content	<input type="checkbox"/>	Project Server - Project Assignment Data	Project Server - Project Assignment Data	Project Server data connection for Assignment data reporting. This is generated automatically by Project Server, your changes will be lost whenever a refresh occurs.	9/25/2010 12:37 PM	SHAREPOINT\system	Project,Assignment,Project Server,Reporting
	<input type="checkbox"/>	Project Server - Rejected Projects List	Project Server - Rejected Projects List	Project Server data connection for Project reporting. This is generated automatically by Project Server, your changes will be lost whenever a refresh occurs.	9/25/2010 12:37 PM	SHAREPOINT\system	Project,Workflow,Rejected,Project Server,Reporting

Figure 9: Default ODC Files

To edit an ODC file, open a suitable file to use as a basis for the report. The selected file will open in Excel. Once the data is displayed, select the Connections option from the Data tab. The ODC file will be displayed. Click the Properties button to review the specific settings. This will expose the Connections Property dialog box. In the next dialog box, select the Definitions tab roughly in the middle of the box. The screen will now display the data selected to be included in the ODC file.

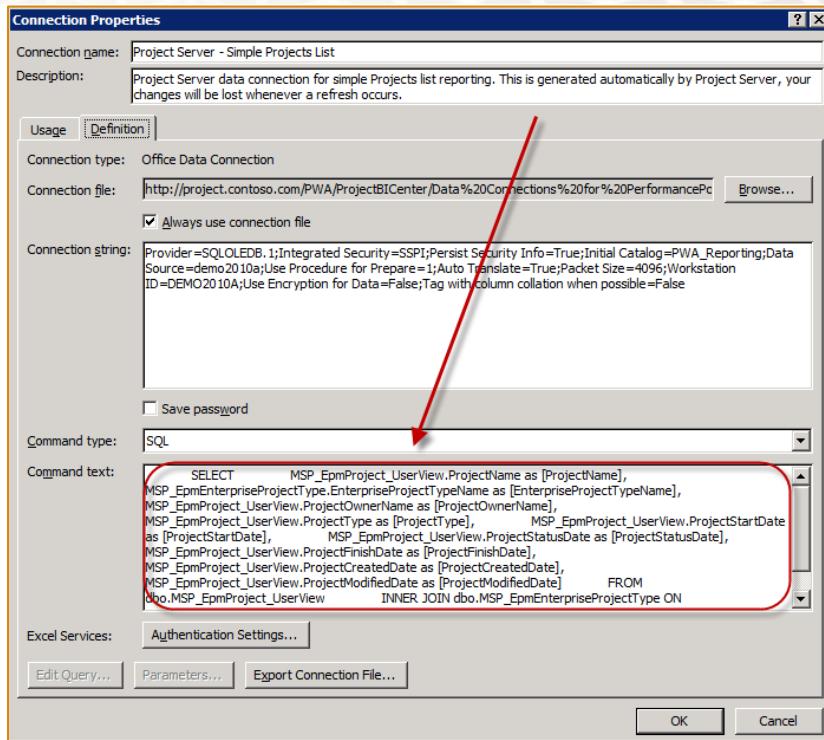
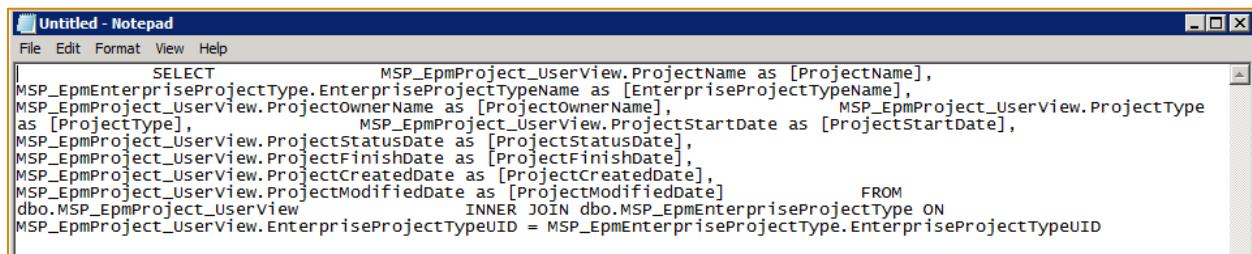


Figure 10: Identifying the Default ODC Settings

To edit the selected fields, to add any new custom fields, or to implement a filter, copy the Command Text box and paste into Notepad for editing. Add the appropriate verbiage as required by using SQL query syntax.



```
File Edit Format View Help
SELECT      MSP_EpmProject_UserView.ProjectName as [ProjectName],
MSP_EpmEnterpriseProjectType.EnterpriseProjectTypeName as [EnterpriseProjectTypeName],
MSP_EpmProject_UserView.ProjectOwnerName as [ProjectOwnerName],          MSP_EpmProject_UserView.ProjectType
as [ProjectType],           MSP_EpmProject_UserView.ProjectStartDate as [ProjectStartDate],
MSP_EpmProject_UserView.ProjectStatusDate as [ProjectStatusDate],
MSP_EpmProject_UserView.ProjectFinishDate as [ProjectFinishDate],
MSP_EpmProject_UserView.ProjectCreatedDate as [ProjectCreatedDate],
MSP_EpmProject_UserView.ProjectModifiedDate as [ProjectModifiedDate]      FROM
MSP_EpmProject_UserView     INNER JOIN dbo.MSP_EpmEnterpriseProjectType ON
MSP_EpmProject_UserView.EnterpriseProjectTypeID = MSP_EpmEnterpriseProjectType.EnterpriseProjectTypeID
```

Figure 11: Modifying the ODC Field Settings

Note that some fields may create issues when added to ODC files. Specifically, the ODC will not display the unique IDs or multi-value fields without special instructions and coding.



Tips and Tricks: ODC Files

ODC files allow the combination of multiple tables to generate useful Excel and Visio files. One trick to leverage this feature is to add the parent task to task summary reports. To do so, append the following text to the Project and Task Data ODC file included by default in the Project Server BI Center installation:

```
SELECT    SummaryTask.TaskName AS SummaryTaskName, Tasklist.TaskName
FROM      dbo.MSP_EpmTask_UserView AS Tasklist INNER JOIN
          dbo.MSP_EpmTask_UserView AS SummaryTask ON Tasklist.TaskParentUID = SummaryTask.TaskUID
```

The resulting report will include both the task name and the summary task name for each task in a project.

A	B	C
1 ProjectName	TaskName	SummaryTaskName
2 Acquisition Target Analysis	Acquisition Target Analysis	Acquisition Target Analysis
3 Acquisition Target Analysis	Develop Mergers & Acquisition Strategy	Acquisition Target Analysis
4 Acquisition Target Analysis	Identify Current Capabilities and Positioning	Develop Mergers & Acquisition Strategy
5 Acquisition Target Analysis	Perform Competitive Analysis	Identify Current Capabilities and Positioning
6 Acquisition Target Analysis	Perform Market Trend Analysis	Identify Current Capabilities and Positioning
7 Acquisition Target Analysis	Define Current Positioning and Gaps	Identify Current Capabilities and Positioning
8 Acquisition Target Analysis	Current Position Analysis Complete	Identify Current Capabilities and Positioning
9 Acquisition Target Analysis	Define Merger/Acquisition Goals	Develop Mergers & Acquisition Strategy
10 Acquisition Target Analysis	Define Strategic Objectives For M&A	Define Merger/Acquisition Goals
11 Acquisition Target Analysis	Define Risk Tolerance for M&A	Define Merger/Acquisition Goals
12 Acquisition Target Analysis	Define Financial Risk Tolerance	Define Risk Tolerance for M&A
13 Acquisition Target Analysis	Define Market Position Risk Tolerance	Define Risk Tolerance for M&A
14 Acquisition Target Analysis	Define Capabilities Risk Tolerance	Define Risk Tolerance for M&A
15 Acquisition Target Analysis	Complete Risk Tolerance Assessment	Define Risk Tolerance for M&A
16 Acquisition Target Analysis	Define Internal Versus M&A Evaluation Criteria	Develop Mergers & Acquisition Strategy
17 Acquisition Target Analysis	Define Internal Development Capabilities Model	Define Internal Versus M&A Evaluation Criteria
18 Acquisition Target Analysis	Define Internal Versus M&A Comparison Model	Define Internal Versus M&A Evaluation Criteria
19 Acquisition Target Analysis	Define Selection Scenario and Target Performance Measures	Define Internal Versus M&A Evaluation Criteria
20 Acquisition Target Analysis	Internal Versus M&A Evaluation Criteria Complete	Define Internal Versus M&A Evaluation Criteria

Figure 12: Including the Summary Task Name in an Excel Report

Another trick is to filter the ODC file to only provide data on a single project. Add the following text to the default Project and Tasks ODC file to filter on a specific project.

```
WHERE MSP_EpmProject_UserView.ProjectName='projectname' AND
MSP_EPMTTask_UserView.TaskOutlineLevel=1
```

This will enable users to more easily generate reports based on their own specific interests.

For users who are not comfortable developing ODC scripts, Microsoft has provided a helpful tool that allows users to select the desired fields, and then generates the required ODC file. The ODC Report Builder tool is a free download and is available as part of the Project Server 2010 Solution Starter pack (<http://code.msdn.microsoft.com/P2010SolutionStarter>).

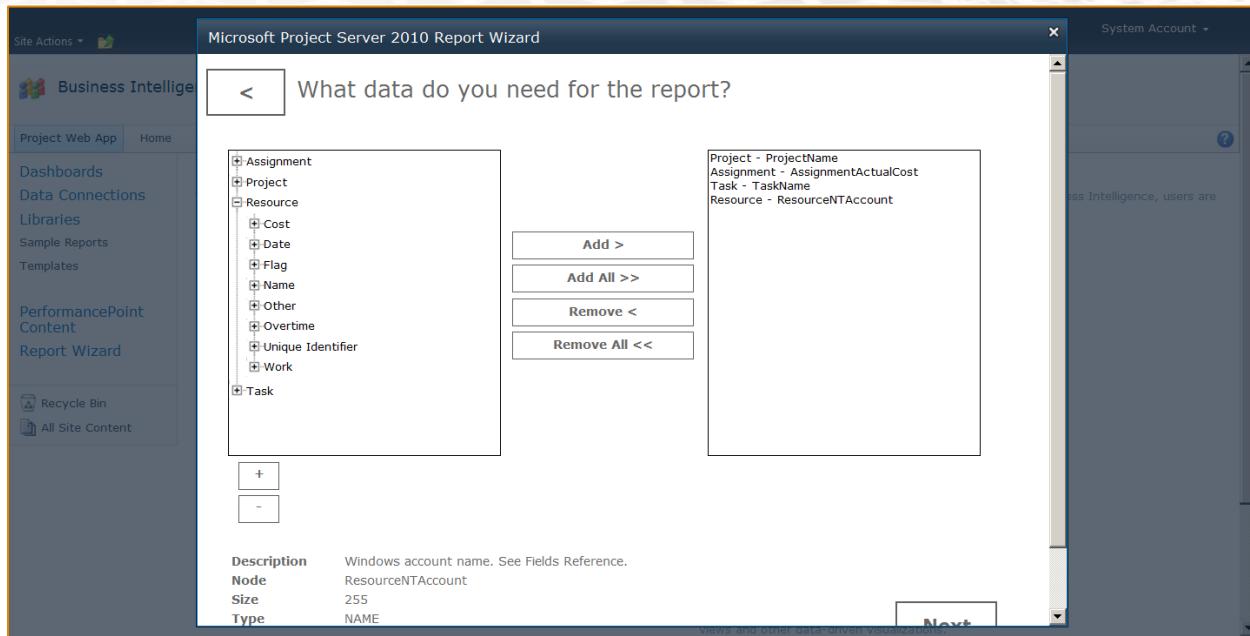


Figure 13: Building an ODC with the Report Wizard

After you select the desired fields, the Report Wizard will generate the appropriate ODC file and post it to the selected SharePoint library.

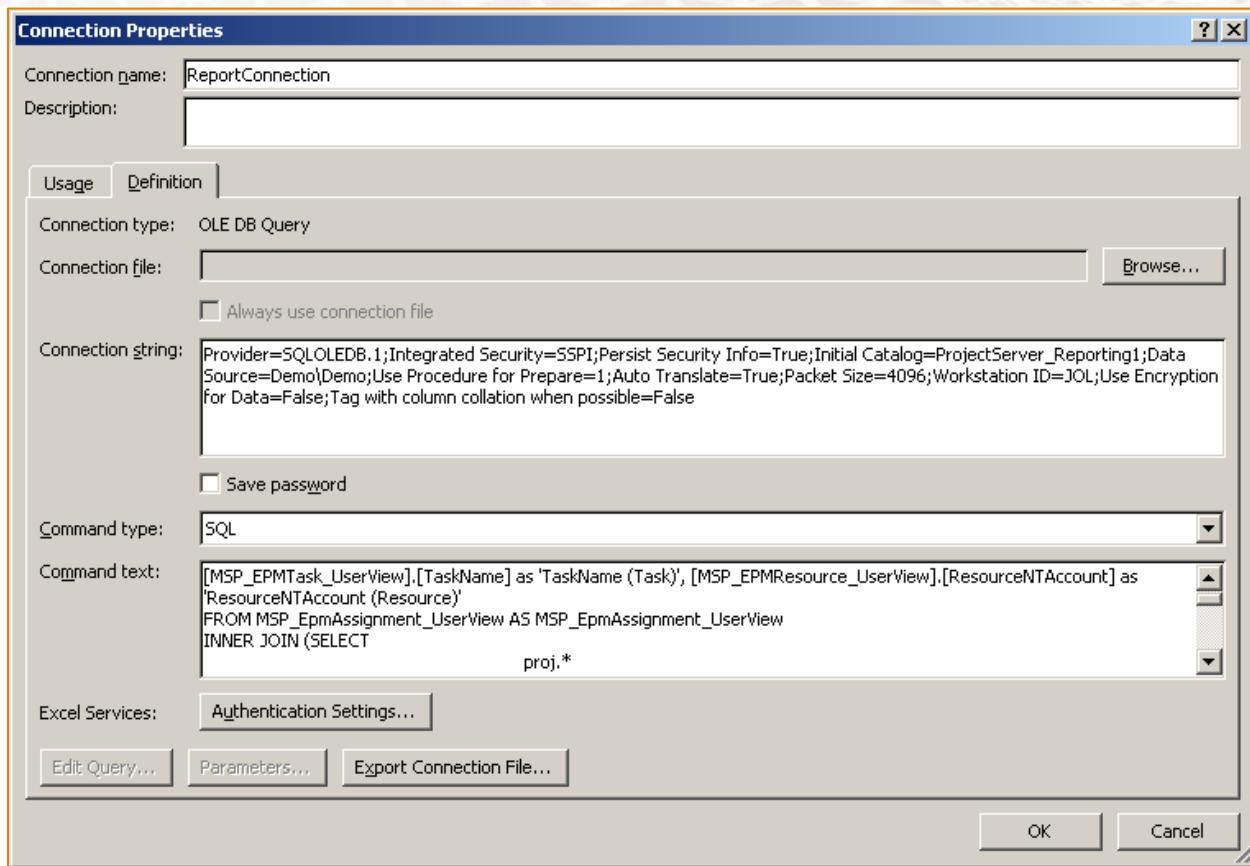


Figure 14: Generating an ODC file from the Report Wizard

5. Excel & Excel Services

Microsoft Excel is probably the most prevalent desktop reporting tool on any desktop around the world. Excel combines the ease of desktop publishing with the power of sophisticated analysis. Excel Services as implemented in Project Server 2010 continues that story. Users may now create reports and manipulate data in Excel, then securely publish that data to a SharePoint site.

Excel reports may be generated directly against the Project Server database or through the intermediary of an ODC file prepared by the Project Server Administrator. The advantage of using an ODC file is that nontechnical users may consume any combination of tables from within the database without needing knowledge of how to develop SQL queries.

Item	Excel Services
Subcomponent of	SharePoint Server
Reporting Level	Projects, Portfolios, Programs
Use When	Users would like to develop customized reports using a familiar Excel interface.
Technical Skills Required	Ability to manipulate data within a spreadsheet.

Table 4: Excel Services

To create a new Excel report, open a new file in Excel. From the Data tab, choose to pull data directly from the Project Server database or from a predefined ODC file.

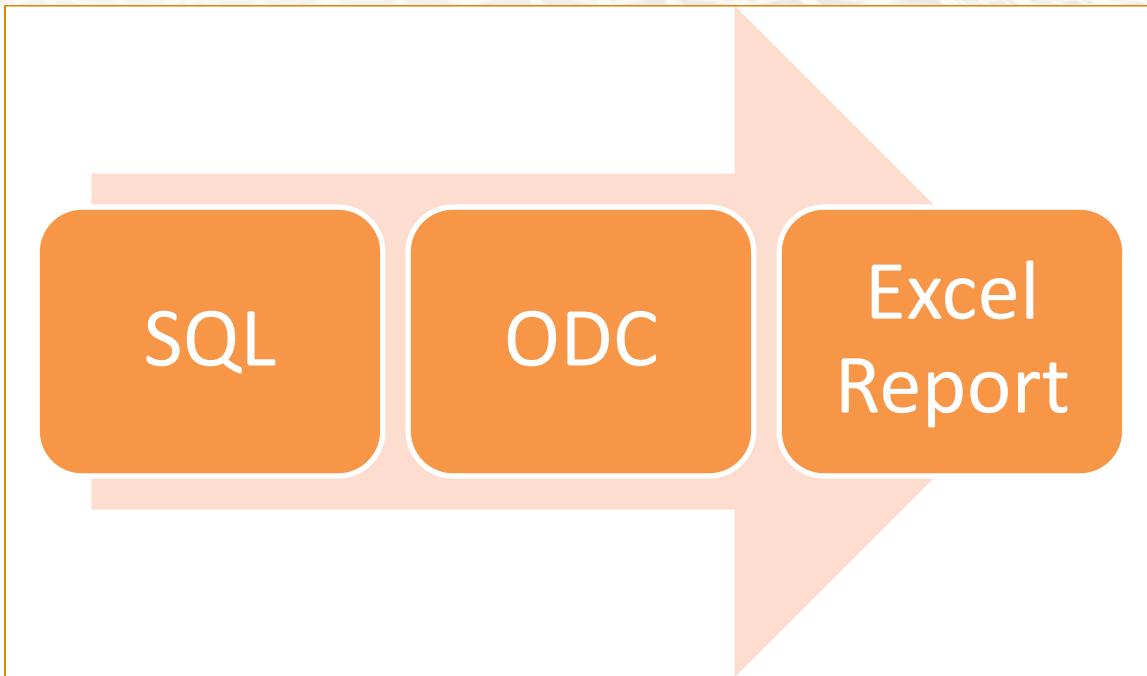


Figure 15: Using ODC Files in Excel Reports

Configure the Excel chart by using the available fields. Add conditional formatting as required. In the example below, a timesheet report is developed and colored data bars are added.

