System Integration: A Plan of Implementation

by

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Abstract

Engineering technologists are presented with an example of a prototyping system integration proposal consisting of a four-phase plan detailing system development and implementation. The purpose of this four-phase integration template is to provide technologists with an example of how offsite corporate design engineers and plant-level prototype technicians can build household spray bottle prototypes through the use of an electronic secure system. Phase one is directed at upper and frontline management for approval (including plan review and modification by a certified system integrator) and support. Phase two establishes the project team in tandem with purchasing, and setting up, hardware and software. Phase three is the rollout portion where all corporate and plant-level individuals are trained on the system. Phase four entails final validation of the preconceived system's capabilities. This optimized system from development through implementation will cost the company $32,852 with an associate(s) commitment of 498 hours (included in total cost).

Introduction

The following documentation provides novice engineering technologists with an example of how system integration can be utilized to improve product prototyping. The proposal is basic and easy to follow. The equipment identified, and their related costs, will change as new technologies are developed and distributed in the marketplace. This paper was not written to "sell" readers on listed hardware and software, but to provide a template of system integration considerations. In the case of this paper, the dialogue is written as a proposal to upper management and can help technologists in creation of proposals for future employers.

Discussion

An integrated prototyping computer-based drawing / bill of material / routing system is being developed for transmitting information within a midsized household spray bottle manufacturing organization. The actual name of the company is not listed due to confidentiality concerns. The integrated system will make it possible for off-site corporate engineering to communicate

prototype design configurations to the manufacturing plant, allow for ease-in-design, communication between the two entities, and streamline the prototyping process through the use of computers and systems software. The system will be configured with off-the-shelf computer equipment and software in a wire, and wireless, internet setup.

The current prototyping communication system requires the use of fax lines and numerous phone calls. This system is not effective, nor efficient, since faxed documents are sometimes misplaced or lost at the plant. Furthermore, phone calls to technicians are not always placed or received to inform them that documents have been transmitted. This can sometimes require multiple fax transmissions of the same document. Corporate management has identified the current "fax and phone" procedure as a weakness that should be immediately addressed. Cost comparisons between the current and proposed systems are not required in this proposal.

The new integrated system will utilize the "Brava! - Enterprise" program for technical content corporate-to-plant and plant-to-corporate electronic communication. Brava! will access database information (includes Word, Excel, and CAD files) through a Java-based system through a TCP/IP-configured computer port. Routers and work instructions will be created in Microsoft's Word, word processing program. Prints will be created in the AutoCAD 2000 "dwg" format (to allow for legacy computers to be used), but will be saved as "dxf" type files for intra-organizational file viewing / marking-up over Microsoft Internet Explorer Version 6.0. By having the capability to "mark-up" AutoCAD dxf files (client / web browser markup capability), Brava! makes it possible for Prototype Technicians to communicate design changes, routing changes, and bill-of-material issues back to the Design Engineers in real-time. Microsoft's PowerPoint program will be used to communicate design particulars to Prototype Technicians at the plant level.

The user-interfaced hardware utilized will be desktop and wireless personal computers (PC) for Design Engineers and Prototype Technicians. The wireless PC's will be used by Prototype Technicians when they are performing an operation out in the plant where a desktop computer is not available.

The following diagrams illustrate system setup (see Figure 1) and information processing steps (see Figure 2):

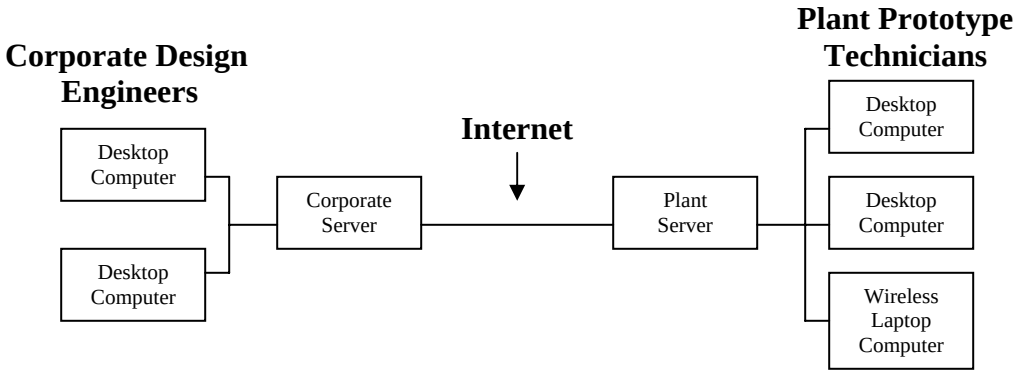

Figure 1. Equipment Setup for the Systems Integration Plan

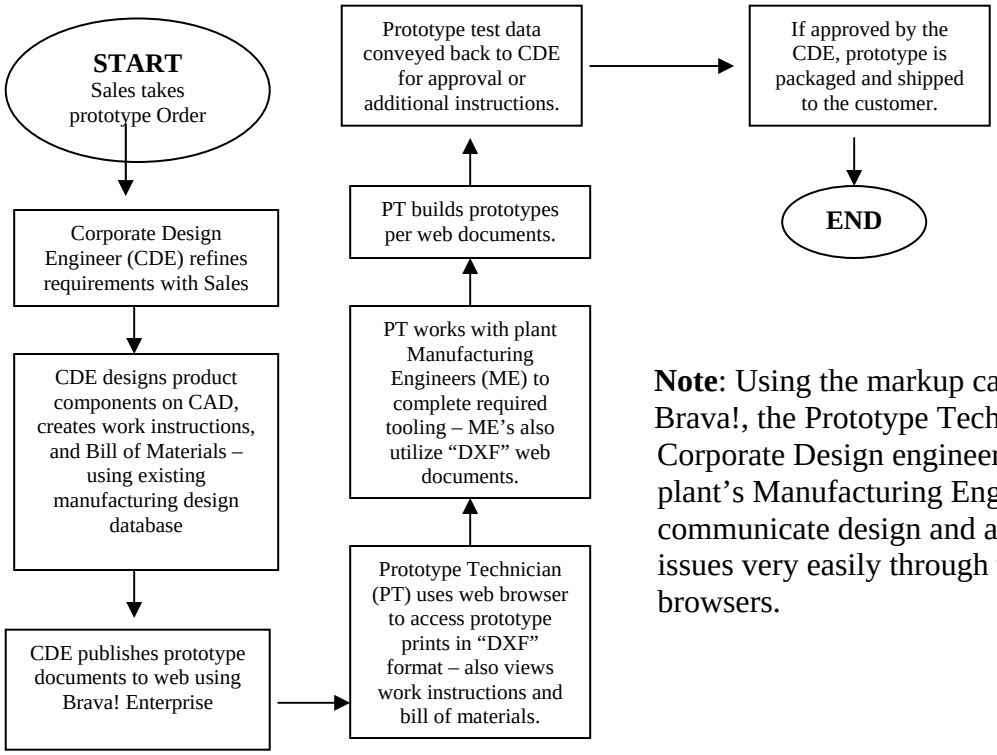

Figure 2. Information Processing for the Systems Integration Plan

Through the use of Brava! there will be no need for a Remote Data Subset Synchronization (RDSS) coupling prototype technician software activities back to the corporate engineering database. As Myerson (2002) states RDSS is only required for client systems needing data synchronization with that of a master server database. Fortunately in the Brava! system arrangement proposed, electronic files accessed by Brava! will remain unchanged and therefore file integrity will be maintained.

The company will also benefit from a knowledge storehouse by implementing the proposed prototyping system with the corporate engineering environment. This accomplishment will come about in the form of highly detailed prints and documents that will be deposited into a data warehouse for all members to use in the company as needed – minimizing duplication and relearning of past mistakes and successes. Through proper Knowledge Management (KM) of the company's intellectual capital, gains in the aggregate storehouse of company knowledge will be available for all to use. For instance, Purba (2001) states "the major entities of a foundation data store become dimensions in a data warehouse – literally historical snapshots of the foundation data store." By using Brava! as the transfer inter-organizational medium, these "snapshots" can standardize product design, processes, and documentation.

Culture and language differences between corporate engineering and plant level prototype technicians will not be a factor for this proposal since all live within the United States and communicate through the English language coupled with American values. Modifications to

the systems may be necessary for future cross-country implementations. Especially in meeting regional needs in culture and language.

The security of the new integrated system should be ample to protect the electronic documents and transmissions for the client company from unwanted eyes. Through the use of the 128-bit Wireless Equivalent Protocol (WEP) security software built into wireless adapters (USB mounted transceivers), the computers should be able to communicate effectively, efficiently, and in "safe-mode" from a security standpoint.