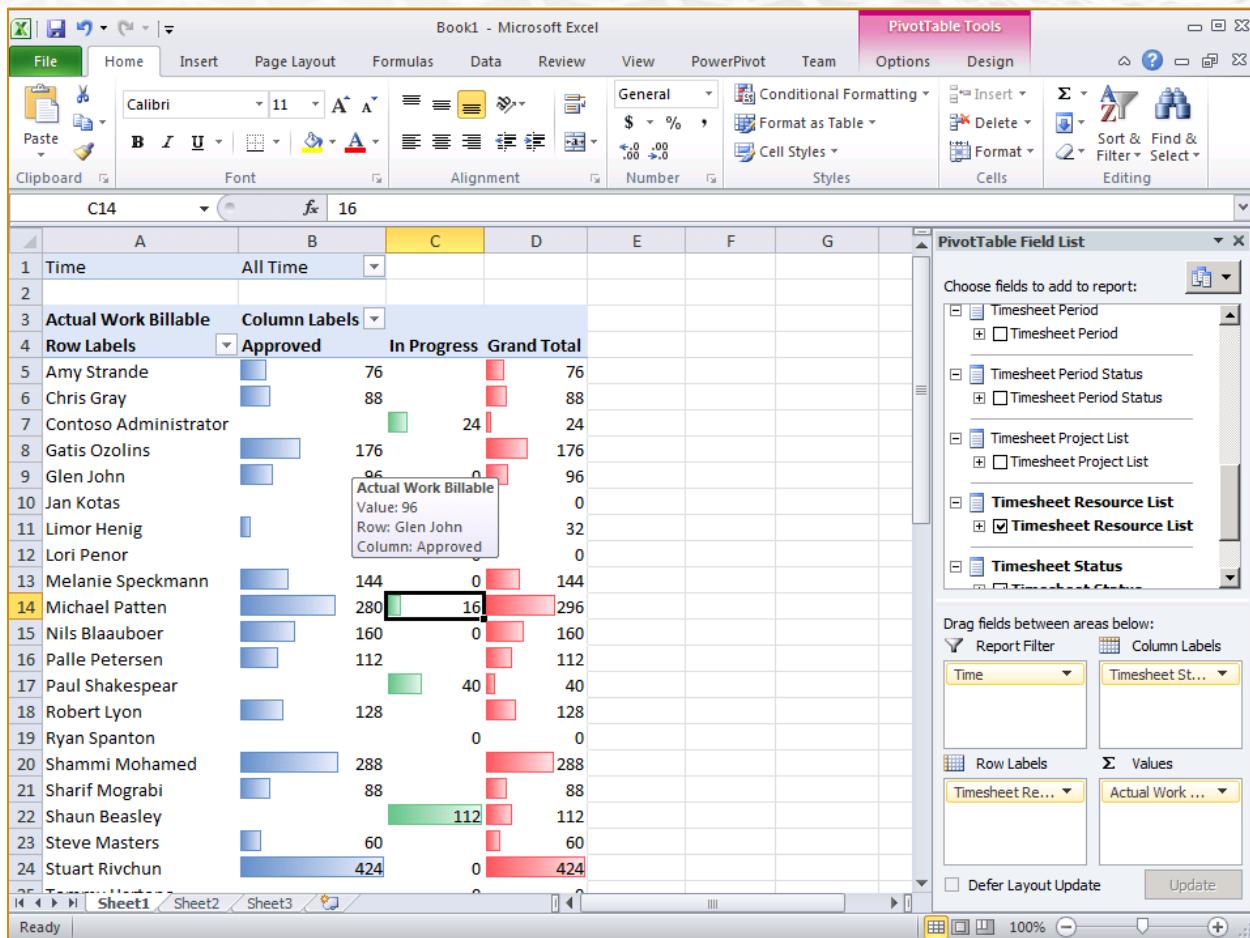


Figure 16: Creating an Excel Report

The Excel Report may then be surfaced within SharePoint Server as an Excel document, an Excel Chart embedded in a Web part, or via a PerformancePoint dashboard. Use the REST API to surface Excel charts dynamically in Microsoft Word documents. For more information on the REST API, see page 66 of this document.

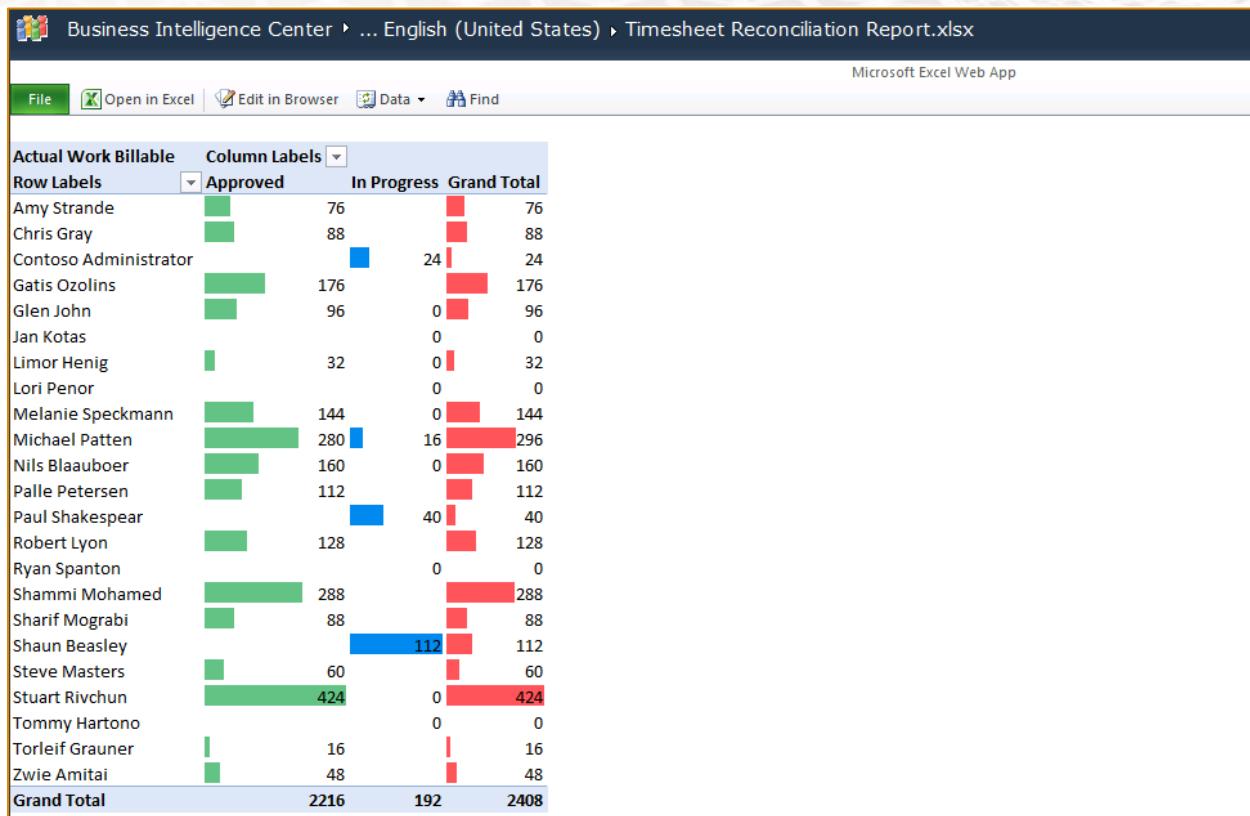


Figure 17: Excel Services Report

Tips and Tricks: Excel Services

Note that certain features available within the Excel client are not available within Web-based Excel reports. Specifically, combo boxes or the data validation typically used to generate drop-down lists are not supported.

A	B	C
Select Project:		Tasks
Acquisition Target Analysis		Acquisition Target Analysis
Acquisition Target Analysis		Develop Mergers & Acquisition Strategy
Apparel ERP Upgrade		Identify Current Capabilities and Positioning
Asset Tracking System		Perform Competitive Analysis
Asset-Change Ownership		Perform Market Trend Analysis
Audit Tracking Solution		Define Current Positioning and Gaps
Auditing Services Training		Current Position Analysis Complete
Automated Software Design Architecture Upgrade		Define Merger/Acquisition Goals
		Define Strategic Objectives For M&A
		Define Risk Tolerance for M&A
		Define Financial Risk Tolerance
		Define Market Position Risk Tolerance
		Define Capabilities Risk Tolerance
		Complete Risk Tolerance Assessment
		Define Internal Versus M&A Evaluation Criteria
		Define Internal Development Capabilities Model
		Define Internal Versus M&A Comparison Model
		Define Selection Scenario and Target Performance Measures

Figure 18: Using PivotTables to Filter Excel Reports

To generate a drop down list to select data for display, it is recommended to either use the new Slicer functionality or to use this workaround using the filter option in a PivotTable:

<http://blogs.office.com/b/microsoft-excel/archive/2008/02/13/a-pivottable-trick-that-brings-data-validation-to-excel-services.aspx>.

6. Visio & Visio Services

As Excel is the most overused reporting tool on desktops around the globe, Visio is probably the most underutilized reporting tool. Visio has long been able to dynamically surface data in intuitive and highly visual charts. With the introduction of Visio Services in SharePoint Server 2010, those charts may now be published to a Web browser for access by users without Visio installed on the local computer.

Visio allows users to marry project data to schematics, maps, or any other conceptual visualization of the project portfolio. Visio reports may be easily generated with a minimal amount of specific tool knowledge.

Visio unshackles users from a traditional chart-based report, and allows the implementation of graphical navigation. For instance, users may create an organization chart linked to resource data, a geographic map with project status overlaid, or a schematic of a product with the status of the various components displayed. Linking these reports to Project Server data is no more complicated than displaying data within Excel.

Item	Visio Services
Subcomponent of	SharePoint Server
Reporting Level	Portfolios, Programs
Use When	Users require an intuitive, graphical report navigation structure.
Technical Skills Required	Ability to develop graphical reports in Visio.

Table 5: Visio Services

Like Excel reports, Visio leverages the same architecture of ODC files and service applications. Visio reports may be generated with data directly from the Project Server database or by consuming data from ODC files.

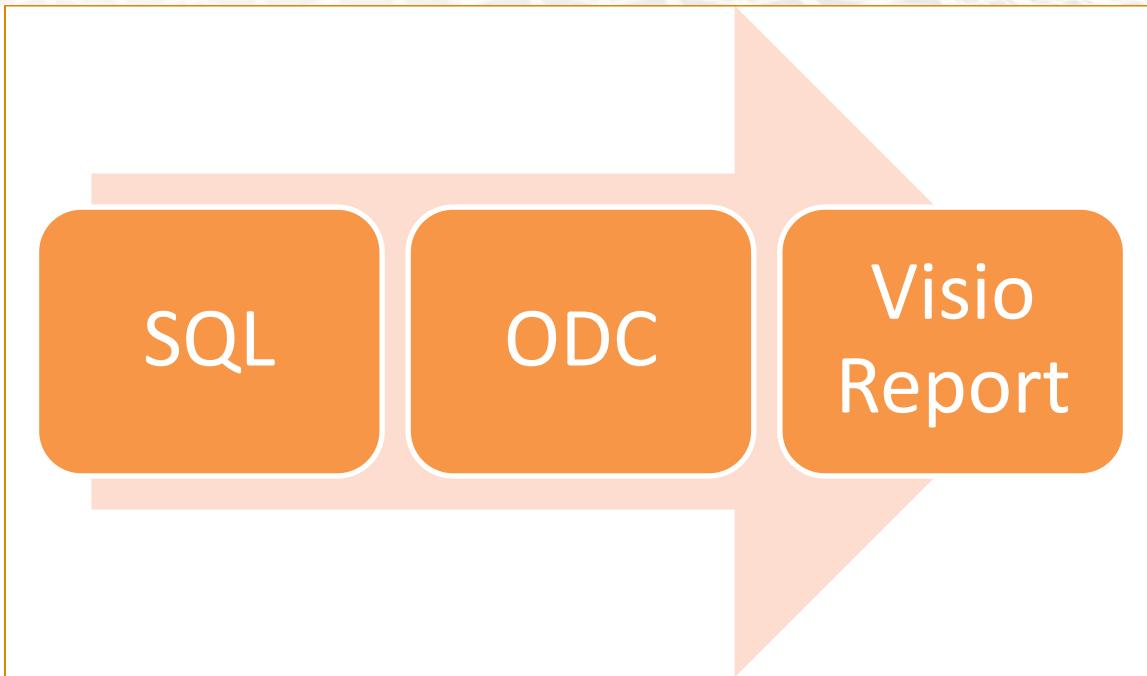


Figure 19: Using ODC Files in Visio Reports

Start a new report by creating the structure within a Visio diagram. Add custom shapes or backgrounds as required.

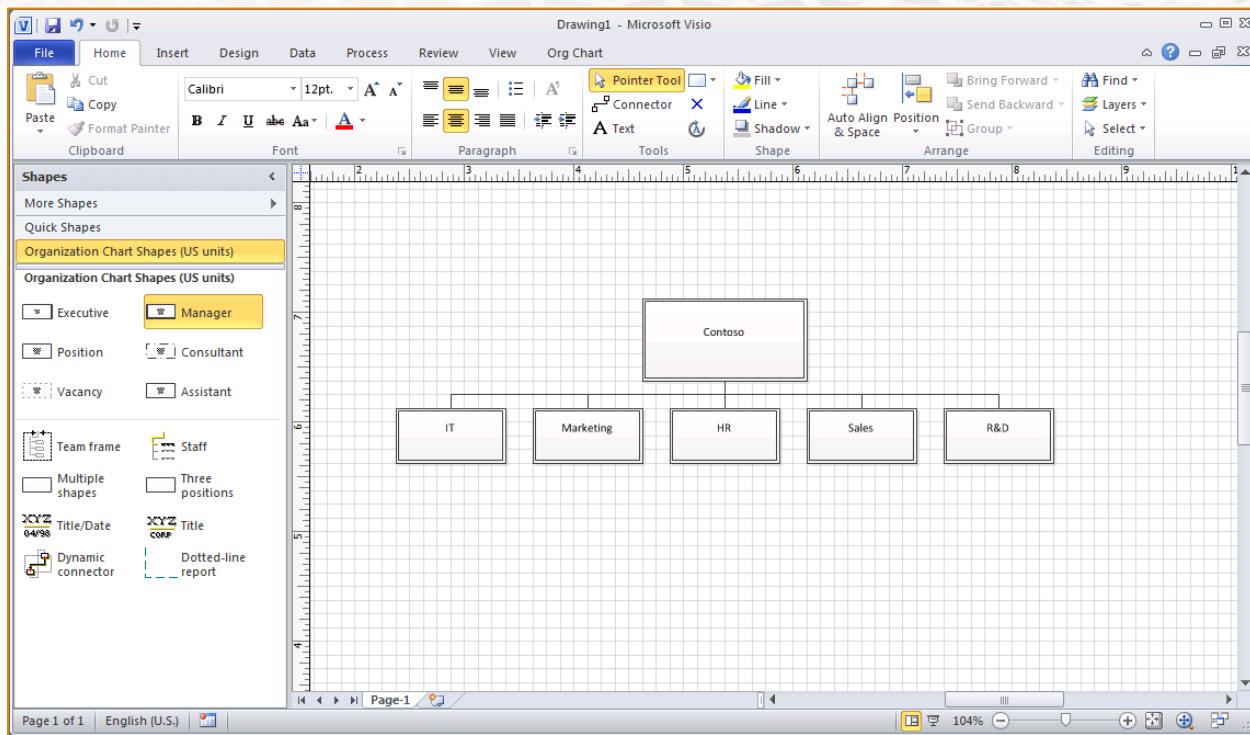


Figure 20: Creating a Reporting Navigational Structure

Once the report has been mocked up within Visio, add a link directly to the Project Server database or to a preconfigured ODC file by using the Data tab.

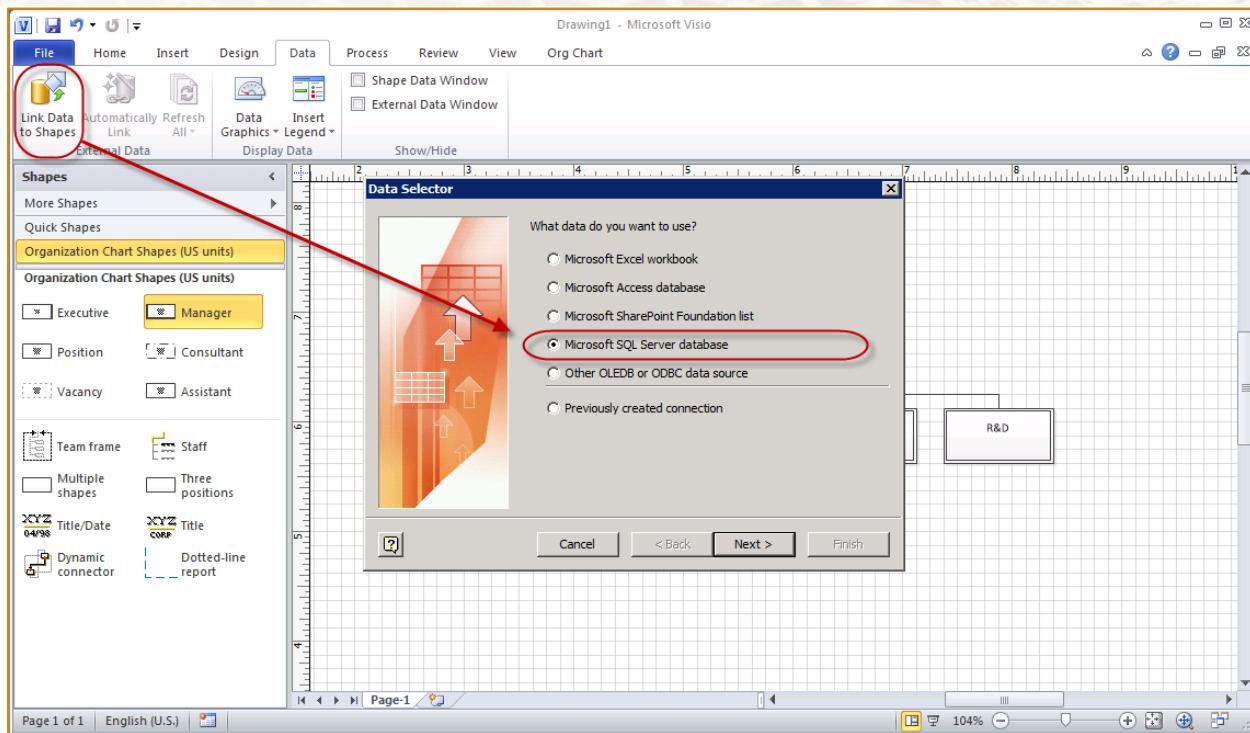


Figure 21: Connecting Visio to the SQL Server Database

After identifying the table to be used, select the columns to be included in the report.

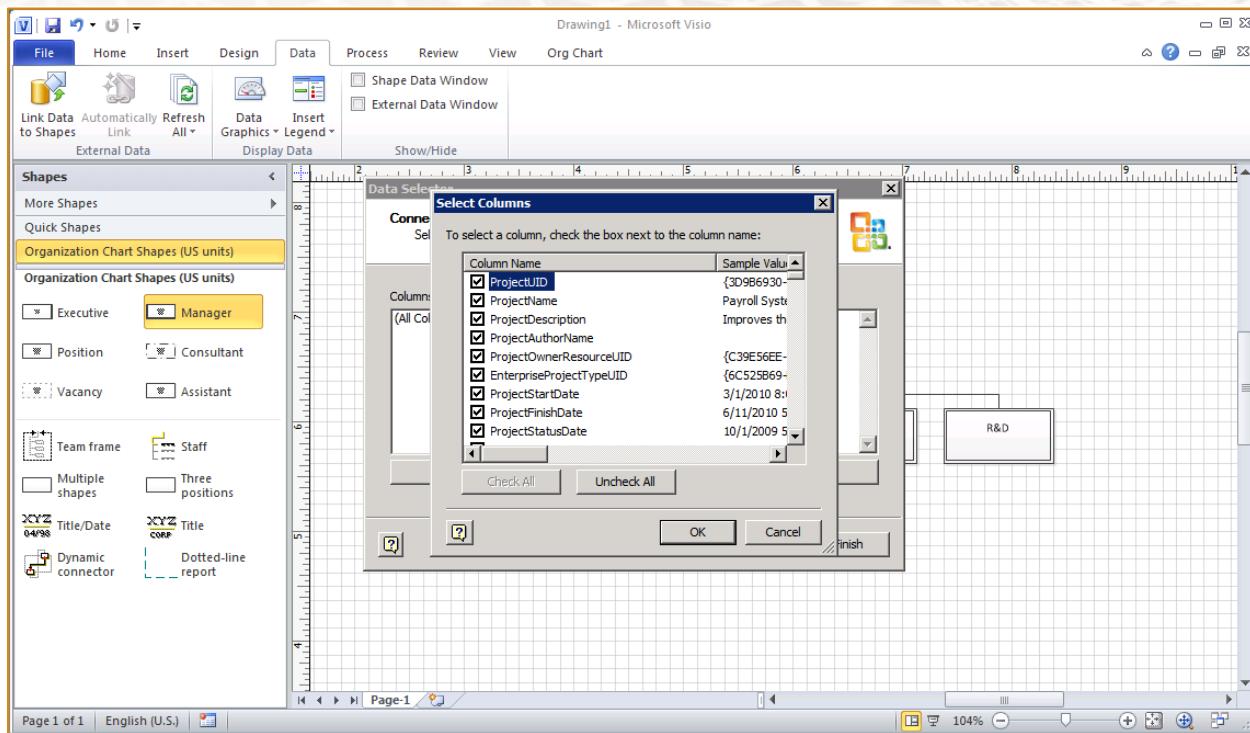


Figure 22: Selecting Columns to Include in the Visio Report

This will add the data to Visio in the External Data window. To combine that data with a graphical element, simply drag the line of data onto the Visio object.

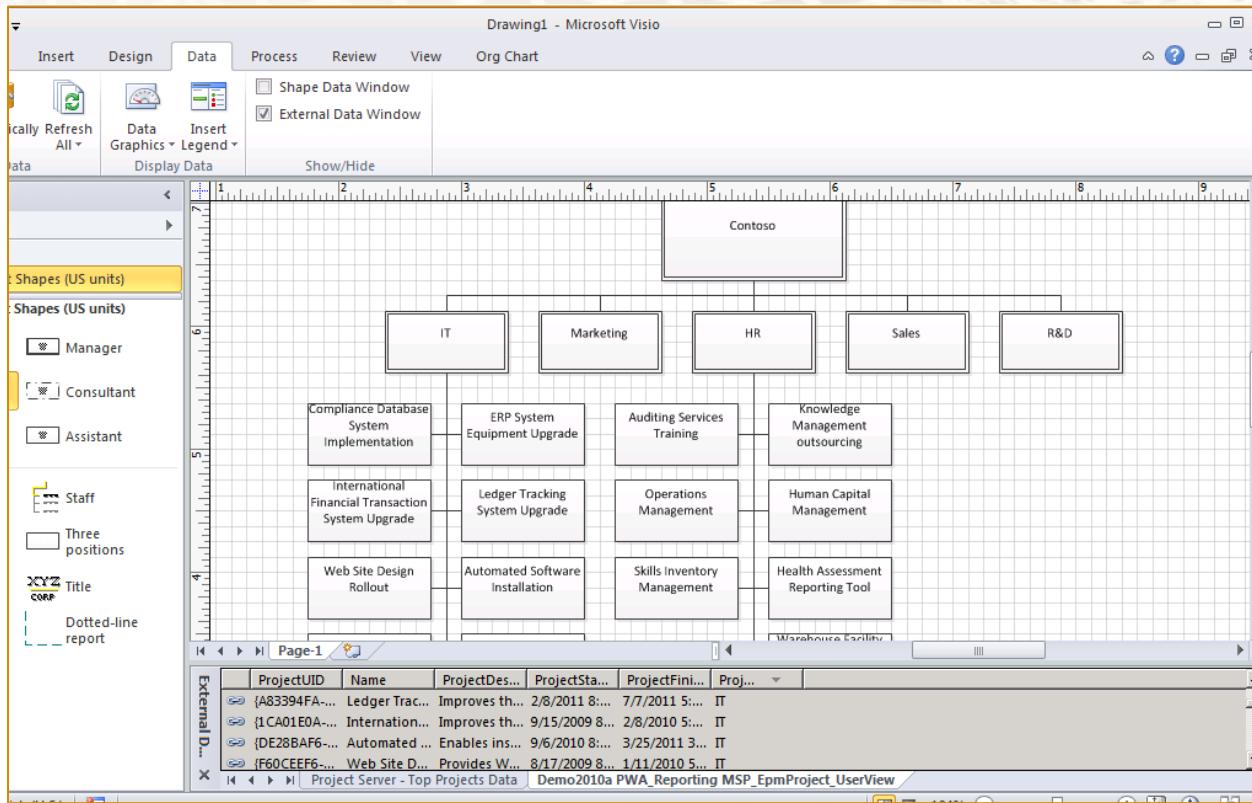


Figure 23: Connecting SQL Server Data to the Visio Report

A chain link icon will appear beside the linked row of data. The linked data may now be displayed within Visio by adding the Shape Data window. Users may click elements within the report to display specific data from the Project Server database.

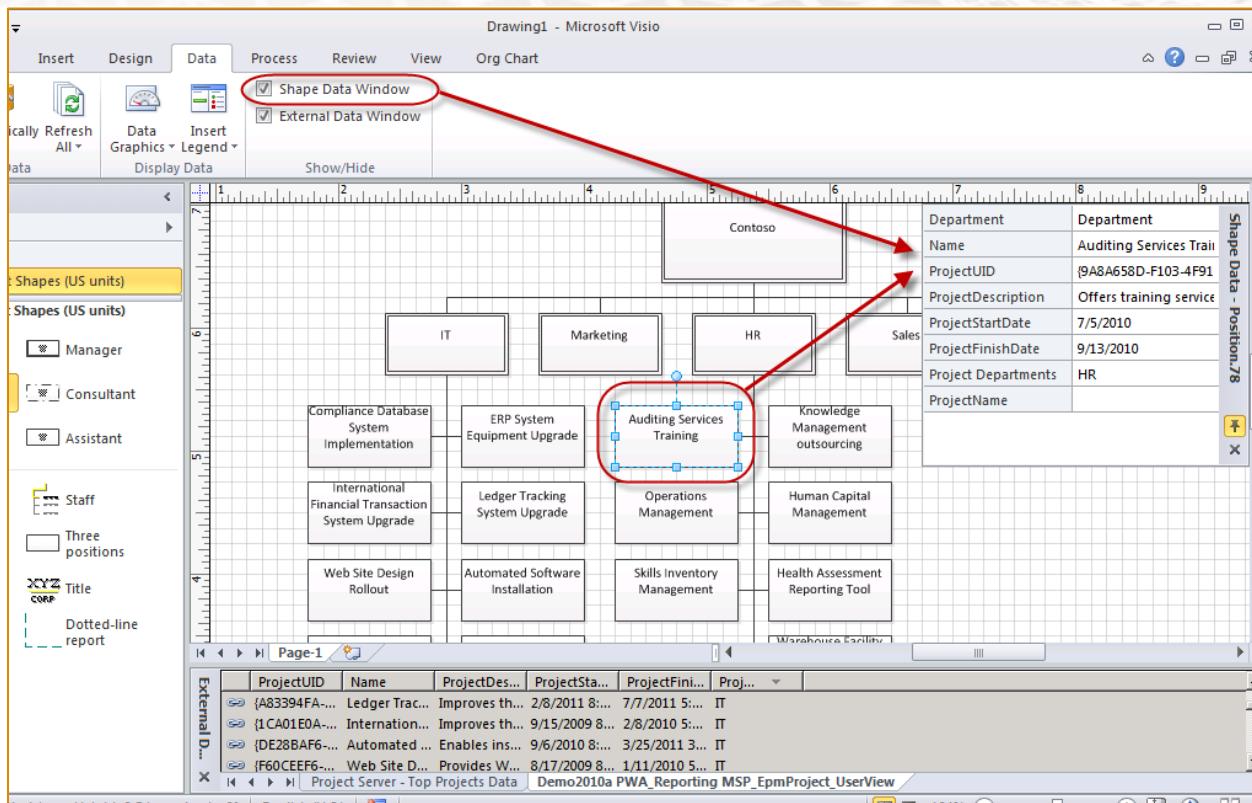


Figure 24: Navigating within Visio

In addition to simply displaying data in text form, data graphics may be added to the report elements to include such graphical elements as thermometers, gauges, and other indicators. In the following example, the projects are configured to be dynamically color-coded based on the data in the Project Department field. A similar technique could be used to change the color of the item based on cost or finish variance figures.

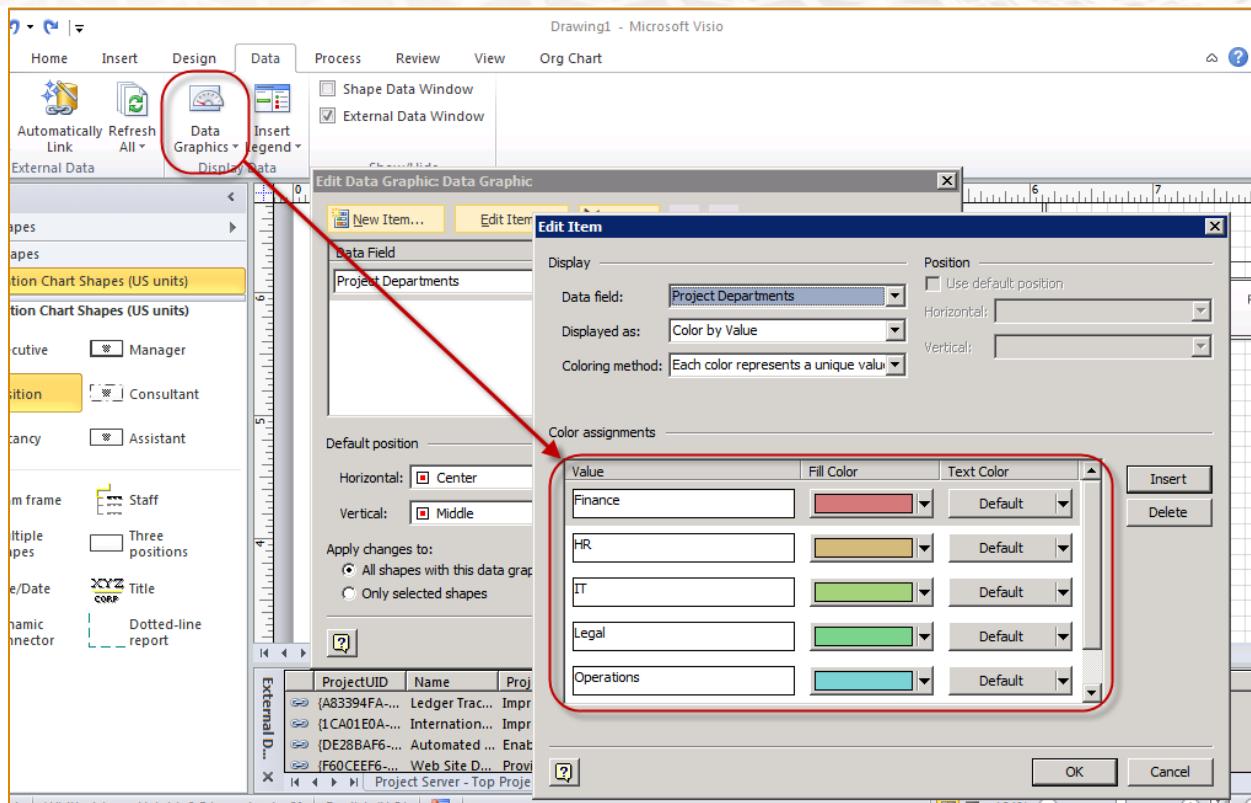


Figure 25: Adding Data Graphics

The projects will now automatically display specific colors based upon the assigned department.

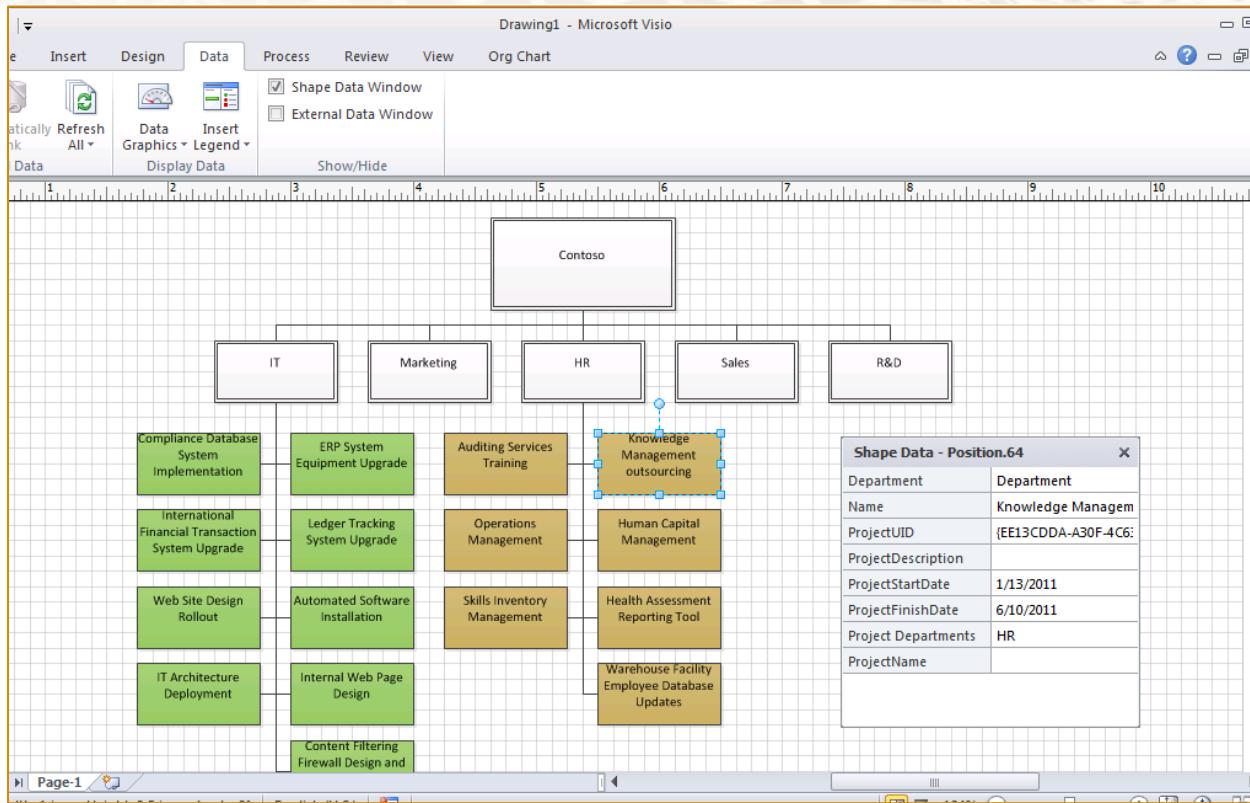


Figure 26: Incorporating Data Graphics in the Visio Report

The Visio drawing may now be saved to a SharePoint document library. Users will be able to open the drawing and navigate through it directly within the browser, without a requirement to install Visio on the local computer.

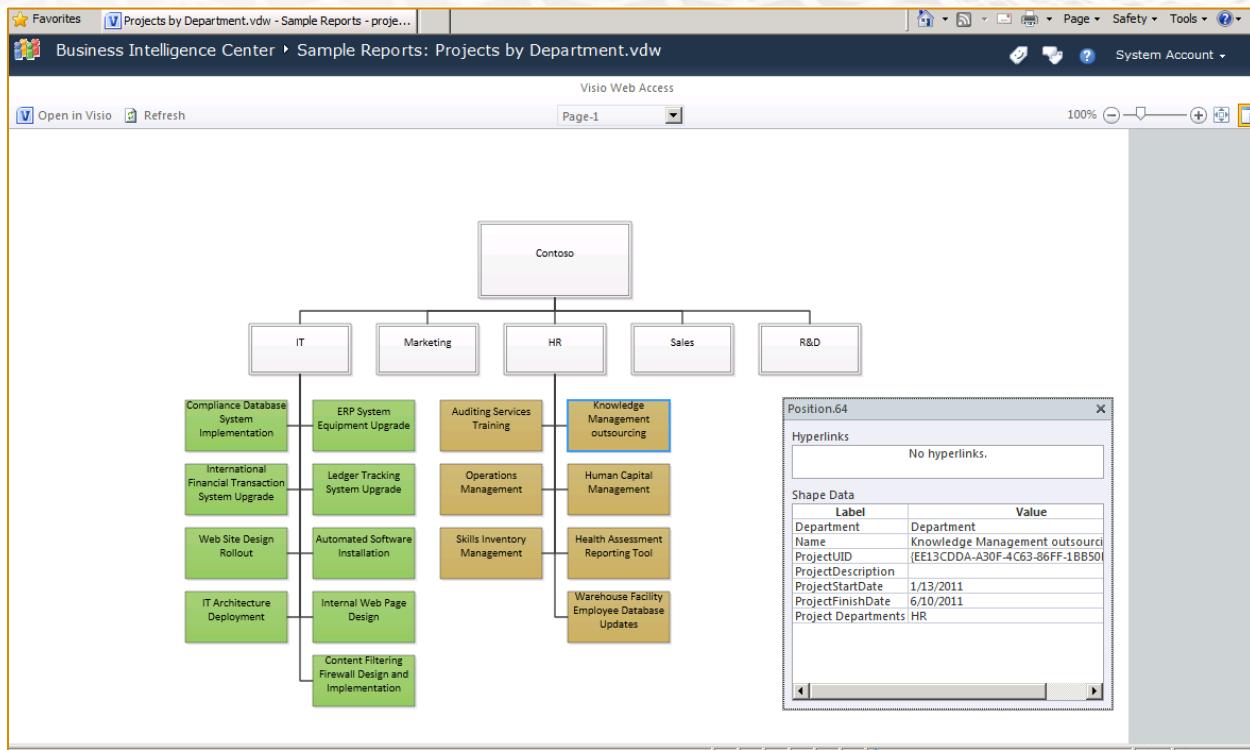


Figure 27: Reviewing the Visio Report in SharePoint Server

To provide an example, in the following illustration, an organization chart has been displayed in Visio with resource availability calculations associated with each resource.

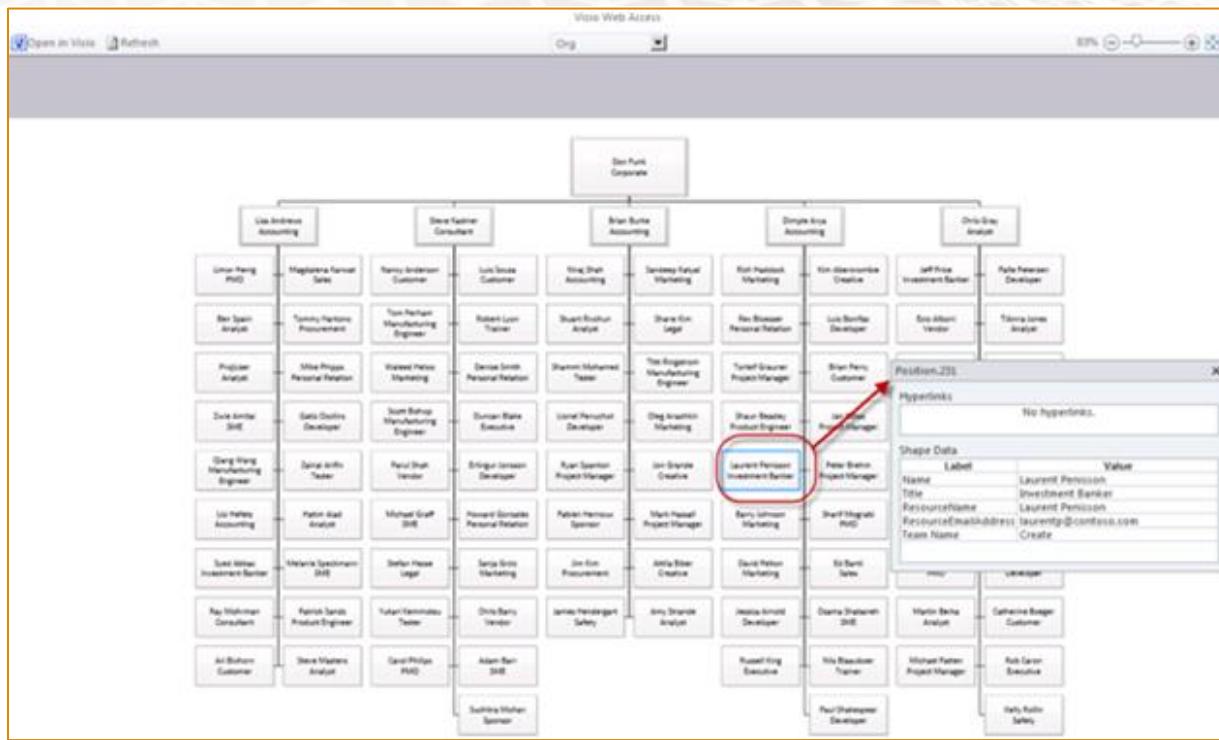


Figure 28: Displaying Data in an Org Chart

In the next illustration, a Visio timeline is dynamically linked to Project Server data and uploaded to a SharePoint site.

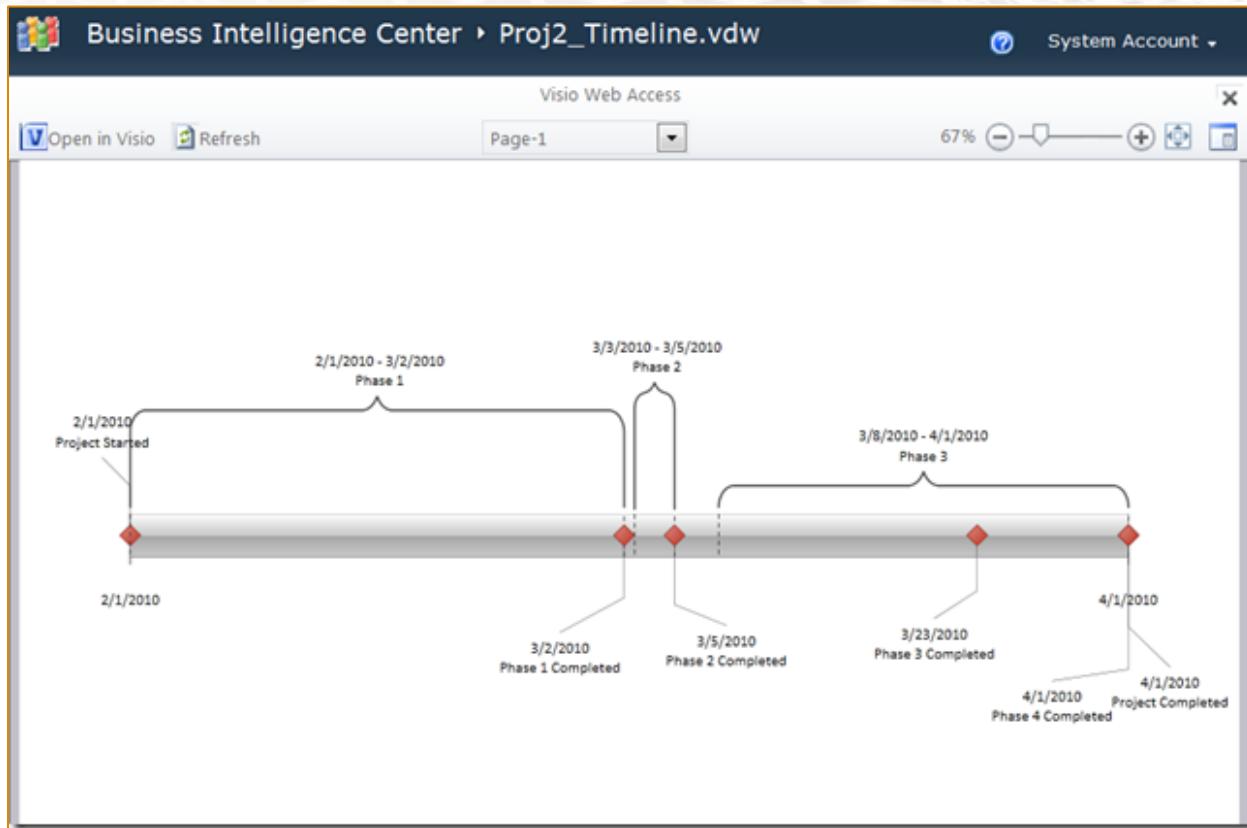


Figure 29: Displaying a Dynamic Timeline with Visio Services

Charts vs. Pivot Charts

Visio charts may be separated into two main categories: charts and Pivot Charts. The normal charts allow database data to be surfaced in a graphical format, but may not be connected to OLAP cubes in SQL Server Analysis Services. Pivot Charts may be connected to OLAP cubes, and thus allow users to flexibly manipulate the report to dive into the detail, or to roll back up to a high-level aggregated view of the project data.

When you are first creating the Visio report, select the PivotChart option to connect a Visio report directly to an Analysis Services OLAP cube. Consider using this option to surface resource availability data in the form of an organization chart.

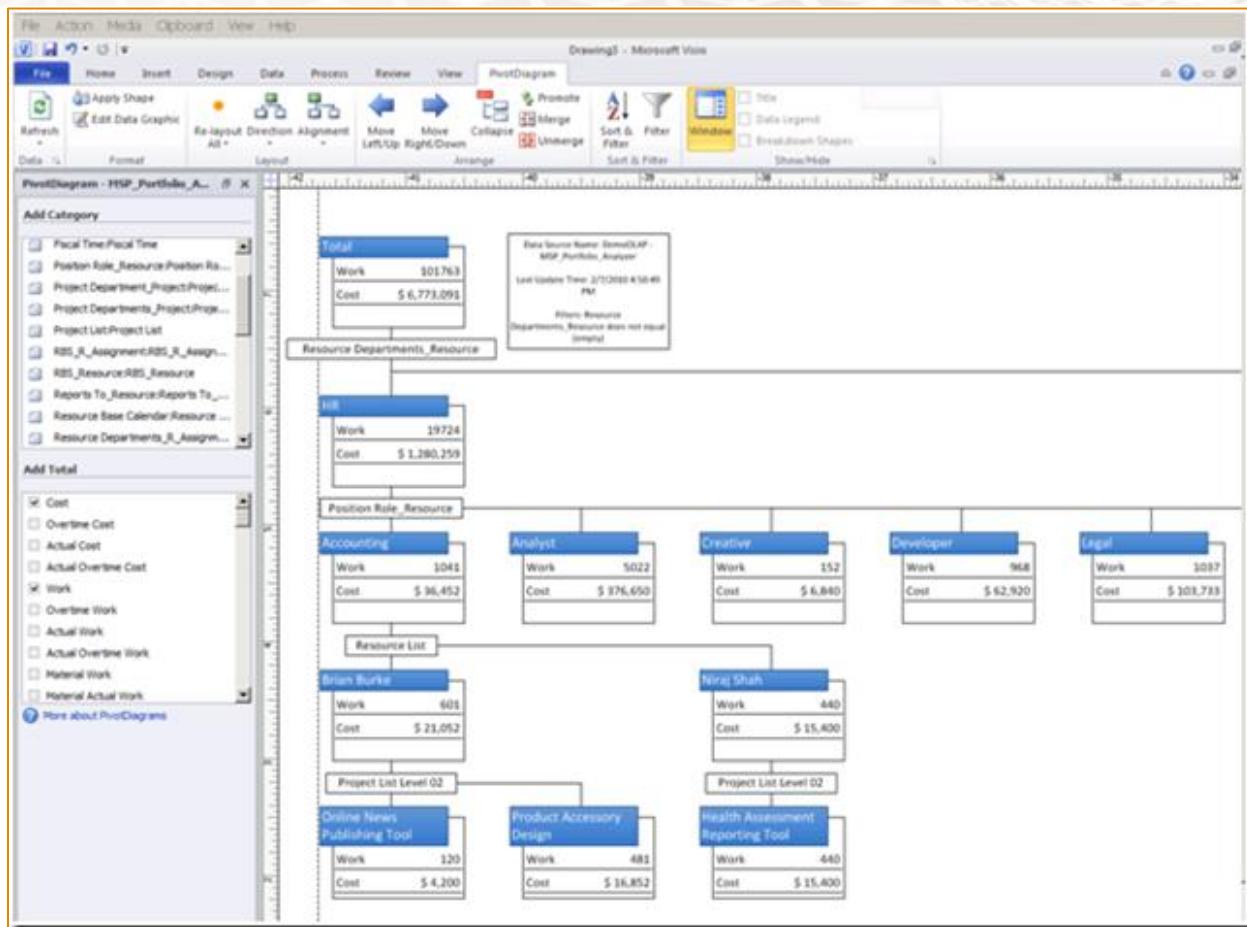


Figure 30: Visio Pivot Charts

Tips and Tricks: Visio Services

When you are creating a report, consider embedding a graphical depiction of the product, facility, or geographic region within which projects will be performed. This allows the end user an intuitive navigational structure to assess and analyze information. In the illustration below, drilling dates are displayed next to a depiction of oil wells over a map of an Alaskan oil field.



Figure 31: Embedding Project Server Resource Data in a Geographic Report

Users may click each of the well heads to expose selected Project Server data.

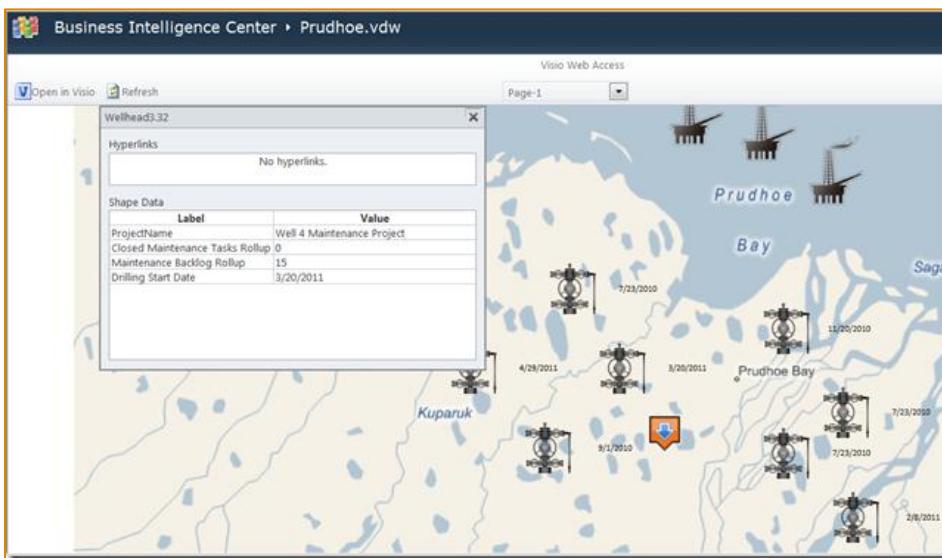


Figure 32: Navigating Within a Geographic Report



7. SQL Server Reporting Services (SSRS)

SQL Server Reporting Services have long been the reporting tool of choice for many organizations. Often requiring a high level of technical skill, SSRS allows report authors to dive deeply into the reporting database to develop robust reports. Organizations typically use SSRS to develop structured reports pulling from multiple data sources, or to develop reports that are e-mailed out to users on a routine schedule.

SSRS reports are probably still the best solution when disparate data sources must be combined and aggregated. For example, organizations will often use SSRS to aggregate program level risks from multiple SharePoint sites and combine with Project Server metrics. Another common use for SSRS is to tie a narrative from a project workspace status list to project level data. For example, team members provide an update of what they have done each week in the form of SharePoint list entries. Each week, the project manager will generate a report compiling these list entries with metrics from Project Server. These reports may all be tied to a scheduled subscription mechanism and e-mailed to key stakeholders on a weekly or monthly basis.

While providing a power to aggregate data that is unparalleled by any of the other reporting options discussed within this document, SSRS also require the most technical knowledge to create. However, Microsoft is aware of this hurdle to the development of SSRS reports, and has released the free Report Builder v3.0 download, a client-based report authoring tool. Unless Report Builder is used against the default Project Server database however, there is still a significant hurdle to generate the core data set to be included in the report.

Item	SQL Server Reporting Services
Subcomponent of	SQL Server
Reporting Level	Portfolios, Programs, Projects
Use When	Users require a predefined set of reports with minimal customization or when users require reports pulling data from a number of data sources. When reporting on a portfolio level, SSRS may require a high level of process standardization.
Technical Skills Required	Ability to develop and deploy reports by using SQL queries. Report Builder allows users familiar with the database structure to create reports with minimal development knowledge.

Table 6: SQL Server Reporting Services



Below is an example of a portfolio-based report that has been included in the default Microsoft Project Server image that is freely downloadable from the Microsoft Web site. Note that this dashboard displays metrics from Project Server. Clicking each project entry will navigate the user to a second report, which displays specific project data (Figure 34).

A screenshot of the Microsoft Project Server 2010 Business Intelligence Center dashboard. The page title is "Business Intelligence Center > Project Status". The left navigation bar includes links for "Project Web App", "Home", "Dashboards" (selected), "Corporate Dashboard", "Documents", "Corporate Reports", "PerformancePoint Content", "Recycle Bin", and "All Site Content". The main content area is titled "Project by Department" and shows a table titled "Projects by Department" as of 2/2/2011 12:51:14 PM. The table has columns for Department, % Comp, and Traffic Light Indicators (Health, Cost, Schedule, Quality, Resource). The last two columns show Project Cost (Actual, Remaining, Baseline, Variance). The table lists projects for Finance, HR, IT, Legal, Operations, Sales, and Marketing departments.

Figure 33: Sample SSRS Report

The latest version of SSRS also features the ability to export reports into Microsoft Word documents, thereby delivering live project data into an editable artifact.



A screenshot of Microsoft Word showing a "Project Status Report" template. The document header includes the Microsoft Project Server 2010 logo and the title "Project Status Report" and "Acquisition Target Analysis". Below the title is a subtitle "As of 2/2/2011". The main content area features a "Project Summary" section with four status indicators: "Project Health" (green), "Project Cost" (green), "Project Quality" (green), and "Project Resource" (green). Each indicator has a corresponding date: Start Date (7/5/2010), Finish Date (10/6/2010), Status Date (1/1/2010), and Schedule Indicator (green dot). A "Project Description" section states: "Provides financial analysis of a target company that an organization wants to acquire." To the right is a gauge chart titled "% Complete" with a value of 97.20%. Below the summary is a "Project Cost Summary" section with a progress bar labeled "Actual Cost Consumed" showing a value of \$97,200. The Word ribbon at the top shows tabs like File, Home, Insert, Page Layout, References, Mailings, Review, Add-Ins, Design, and Layout. The status bar at the bottom shows "Page: 1 of 2" and "Words: 173".

Figure 34: Exporting a Status Report to Microsoft Word

Report Builder

Report Builder enables users to make effective, simple reports, with minimal effort. After downloading the tool from the Microsoft Web site, follow these simple instructions to generate a prototype report.

First, configure a data source. The data source may include either the Analysis Services OLAP cubes or the Project Server Reporting database. Once the data source has been configured, select the appropriate fields and filters to generate a compelling report.

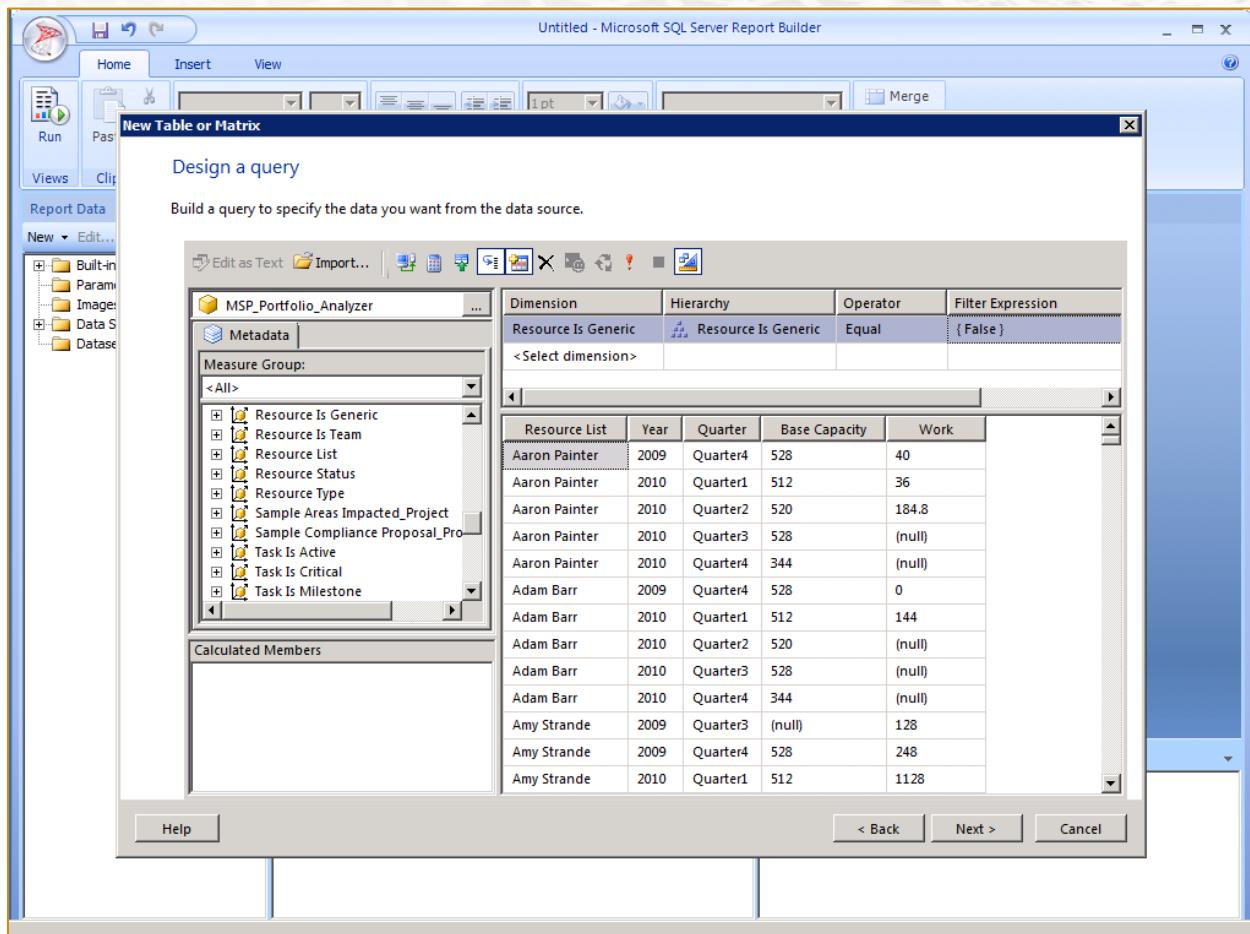


Figure 35: Creating an SSRS Report with Report Builder

After defining the data source, configure the report layout and preview the finished report.

Untitled - Microsoft SQL Server Report Builder

Run

Views Zoom First Previous [1] of 2? Next Last Refresh Stop Back

Print Page Setup Print Layout Export Document Map

Print Print Export Options Parameters Find

Resource List	2009		2010								
	Base Capacity	Total	Work	Base Capacity	Quarter1		Quarter2		Quarter3		Quarter4
		Work			Base Capacity	Work	Base Capacity	Work	Base Capacity	Work	Base Capacity
Aaron Painter	528	40	512	36	520	184.8	528			344	
Adam Barr	528	0	512	144	520		528			344	
Amy Strande	528	376	512	1128	520	24	528	12		344	
Ari Bixhorn	0		0		0		0			0	
Attila Biber	528		512	48	520	104	528	0		344	
Barry Johnson	528	168	512	1176	520	416	528	16		344	
Ben Spain	528	672	512	1392	520	1486	528	606		344	
Brian Burke	528	40	512	344	520	56	528	41.481667		344	
Brian Groth	528		512		520		528			344	
Brian Perry	0	16	0		0		0			0	
Carol Troup	528	136	512	8	520	32	528			344	
Catherine Boeger	0		0		0		0			0	
Chris Barry	528		512		520	248	528	0		344	
Chris Gray	528	1396	512	848	520		528	12		344	
Contoso Administrator	528		512	0	520		528			344	
David Pelton	528	145.014917	512	56.799967	520	1.036667	528	200		344	
Denise Smith	528	24	512	0	520	184	528	0		344	

Figure 36: Previewing an SSRS Report

Finally, load the report back into the appropriate report library within SharePoint Server. Once it is uploaded, the report may be surfaced or referenced throughout the corporate intranet.



Project Web App > Reporting Services Reports

Actions ▾ 🔍 ⏪ 1 of 2 ⏩ 🔍 Find Next 100%

	2009		2010										Total
	Total		Quarter1		Quarter2		Quarter3		Quarter4				Total
Resource List	Base Capacity	Work	Base Capacity	Work	Base Capacity	Work	Base Capacity	Work	Base Capacity	Work	Base Capacity	Base Capacity	Base Capacity
Aaron Painter	528	40	512	36	520	184.8	528		344		1904	220.8	1904
Adam Barr	528	0	512	144	520		528		344		1904	144	1904
Amy Strande	528	376	512	1128	520	24	528	12	344	0	1904	1164	1904
Ari Bixhorn	0		0		0		0		0		0	54.666667	0
Attila Biber	528		512	48	520	104	528	0	344		1904	152	1904
Barry Johnson	528	168	512	1176	520	416	528	16	344		1904	3508	1904
Ben Spain	528	672	512	1392	520	1486	528	606	344		1904	521.481667	1904
Brian Burke	528	40	512	344	520	56	528	41.481667	344	80	1904	80	1904
Brian Groth	528		512		520		528		344		1904	860	1904
Brian Perry	0	16	0		0		0		0		0	0	0
Carol Troup	528	136	512	8	520	32	528		344	8	1904	48	1904
Catherine Boeger	0		0		0		0		0		0	0	0
Chris Barry	528		512		520	248	528	0	344		1904	248	1904
Chris Gray	528	1396	512	848	520		528	12	344		1904	92	1904

Figure 37: Displaying an SSRS Report in the Browser

The report may even be exported to Microsoft Office applications for further analysis.

Resource Capacity Report.rdl

	2009 Total		2010 Quarter1		Quarter2		Quarter3		Quarter4		2011 Total	
Resource List	Base Capacity	Work	Base Capacity	Work	Base Capacity	Work	Base Capacity	Work	Base Capacity	Work	Base Capacity	Work
Aaron Painter	528	40	512	36	520	184.8	528		344		1904	220.8
Adam Barr	528	0	512	144	520		528		344		1904	144
Amy Strande	528	376	512	1128	520	24	528	12	344	0	1904	1164
Ari Bixhorn	0		0		0		0		0		0	54.666667
Attila Biber	528		512	48	520	104	528	0	344		1904	152
Barry Johnson	528	168	512	1176	520	416	528	16	344		1904	1608
Ben Spain	528	672	512	1392	520	1486	528	606	344	24	1904	3508
Brian Burke	528	40	512	344	520	56	528	41.481667	344	80	1904	521.481667
Brian Groth	528		512		520		528		344		1904	
Brian Perry	0	16	0		0		0		0		0	0
Carol Troup	528	136	512	8	520	32	528		344	8	1904	48
Catherine Boeger	0		0		0		0		0		0	0
Chris Barry	528		512		520	248	528	0	344		1904	248
Chris Gray	528	1396	512	848	520		528	12	344		1904	860
Contoso Administrator	528		512	0	520		528		344		1904	0
David Pelton	528	145.014917	512	56.799967	520	1.036667	528	200	344		1904	257.836634
Denise Smith	528	24	512	0	520	184	528	0	344		1904	184
Dimple Arya	528		512	0	520	80	528		344		1904	80
Dilogo Andrade	528	168	512	108	520	8	528	32	344	16	1904	164
Don Funk	528		512		520		528		344		1904	
Duncan Blake	528		512		520		528		344		1904	
Ed Banti Erlingur	528		512		520	56	528	0	344		1904	56
Erlingur	528		512		520	92	528		344		1904	92

Figure 38: Exporting SQL Server Reports to Excel



Tips and Tricks: SSRS

One of the common requirements in a Project Server implementation is to aggregate multiple lists of data across a program. With Project Server 2010, this request has become even more common as organizations store more and more data in various lists and libraries accessible from the Project Server Project Detail Pages.

The SharePoint List Association Manager (SLAM) provides a free interface to develop relationships between disparate SharePoint lists, and then pulls the data into a single SQL Server table. A minimal knowledge of SharePoint Server and SQL scripting is required for the tool deployment.

Download the SLAM tool from Codeplex at the following link: <http://slam.codeplex.com/>

8. PerformancePoint Services

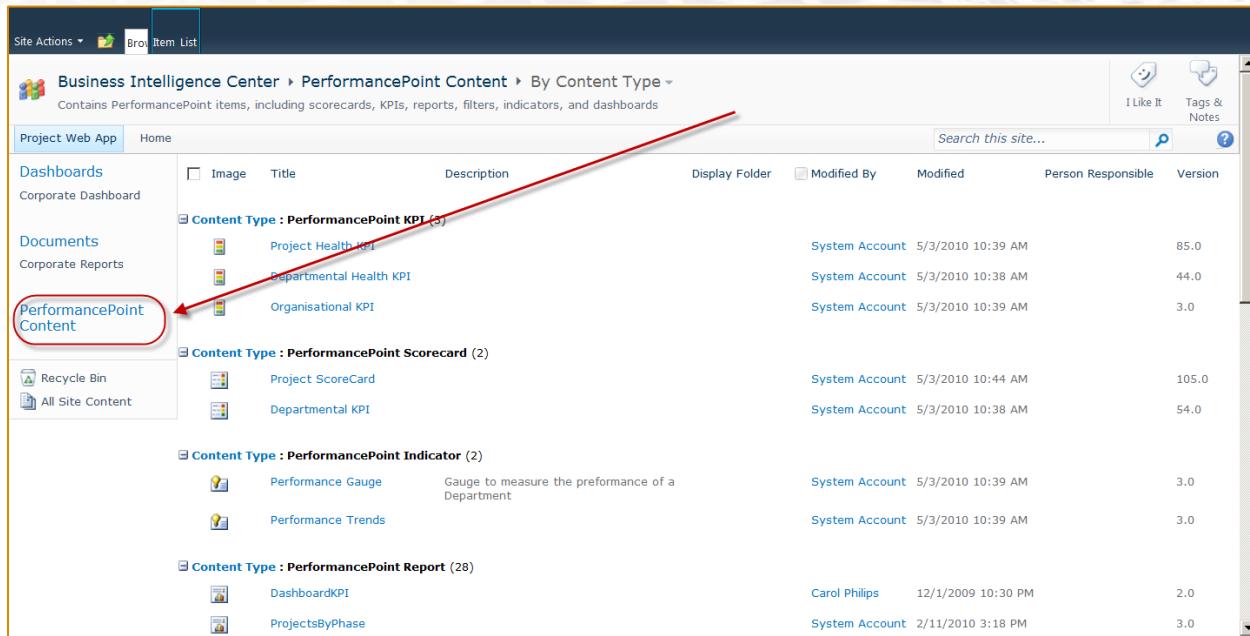
PerformancePoint Services is a collection of reporting tools that are now included within SharePoint Server 2010. PerformancePoint allows users to perform a number of reporting tasks. Most notable of these tasks, perhaps, is the ability to assemble a library of reporting assets which may then be combined into any number of project or portfolio dashboards. Additionally, PerformancePoint allows users to create reporting components that may be reused in multiple customized dashboards.

This tool is arguably the closest successor to the Data Analysis views in prior versions of Project Server. It features a client-based application called PerformancePoint Dashboard Designer, which is downloaded to the client computer upon the first use. For more information on Dashboard Designer, refer to this link: <http://office.microsoft.com/en-us/dashboard-designer-help/getting-started-performancepoint-dashboard-designer-HA100800792.aspx>

Item	PerformancePoint Services
Subcomponent of	SharePoint Server
Reporting Level	Projects, Portfolios, Programs
Use When	Specific reporting elements must be combined and recombined into specific dashboards. When users must be presented with a dynamic interface within SharePoint Server to drill into specific project and portfolio data.
Technical Skills Required	Basic spreadsheet skills. The ability to edit SharePoint sites by adding Web parts.

Table 7: PerformancePoint Services

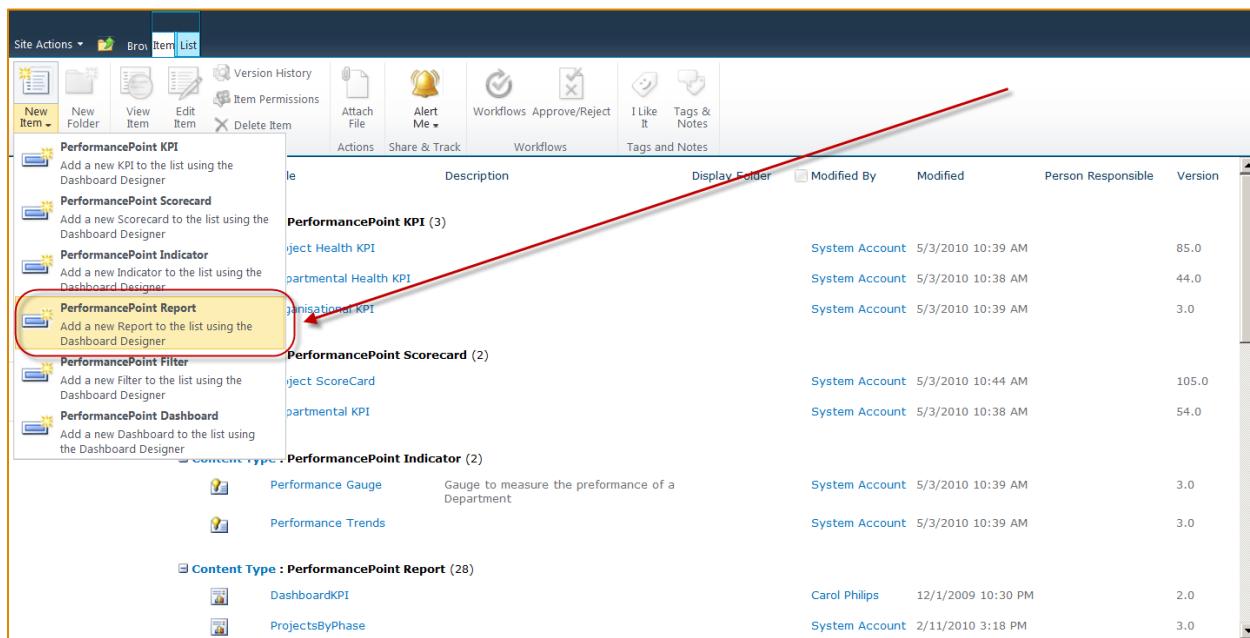
To create a simple PerformancePoint Services report, navigate to the PerformancePoint library within the Project Server Business Intelligence Center.



The screenshot shows the Microsoft Project Server 2010 Business Intelligence Center. On the left, there's a navigation menu with links like Site Actions, Browse, Item List, Project Web App, Home, Dashboards, Corporate Dashboard, Documents, Corporate Reports, and PerformancePoint Content. The PerformancePoint Content link is highlighted with a red oval. A red arrow points from this oval to the 'Content Type : PerformancePoint KPI (3)' section in the main content area. The main area displays a list of items with columns for Image, Title, Description, Display Folder, Modified By, Modified, Person Responsible, and Version. The items listed under 'Content Type : PerformancePoint KPI (3)' are Project Health KPI, Departmental Health KPI, and Organisational KPI.

Figure 39: Navigating to PerformancePoint Services Content

Create a new report by selecting the option in the Item tab. If this is your first time creating a report on the local computer, this action may download and install the Dashboard Designer utility.



This screenshot is similar to Figure 39 but focuses on creating a new report. The 'PerformancePoint Report' item in the navigation menu is highlighted with a yellow box. A red arrow points from this yellow box to the 'PerformancePoint Report (3)' section in the main content area. The main content area shows a list of items under 'Content Type : PerformancePoint Report (28)', including DashboardKPI and ProjectsByPhase.

Figure 40: Creating a New PerformancePoint Services Report

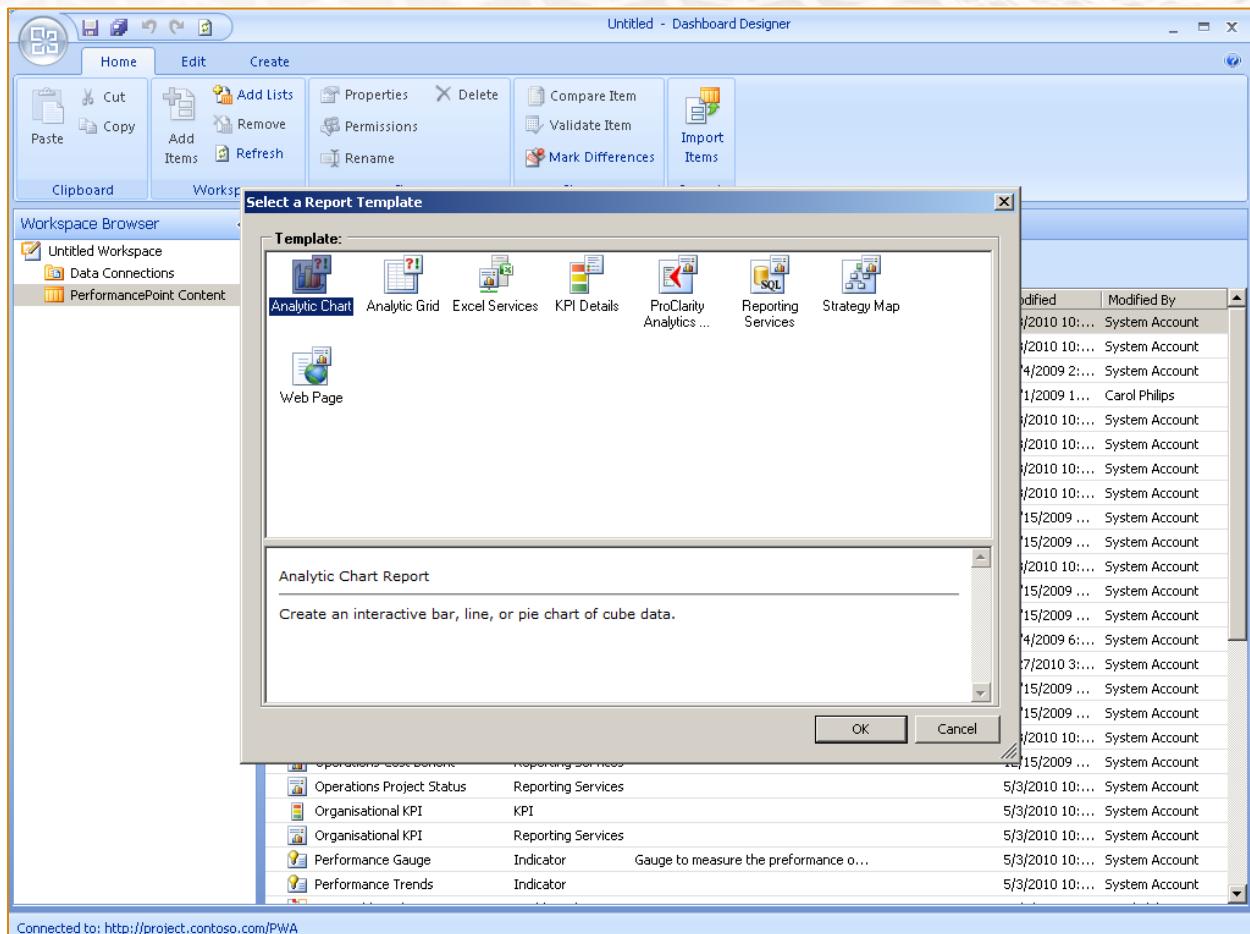


Figure 41: The PerformancePoint Dashboard Designer

Select the Analytic Chart option to create a basic PerformancePoint report. In the next window, assign a data source, add the relevant fields, and right-click the chart to change it to a pie chart.

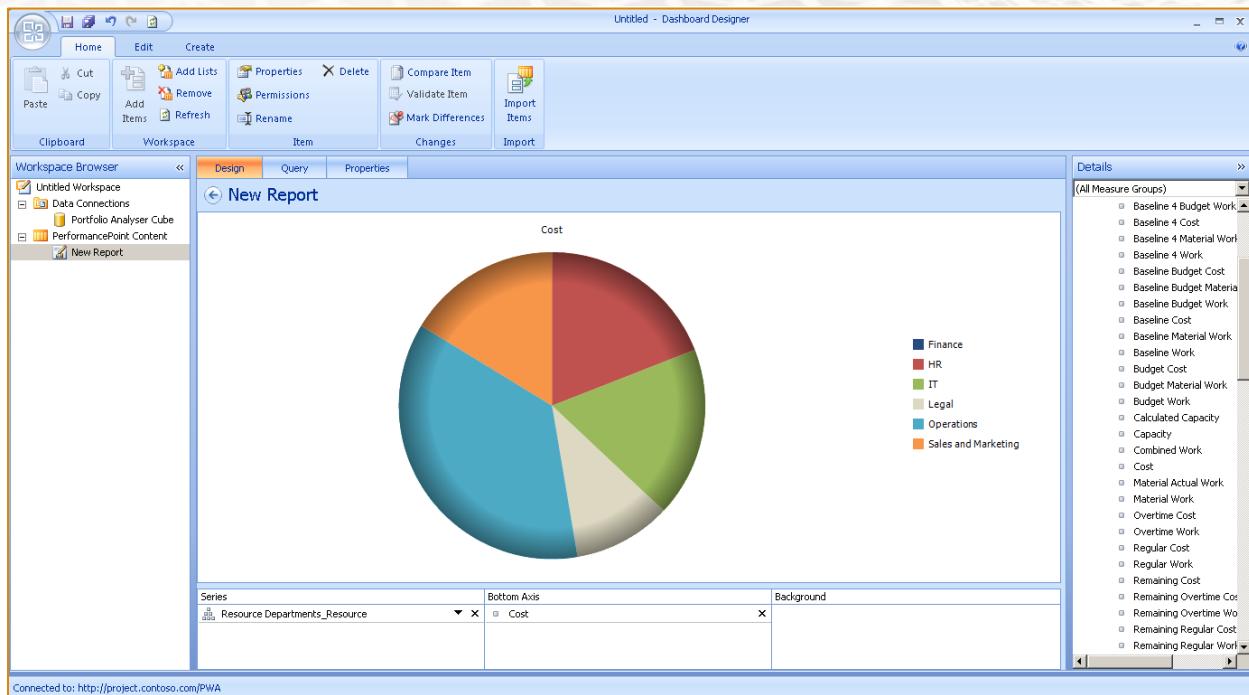


Figure 42: Creating the PerformancePoint Report

Press the Save button to save the report to the PerformancePoint report library. The report may now be surfaced within a PerformancePoint dashboard or by using a PerformancePoint Web part on a SharePoint site.

Decomposition Trees

An embedded feature within PerformancePoint charts is the decomposition tree interface. A decomposition tree allows the user to drill down into OLAP data. To explore this feature, you may right-click the chart in the above diagram and then select the Decomposition Tree option.

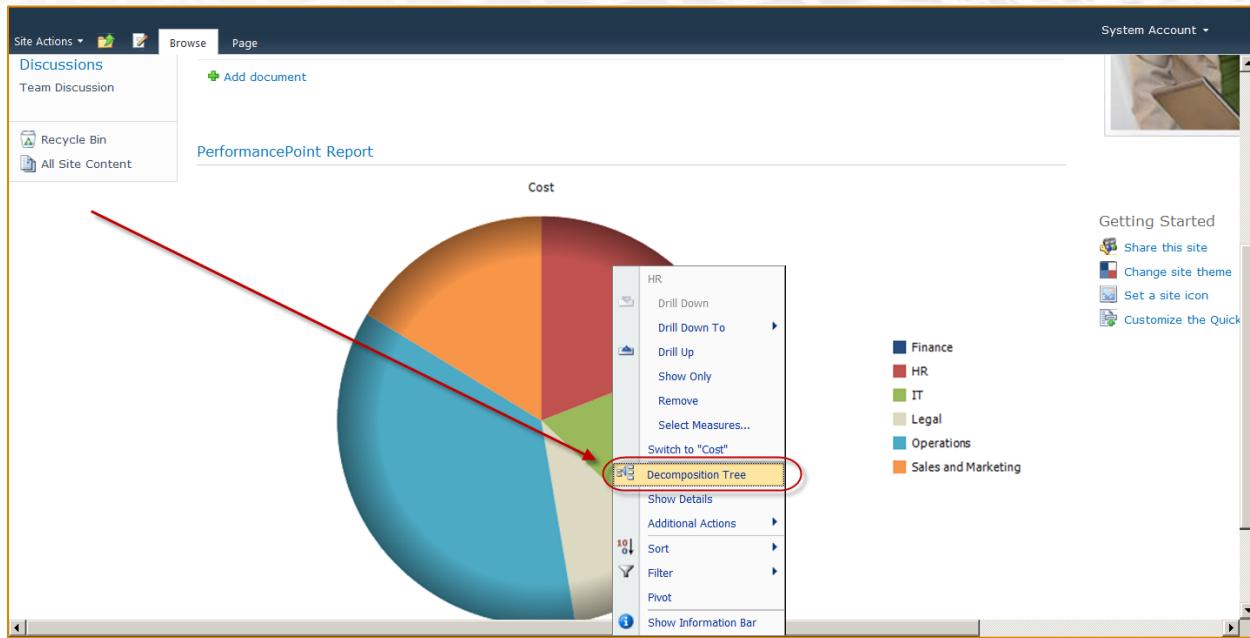


Figure 43: Decomposing a PerformancePoint Report

This will open a new interface for drilling into the data. Click each element within this interface to select how it should be analyzed.

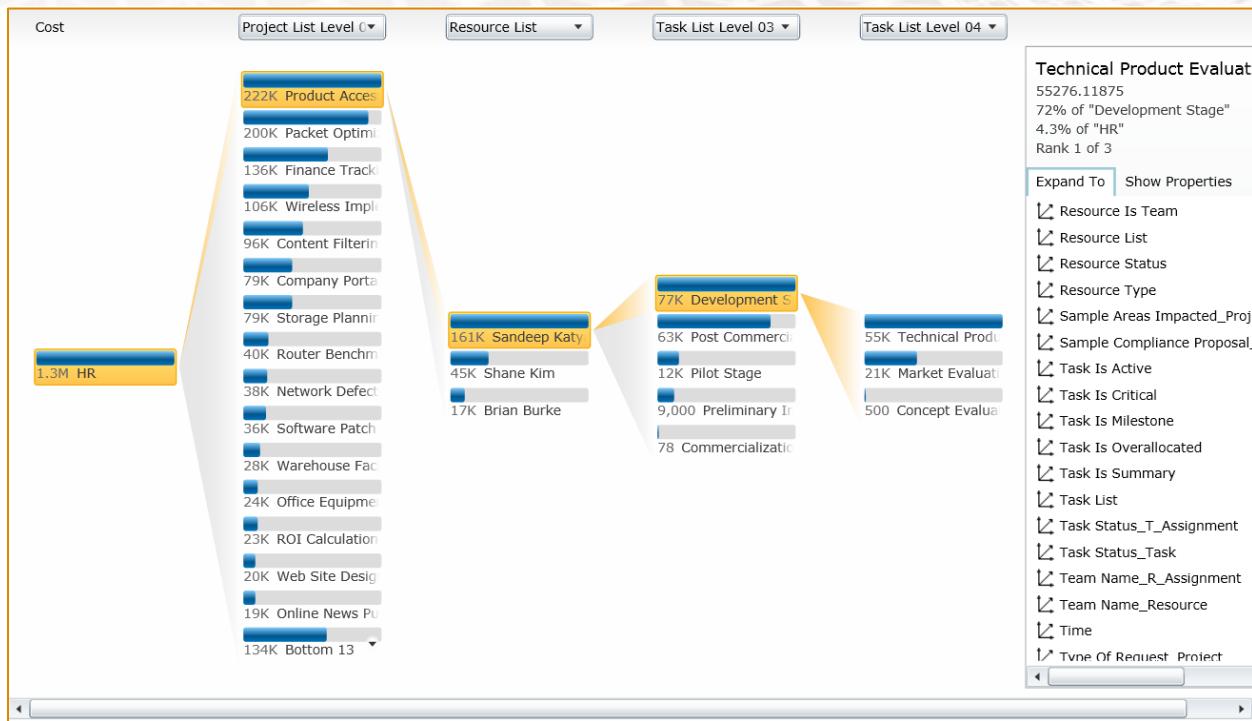


Figure 44: PerformancePoint Decomposition Trees

The decomposition tree feature allows users to flexibly drill into specific charts to any level of detail. Results may be exported to Excel as needed.

Creating Dashboards

PerformancePoint Services is primarily positioned as the tool of choice to develop comprehensive dashboards of Project Server data. As implemented in PerformancePoint Services, the dashboard may be composed of specific elements pulled from specific SharePoint libraries.

To build dashboard components in Project Server, add content to the PerformancePoint Content Library in the Business Intelligence Center. The content itself does not necessarily have to reside within the PerformancePoint library, but may reside in other libraries. For example, when you are creating reports in the PerformancePoint library, the items may constitute placeholders that redirect users to specific SSRS or Excel reports.



The screenshot shows the Microsoft Project Server 2010 Business Intelligence Center. The left navigation bar includes links for Dashboards, Documents, Corporate Reports, and PerformancePoint Content, which is highlighted with a red oval and a red arrow pointing to a callout box. The callout box contains text about dashboards and lists items like 'Start using PerformancePoint Services', 'View Excel Services samples', 'View SharePoint samples', and 'Learn more online'. Other sections visible include 'Monitor Key Performance' and 'Build and Share Reports'.

Figure 45: Navigating to the PerformancePoint Content Library

As described on page 78 of *Microsoft SharePoint 2010 PerformancePoint Services Unleashed*, the items that may be added to a PerformancePoint Content library include the following:

Item	Description
KPI	Data indicating how well the organization is meeting a key, defined target.
Scorecard	A compilation of multiple KPIs.
Indicator	A visual element associated with KPIs such as a stoplight that appears red, yellow, or green.
Report	Reports enable the visualization of data and may be further classified as Excel Services reports, analytic charts, strategy maps, SSRS reports, and so forth.
Filter	Filters allow the filtering of elements on the dashboard. For instance, one dashboard may be filtered based on department, while another identical dashboard may use a different filter of geographic region.
Dashboard	A compilation of KPIs, scorecards, reports, and filters.

Table 8: PerformancePoint Content Types



Each of these components may be combined as needed to create a series of dashboards. After you populate the PerformancePoint list with reusable content, create a new dashboard by using the New Dashboard command.

Name	Description	Display Folder	Modified By	Modified	Person Responsible	Version
PerformancePoint KPI (3)			System Account	5/3/2010 10:39 AM		85.0
Project Health KPI			System Account	5/3/2010 10:38 AM		44.0
Departmental Health KPI			System Account	5/3/2010 10:39 AM		3.0
Organisational KPI						
PerformancePoint Scorecard (2)			System Account	5/3/2010 10:44 AM		105.0
Project Scorecard			System Account	5/3/2010 10:38 AM		54.0
Departmental KPI						
PerformancePoint Indicator (2)			System Account	5/3/2010 10:39 AM		3.0
Performance Gauge	Gauge to measure the performance of a Department		System Account	5/3/2010 10:39 AM		3.0
Performance Trends			System Account	5/3/2010 10:39 AM		3.0
Content Type : PerformancePoint Report (32)						
DashboardKPI			Carol Philips	12/1/2009 10:30 PM		2.0
ProjectsByPhase			System Account	2/11/2010 3:18 PM		3.0

Figure 46: Creating a New Dashboard

This will open the Dashboard Designer tool.

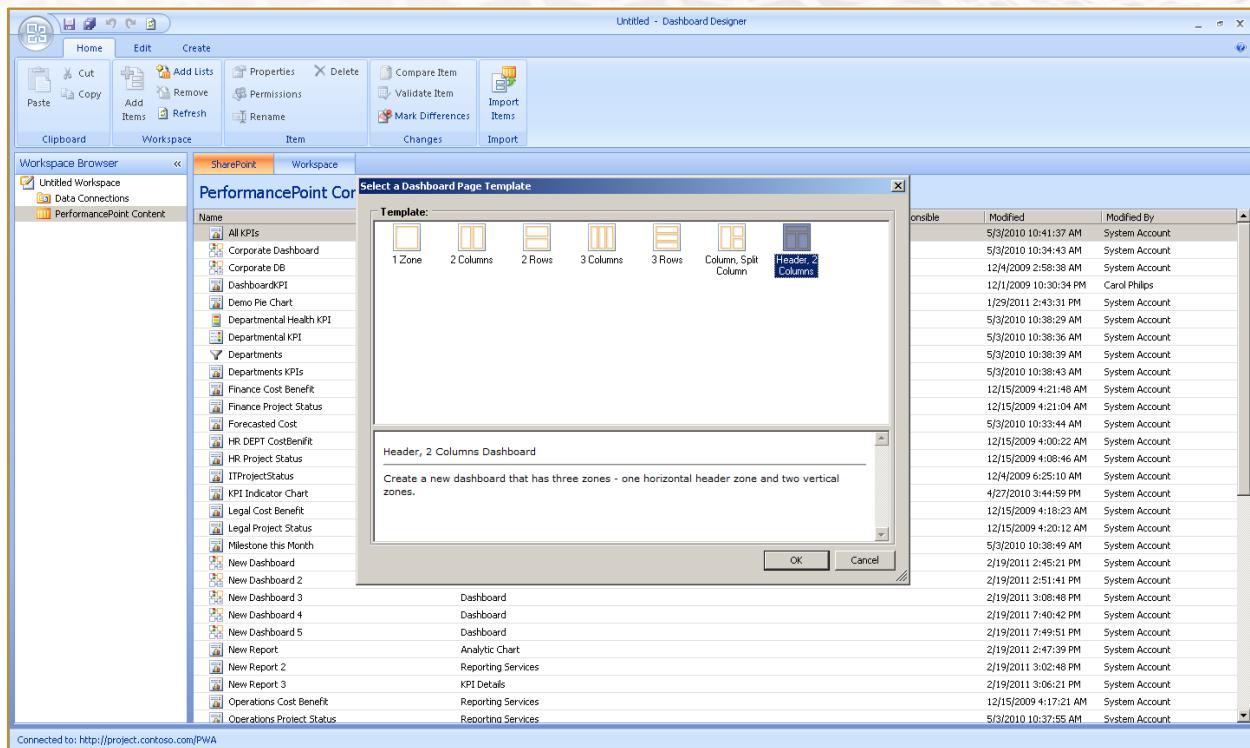


Figure 47: Selecting a Dashboard Format

After you select an appropriate dashboard format, pick and choose the relevant PerformancePoint content to include.



Untitled - Dashboard Designer

Clipboard Workspace Home Edit Create

Cut Copy Add Lists Add Items Refresh Properties Delete Compare Item Validate Item Rename Mark Differences Import Items Import

Workspace Browser <> SharePoint Workspace

PerformancePoint Content

Name	Type	Description	Person Responsible	Modified	Modified By
All KPIs	Reporting Services			5/3/2010 10:41:37 AM	System Account
Corporate Dashboard	Dashboard			5/3/2010 10:34:43 AM	System Account
Corporate DB	Dashboard			12/4/2009 2:58:38 AM	System Account
DashboardPI	Reporting Services			12/1/2009 10:30:34 PM	Carol Philips
Demo Pie Chart	Analytic Chart			1/29/2011 2:43:31 PM	System Account
Departmental Health KPI	KPI			5/3/2010 10:38:29 AM	System Account
Departmental KPI	Scorecard			5/3/2010 10:38:36 AM	System Account
Departments	Member Selection			5/3/2010 10:38:39 AM	System Account
Departments KPIs	Reporting Services			5/3/2010 10:38:43 AM	System Account
Finance Cost Benefit	Reporting Services			12/15/2009 4:21:48 AM	System Account
Finance Project Status	Reporting Services			12/15/2009 4:21:04 AM	System Account
Forecasted Cost	Analytic Chart	This Analytical chart outlines the cost forecast per department		5/3/2010 10:33:44 AM	System Account
HR DEPT CostBenefit	Reporting Services			12/15/2009 4:08:22 AM	System Account
HR Project Status	Reporting Services			12/15/2009 4:08:46 AM	System Account
ITProjectStatus	Reporting Services			12/4/2009 6:25:10 AM	System Account
KPI Indicator Chart	Excel Services			4/27/2010 3:44:59 PM	System Account
Legal Cost Benefit	Reporting Services			12/15/2009 4:18:23 AM	System Account
Legal Project Status	Reporting Services			12/15/2009 4:20:12 AM	System Account
Milestone this Month	Excel Services	Displays Milestones that should be completed this month		5/3/2010 10:38:49 AM	System Account
New Dashboard	Dashboard			2/19/2011 2:45:21 PM	System Account
New Dashboard 2	Dashboard			2/19/2011 2:51:41 PM	System Account
New Dashboard 3	Dashboard			2/19/2011 3:08:48 PM	System Account
New Dashboard 4	Dashboard			2/19/2011 7:40:42 PM	System Account
New Dashboard 5	Dashboard			2/19/2011 7:49:51 PM	System Account
New Dashboard 6	Dashboard			2/19/2011 8:44:29 PM	System Account
New Report	Analytic Chart			2/19/2011 2:47:39 PM	System Account
New Report 2	Reporting Services			2/19/2011 3:02:46 PM	System Account
New Report 3	KPI Details			2/19/2011 3:06:21 PM	System Account
Operations Cost Benefit	Reporting Services			12/15/2009 4:17:21 AM	System Account

Connected to: http://project.contoso.com/PWA

Figure 48: Selecting PerformancePoint Content

Selecting content from this list will populate the Details view on the right of the window. Drag the components onto the dashboard framework to populate the dashboard.

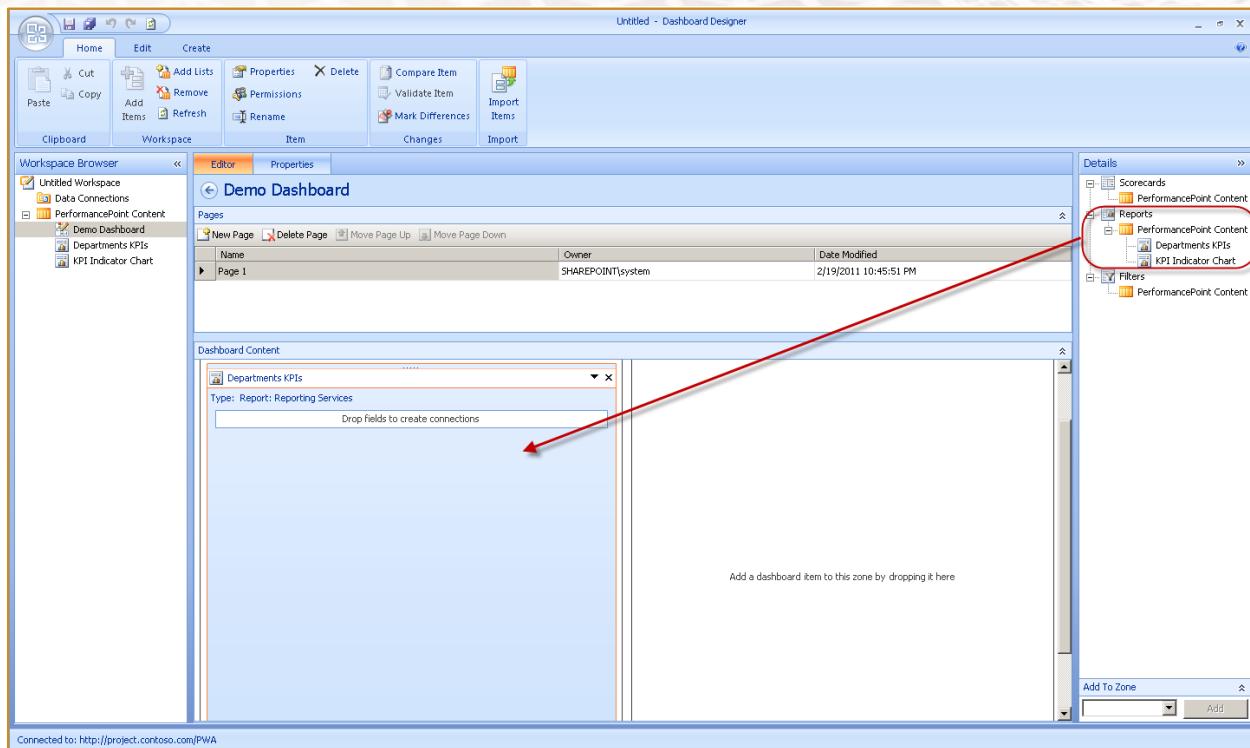


Figure 49: Adding PerformancePoint Content to the Dashboard

Add pages in the interface at the top of the view to create multiple pages of data. Each of those pages may then be populated by dragging items from the Details window on the right.

Once the dashboard has been completed, right-click the newly created dashboard name in the Workspace Browser window to deploy the dashboard to SharePoint Server.

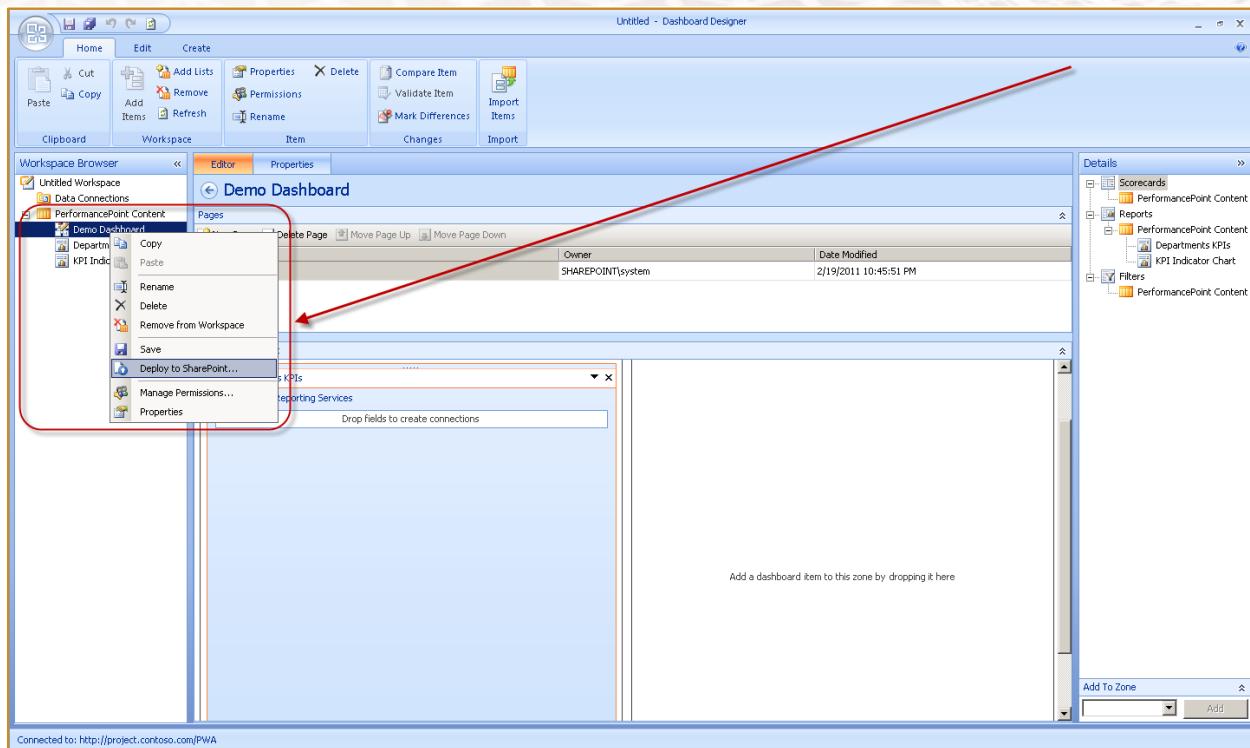


Figure 50: Deploying the Dashboard to SharePoint Server

This will publish the dashboard to the site of choice. In the example below, PerformancePoint Analytic Charts and Excel Services reports have been combined to create a single dashboard page.

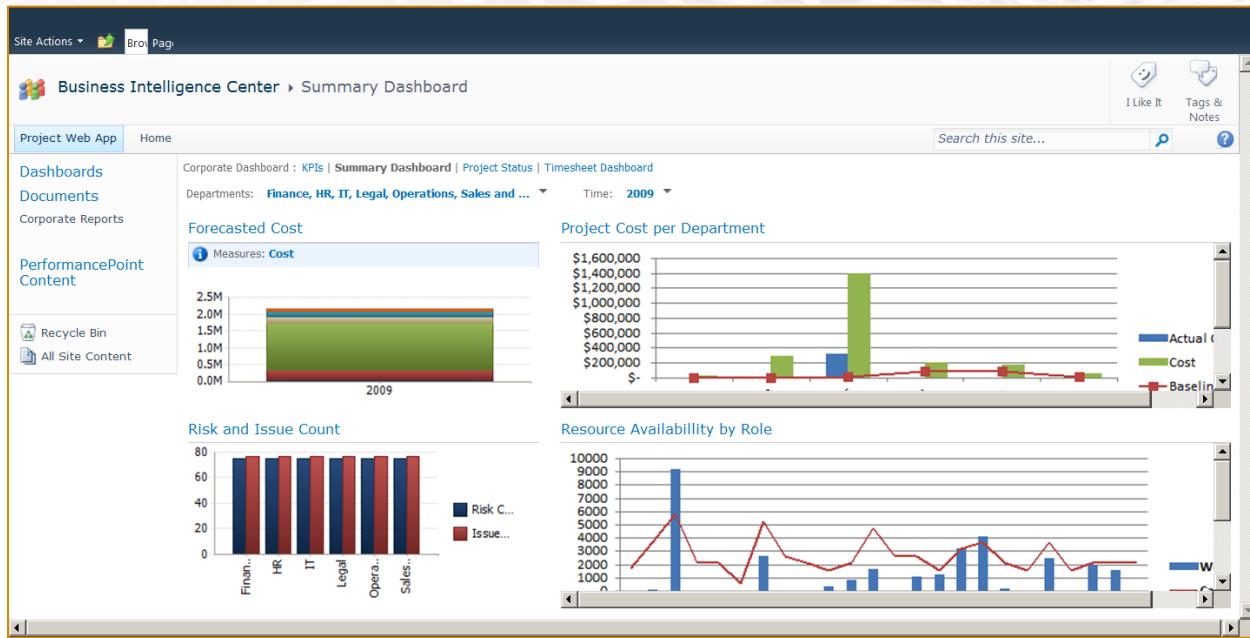


Figure 51: Previewing the Dashboard

For more information on creating dashboards with Project Server data, refer to the following link:
<http://technet.microsoft.com/en-us/library/gg550868.aspx>.

9. The REST API

Document automation has long been a request of organizations that are implementing Project Server. Many users have requested the option to create status report templates in Microsoft Word that dynamically populate with Project Server data. The REST API, a built-in feature of SharePoint Server 2010, allows users to embed dynamic Excel charts into Office applications such as Word and PowerPoint.

To use the REST API, users only need to determine the correct URL for each element within the Excel report. The syntax for developing the URL is well documented online at the following link:

<http://blogs.office.com/b/microsoft-excel/archive/2009/11/09/excel-services-in-sharepoint-2010-rest-api-examples.aspx>

Item	The REST API
Subcomponent of	SharePoint Server
Reporting Level	Projects, Portfolios, Programs
Use When	Users need to dynamically embed Excel-based graphics and data in Microsoft Word documents.
Technical Skills Required	The ability to name charts and ranges in Excel.

Table 9: The REST API

To consume an Excel worksheet posted to a SharePoint library, the Excel sheet must first be properly prepared. In the following worksheet, the data range has been named.

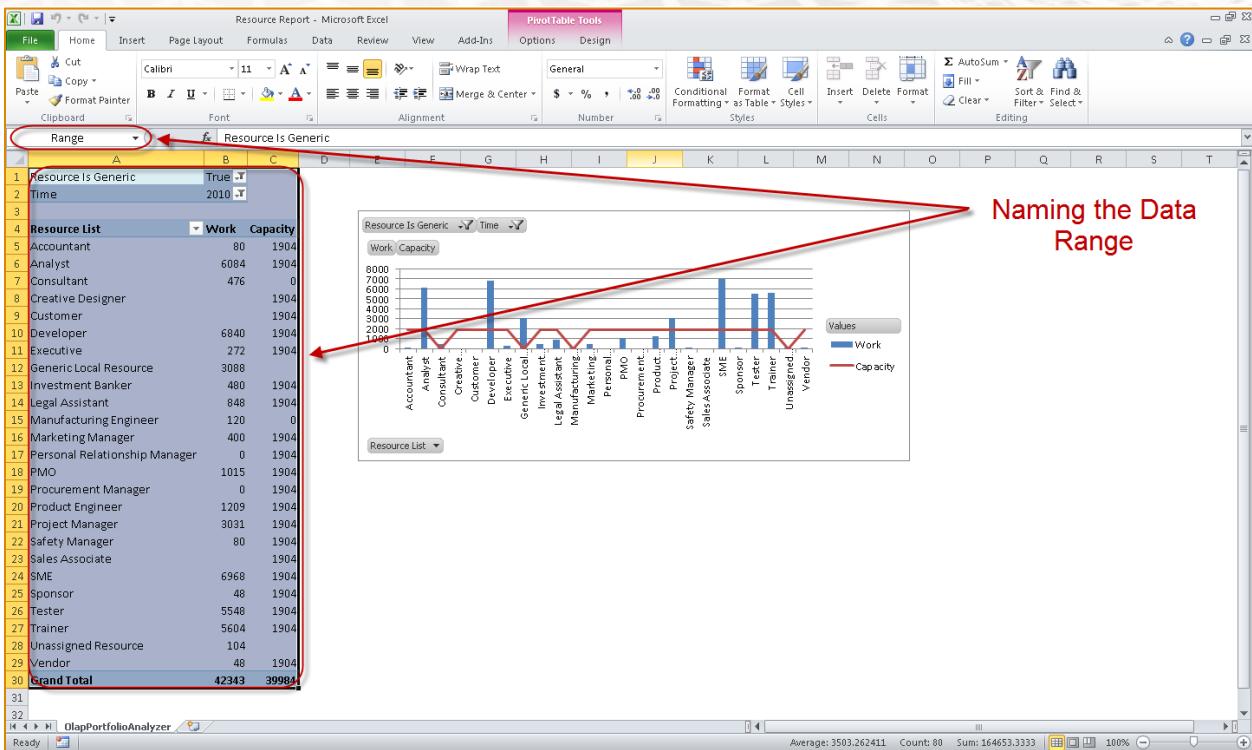


Figure 52: Preparing the Excel Report

Next, the chart needs to be named.

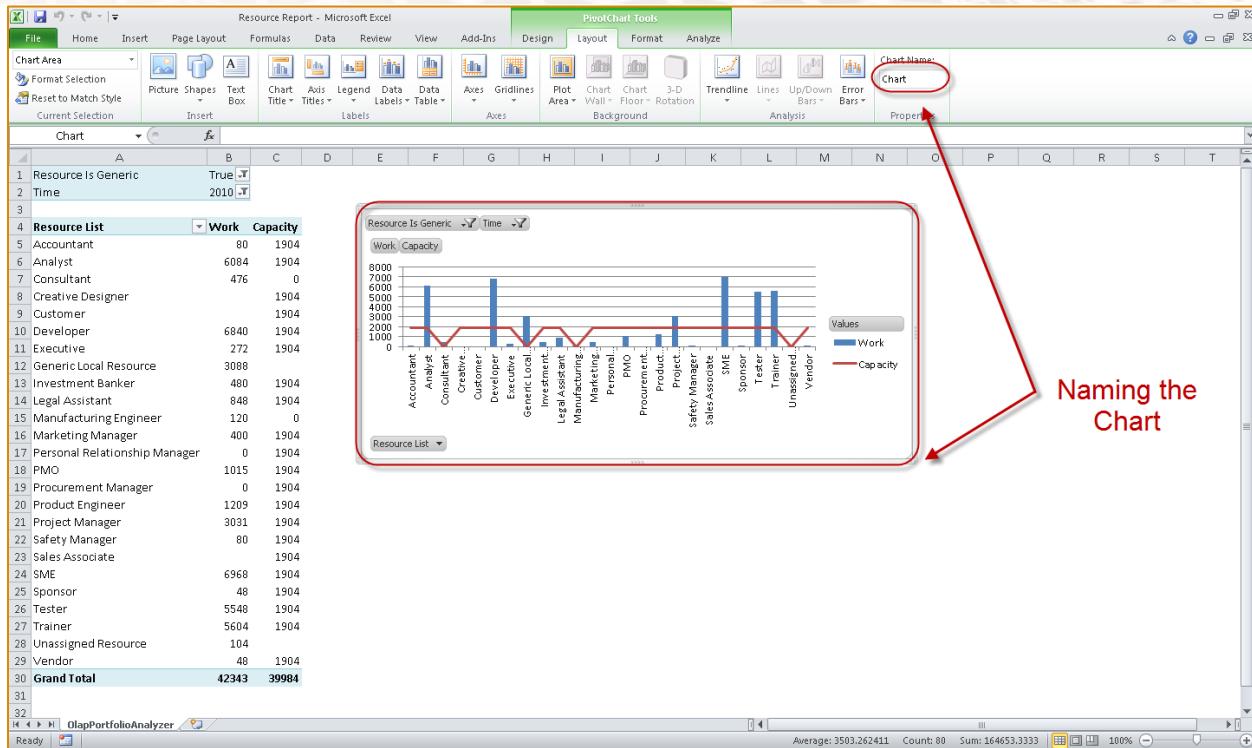


Figure 53: Preparing the Excel Chart

The Excel sheet should then be posted to a SharePoint library. Once it is posted to the library, users may consume the named data by using the REST API. The only requirement to use this data is an understanding of how to develop the correct URL pointing back to the report. For a typical Project Server deployment, where the report is posted to the Business Intelligence Center, the REST URL should appear similar to the examples below (with the italicized sections replaced with specific parameters):

Chart URL:

`http://servername/PWA/_vti_bin/ExcelRest.aspx/ProjectBICenter/Sample%20Reports/English%20(United%20States)/WorkbookName.xlsx/Model/Charts('ChartName')`

Range URL:

`http://servername/PWA/_vti_bin/ExcelRest.aspx/ProjectBICenter/Sample%20Reports/English%20(United%20States)/WorkbookName.xlsx/Model/Ranges('RangeName')`

After you develop the URL, validate it by pasting it into a browser window and confirm that it appears correctly.

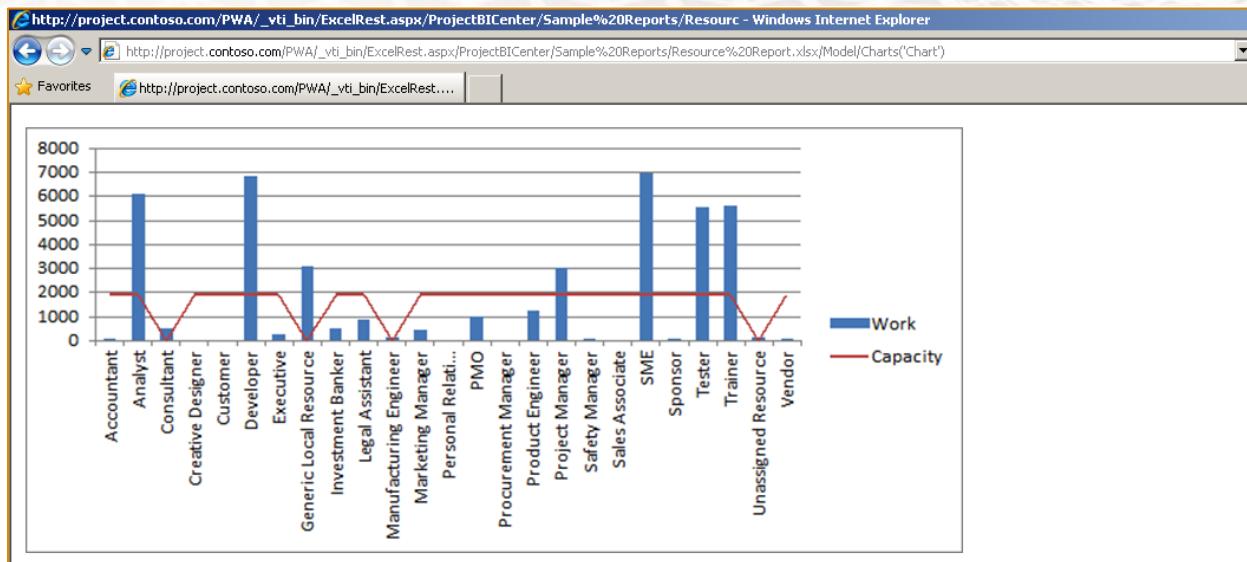


Figure 54: Displaying the Excel Chart in a Browser

That URL may now be used to embed the chart in a number of different tools and applications.

Tips and Tricks: The REST API

Embed a server-based Excel chart into a Word document by using the Microsoft Word Quick Parts option. Open the Word document and select the Quick Parts option on the Insert tab. From there, select the option to add a Field, and select the Links and References field. Finally, select the IncludePicture option and paste the URL into the appropriate field. The chart is now dynamically embedded within the Word document.



Microsoft®
Project Server 2010

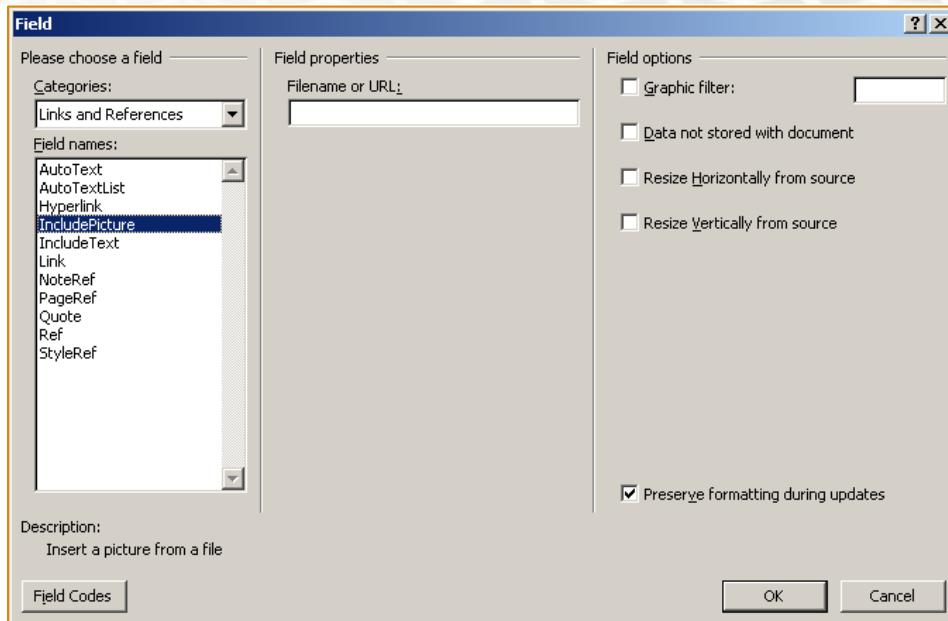


Figure 55: Adding Charts as a Word Quick Part

By using this technique, you can easily prepare weekly status report templates in Word, and then save them to PDF or XPS formats.

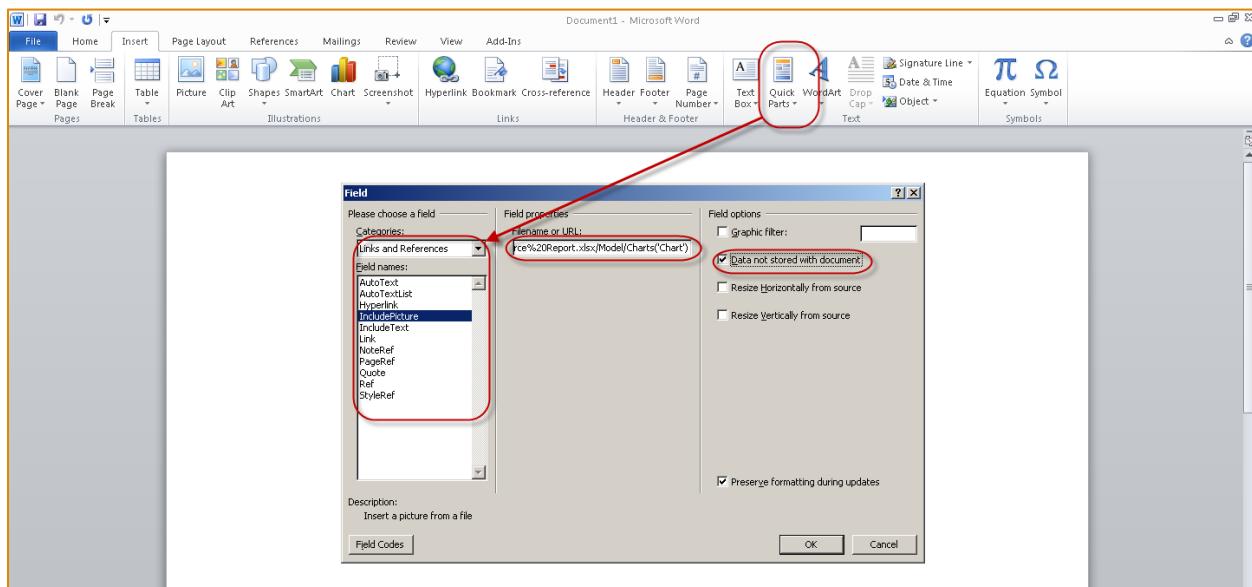


Figure 56: Inserting a Dynamic Chart in a Word Document



The chart will appear in the Word document and will automatically refresh whenever the document is opened.

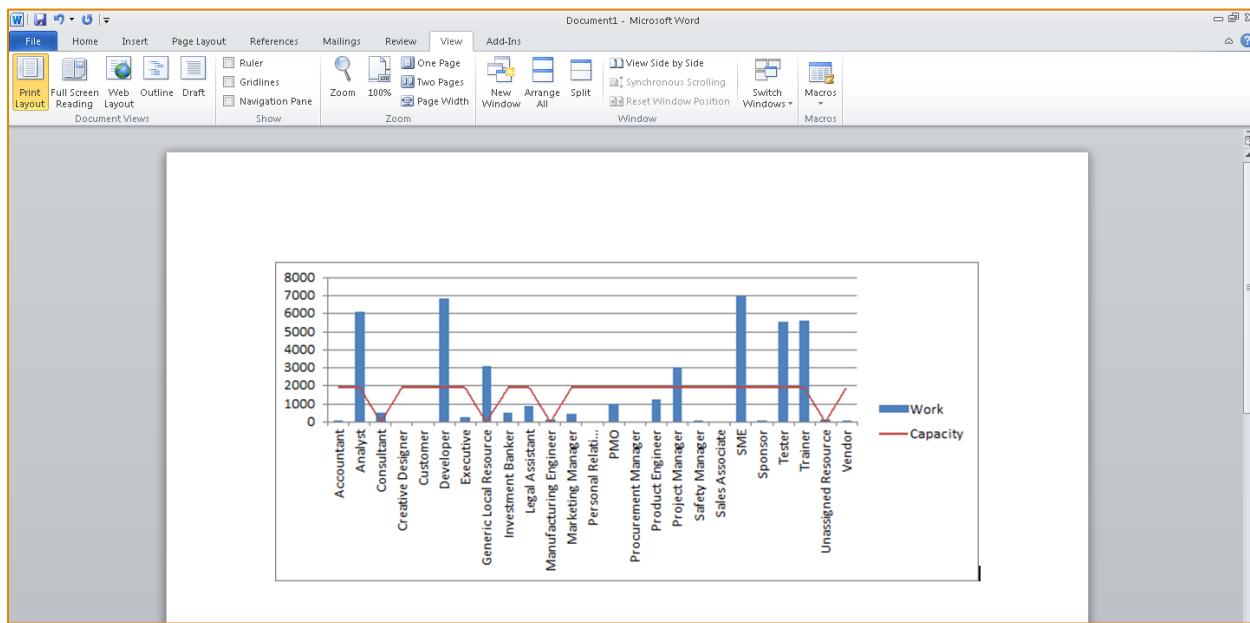


Figure 57: Creating Word Documents with Dynamic Content

To add the data supporting the chart to the same Word document, use a similar technique, but instead of choosing the **IncludePicture** field, choose the **IncludeText** option. The resulting data may be formatted just like any other Microsoft Word table.

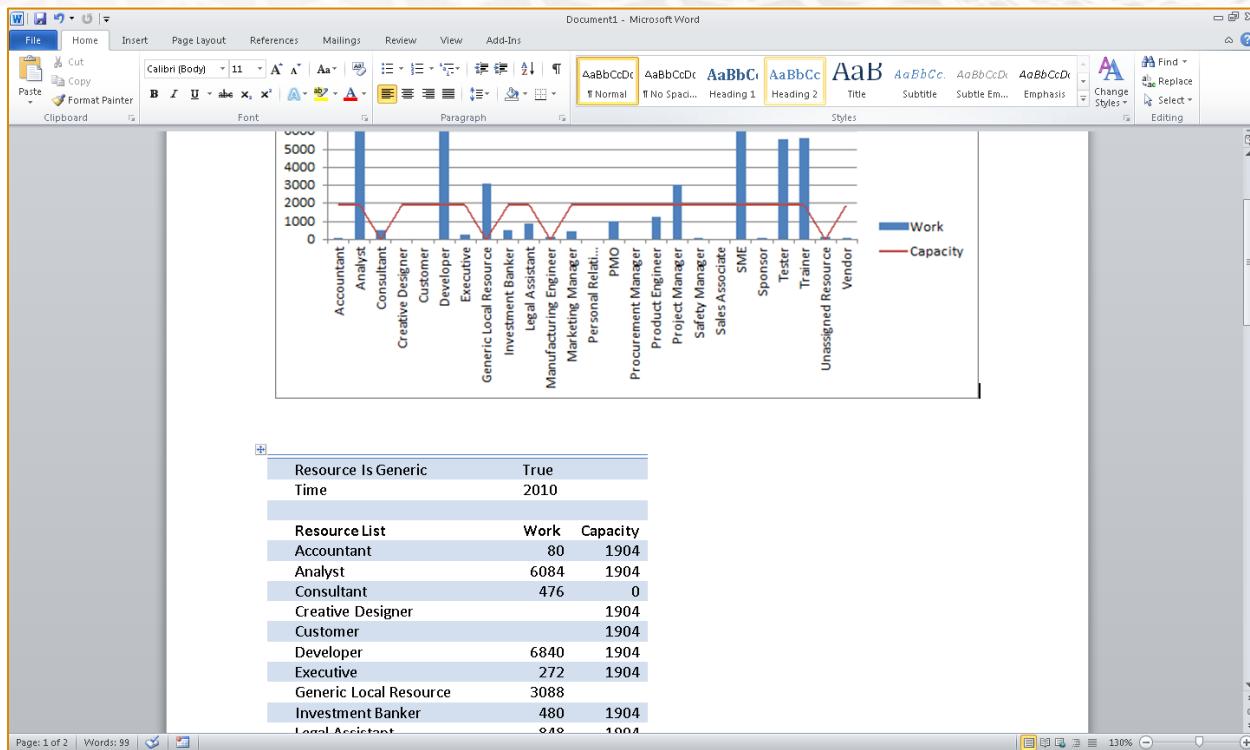


Figure 58: Adding Data to the Word Document

The REST API may also be used to embed Excel charts in SharePoint sites by using the Content Editor Web part. In the following example, the chart URL has been inserted as a picture link within the text of the Web Part.



Site Actions ▾ Browse Page

Demo › Home

Demo

Search this site...

Libraries
Site Pages
Shared Documents

Lists
Calendar
Tasks

Discussions
Team Discussion

Recycle Bin
All Site Content

Welcome to your site!

Add a new image, change this welcome text or add new lists to this page by clicking the edit button above. You can click on Shared Documents to add files or on the calendar to create new team events. Use the links in the getting started section to share your site and customize its look.

A bar chart comparing work assigned to resources against their capacity. The Y-axis represents units from 0 to 8000. The X-axis lists resource types: Accountant, Analyst, Consultant, Creative Designer, Customer, Developer, Executive, Generic Local Resource, Investment Banker, Legal Assistant, Manufacturing Engineer, Marketing Manager, Personal Retailer, PMO, Procurement Manager, Product Engineer, Project Manager, Safety Manager, Sales Associate, SME, Sponsor, Tester, Trainer, Unassigned Resource, and Vendor. Blue bars represent work, and a red line represents capacity. The chart shows significant variance across different roles, with some like Developers having high work loads (up to 6000) and others like Sales Associates having very low work loads (around 1000).

Work
Capacity

Getting Started
 Share this site
 Change site theme

Figure 59: Adding Data to a Project Workspace

The REST API may also be used to embed Excel Services data in PowerPoint or other Microsoft Office applications.



10. External Content Types

External content types provide configurable methods of surfacing and manipulating Project Server data within the familiar format of SharePoint lists. Use external content types within organizations accustomed to consuming data in the form of SharePoint lists, interested in adding personalized features to Project Center-like views, or incorporating Project Server data into other SharePoint content.

External content types may be created with SharePoint Designer, a free-client based tool. SharePoint Designer may not be used directly on the PWA site, but may be used against other non-PWA sites or against sub-sites underneath the main PWA site.

For more information on creating external content types, refer to this blog post:

<http://blogs.msdn.com/b/bcs/archive/2010/01/28/bcs-team-channel-creating-an-external-content-type-in-sharepoint-designer-2010.aspx>.

Item	External Content Types
Subcomponent of	SharePoint Server
Reporting Level	Project, Portfolios, Programs
Use When	Organizations would like to pull Project Server data into SharePoint lists for consumption and view creation.
Technical Skills Required	Ability to create service applications within SharePoint Server, including setting security appropriately.

Table 10: External Content Types

Tips and Tricks: External Content Types

External lists are a new list type implemented in SharePoint Server 2010 to surface external data that has been captured in external content types. After creating the content type, add an external list to a page.



External > Project Data > ProjectData Read List

	ProjectName	ProjectStartDate	ProjectFinishDate	ProjectType	ProjectCost	ProjectWork	Project Departments
<input type="checkbox"/> Project Departments : Finance (5)							
<input type="checkbox"/> Project Departments : HR (9)							
<input type="checkbox"/> Project Departments : IT (48)							
<input type="checkbox"/> Auditing Services Training	7/5/2010 1:00 AM	9/13/2010 8:00 AM	0	60580.000000	624.000000	HR	
<input type="checkbox"/> Health Assessment Reporting Tool	8/31/2009 1:00 AM	12/7/2011 1:13 AM	0	742616.500000	10583.999750	HR	
<input type="checkbox"/> Human Capital Management	9/23/2010 1:00 AM	9/23/2010 1:00 AM	0	0.000000	0.000000	HR	
<input type="checkbox"/> Knowledge Management outsourcing	1/13/2011 12:00 AM	6/10/2011 10:00 AM	0	99940.000000	1532.000000	HR	
<input type="checkbox"/> Operations Management	7/15/2010 1:00 AM	9/23/2010 8:00 AM	0	60740.000000	632.000000	HR	
<input type="checkbox"/> Payroll System Upgrade	3/1/2010 12:00 AM	6/11/2010 10:00 AM	0	52040.000000	800.000000	HR	
<input type="checkbox"/> Project Management Professional Training	8/17/2011 1:00 AM	1/12/2012 9:00 AM	0	99940.000000	1532.000000	HR	
<input type="checkbox"/> Skills Inventory Management	4/21/2011 1:00 AM	4/21/2011 1:00 AM	0	0.000000	0.000000	HR	
<input type="checkbox"/> Warehouse Facility Employee Database Updates	10/6/2009 1:00 AM	3/4/2010 9:00 AM	0	100700.000000	1540.000000	HR	

Figure 60: Displaying Project Server Data in External Lists

The list displays data much like a Project Center view but provides a number of advantages. External lists may then be searched like regular SharePoint Server content or specific columns may be used as a reference in other lists.

More importantly, users may create grouping and totals within a personalized view of all projects. This feature becomes relevant when an organization requires a dynamic view totaling how many projects are active vs. inactive, or how many projects are within each branch of a portfolio hierarchy. The user may then save the view for personal consumption without other users seeing it.

The other feature that external lists offer over the Project Center view is that external list views may be created by using dynamic filters. For instance, a common user request in Project Server is to display all projects where the Finish or the Status Date is less than the current date. Due to constraints with how project fields are calculated, the Project Center view can support such views, but not dynamically. Each project must be opened, recalculated, and published to update the information used in the filter. External lists do not share the same technical constraint.

In the following example, the external list has been modified to only display projects scheduled to start after the current date.



A screenshot of the Microsoft Project Server 2010 interface. The top navigation bar includes "Site Actions" and "System Account". A "Filter" dialog box is open, with the heading "Filtering the Project List by Today's Date". The dialog box contains instructions: "Show all of the items in this view, or display a subset of the items by using filters. To filter on a column based on the current date or the current user of the site, type [Today] or [Me] as the column value. Learn about filtering items." There are two radio button options: one for "Show all items in this view" and another for "Show items only when the following is true:". Under the second option, there is a section for "Show the items when column" set to "Project Departments", with a dropdown menu showing "is not equal to" and a text input field. Below this is a section for "When column" set to "ProjectStartDate", with a dropdown menu showing "is greater than" and a text input field containing "[Today]". A red arrow points from the text "Filtering the Project List by Today's Date" to the "[Today]" input field.

Figure 61: Dynamically Filtering External List Views

The current date will always be recalculated as of the moment that the user accesses the list. This provides an updated, dynamic view into large numbers of projects.

11. Conclusion

Although a number of reporting examples are discussed above, this document does not purport to be an exhaustive survey of all of the reporting options available to users of Microsoft Project Server. In addition to the examples already presented, an extensive user base is constantly combining existing tools to develop new and innovative solutions. Additionally, an extensive community of developers and third-party solution vendors has already developed a number of solutions to extend the reporting capabilities of Project Server.

If, like any project manager, we look into a crystal ball to extrapolate current trends into the near future, the following business intelligence innovation paths have clearly been identified as already ongoing:

- Increased support for the individual and individualized reporting. This will include the increased leveraging of familiar end user reporting tools to pull data from Project Server as well as new mechanisms to pull data from throughout an EPM tool deployment and aggregate it in accessible formats.
- A renewed focus on capturing the human narrative of a project, and combining that subjective narrative with the objective metrics that EPM tools have been focused on in the past.
- Further development of standard models for enterprise project reporting. These reports have always been the cornerstone of EPM tool deployments, and will continue doing so in the future.

As the body of knowledge around reporting against Project Server 2010 grows and matures, please feel free to visit the Microsoft Project reporting site to review the latest material:

<http://technet.microsoft.com/en-us/projectserver/ff513702>.



12. About the Author

Andrew Lavinsky is a manager with the UMT Consulting Group. Based in Houston, TX, and primarily serving clients in the US South Central District, he focuses on implementing Microsoft technologies to enable organizational performance improvement.

As a professional trainer and consultant, Andrew has a diverse background providing services in such industries as oil and gas, health care, finance, and IT. Andrew has lectured extensively on project and IT operations management topics within the US and abroad.

A graduate of the George Washington University, Andrew has been an active volunteer with PMI, ITSMF and a number of other professional and educational organizations. In the mid-90s, Andrew was involved in the creation of one of the first official nongovernmental organizations in China. In the late-90s, he served as a Peace Corps Volunteer in rural Mongolia; moving on to manage project delivery for Fortune 500 companies in the Chinese market.

For his contributions to the Microsoft Project community, Andrew was awarded the Microsoft MVP designation in July 2010.

The author welcomes any and all feedback via LinkedIn (<http://www.linkedin.com/in/azlav>) or Twitter ([@alavinsky](https://twitter.com/alavinsky)).

13. References

Microsoft Project 2010 Resources:

Product information

- Project 2010 product site: <http://www.microsoft.com/project>
- Project Team Blog: <http://blogs.msdn.com/project>

End-User Product Help

- Project 2010 Help <http://office2010.microsoft.com/project-help>
- Project 2010 Help <http://office2010.microsoft.com/project-server-help>
- Demand Management for Project 2010 - <http://go.microsoft.com/?linkid=9739874>
- Business Intelligence for Project 2010 - <http://go.microsoft.com/?linkid=9726143>
- Upgrade and Migration to Project 2010 - <http://go.microsoft.com/?linkid=9676814>

Interactive content - Videos & Sessions & Webcasts

- <http://www.microsoft.com/showcase/en/US/channels/microsoftproject>
- <http://www.microsoft.com/events/series/epm.aspx>

Project Professional 2010 and Project 2010 Demo Image:

- Download: <http://go.microsoft.com/?linkid=9713956>
- Hosted Virtual Lab: <http://go.microsoft.com/?linkid=9713654>

IT Professional related - TechNet

- Tech Center: <http://technet.microsoft.com/ProjectServer>
- Admin Blog: <http://blogs.technet.com/projectadministration>

Developer related - MSDN

- Developer center: <http://msdn.microsoft.com/Project>
- Programmability blog: http://blogs.msdn.com/project_programmability

Got Questions? Search or ask in the official Microsoft Forums!

- <http://social.msdn.microsoft.com/Forums/en-US/category/projectserver2010,projectprofessional2010/>

SharePoint 2010 Products

- <http://sharepoint.microsoft.com>

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