Integration Details

Through the integration of the prototyping process into a semi-automated system, the handling of prototype work orders via electronic "paper" work should make it easier for corporate design engineers and plant level prototype technicians to communicate. The goal of the system will be to communicate technical bi-directional information electronically without the use of paper documentation. This goal should be obtainable by designing a user-friendly computer-based integrated prototyping system and properly instructing corporate and plant work associates in its use.

This new integrated system is also needed to further insure that personnel such as Corporate Design Engineers and Prototype Technicians directly support manufacturing. The proposed Brava! Enterprise program will allow for a deeper integration of information technologies from production-to-engineering and engineering-to-production. Thus, further enhancing the likelihood of prototyping success (i.e.: building prototypes that are manufacturable on the production floor beyond the typical "one-time" prototyping process utilized by most companies). Figure 3 illustrates the steps involved in integrating the system:

Prototyping System Integration Timeline

	Step	Task / Discussion	Week:	Year																	
				Month 1				Month 2				Month 3				Month 4				Month 5		
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Phase 1	1	Clearly define the goal of the system (this proposal)																				
	2	Obtain Upper Management approval of initial proposal & financial arrangements																				
	3	Share issues of inherent risk in implementation with Upper Management																				
	4	Certified System Integrator to critique existing proposal & submit a new one																				
	5	If necessary, resubmit new proposal to Upper Management for approval																				
	6	Seek Frontline Management approval of the proposal (separate meeting)																				
	7	Determine system user capability, share with Upper and Frontline Management																				
	8	Confirm financial arrangements with Upper Management																				
	9	Repeat sharing of inherent risk issues with Upper Management																				
	10	Milestone: Project Approved																				
Phase 2	11	Information Technology (IT) Technician orders and receives Hardware																				
	12	IT Technician orders and receives Software																				
	13	IT Technician sets up computers, network, and software at company locations																				
	14	Pick project team members (1 IT Tech. [plan proposer], 1 C. Engr., 1 P. Tech.)																				
	15	Train project team in use of software and hardware																				
	16	Project team tests / modifies system to insure that all requirements are met																				
	17	Implement contingency plan if issues arise (buffer for unknown problems)																				
	18	Validate integrity of the system after each system change or modification																				
	19	Milestone: System Setup and Troubleshooting is Complete																				
Phase 3	20	Train corp. engineering & plant prototype technicians in use of the system																				
	21	Facilitate users by being available for questions & issues in usage of the system																				
	22	Validate integrity of the system																				
	23	Company target completion date for integrated prototyping system																				
	24	Milestone: Prototyping System Integration Plan is Complete																				
Phase 4	25	Follow-up with the company to make sure the system is working as planned																				
	26	Correct issues as needed																				
	27	Milestone: Follow-up of Prototyping System Integration Plan is Complete																				

Note: Weeks, Months, and Year to be determined based upon company receptiveness of proposal.

Figure 3. Prototyping System Integration Timeline

To further elaborate on the integration details, the following discussion will highlight key tasks within the prototyping system integration timeline - specifically tasks that must be accomplished in order to obtain successful system integration. It must be stated at this point that weekly updates of the project will be given to upper management. Good communication between the company and the project team is the goal.

The 19-week prototyping system integration plan is divided up into 4 phases of implementation (timeline may vary depending on needs of each company involved). Phase 1 involves defining and refining the proposal in tandem with obtaining company approval of the plan. Phase 2 details the setting up of the system for company usage. Phase 3 involves the rolling out of the system to company individuals who will be using the system. And lastly, phase 4 is when the proposing party (the Information Technology Technician – IT Tech) communicates with system users to insure that the system is working as planned. The following dialogue provides greater insight into each project step.

Phase 1 - Definition and approval:

Step 1 Establish guidelines and requirements for the system integration project in clear and concise terms.

Steps 2 & 3	Obtain upper management approval of the initial proposal, and agreement on the financial aspects, and inherent risks of the project. It is very important at this stage that upper management understands the positives and possible negatives of the system in order to create buy-in early on in the life of the project.
Step 4	The information system proposed is analyzed by a system integrator who is certified by the Control and Information System Association (CSIA). Through CSIA certification, the system integrator is by definition (paraphrased) "an independent value-added engineer, or technologist, that focuses on industrial control and information systems, manufacturing execution systems, and plant automation that require application knowledge and technical expertise (CSIA, 2007)."
Step 5	This step is allows for system improvements identified by the system integrator.
Steps 6 & 7	Planner meets with frontline management, system users, and upper and frontline management to share apparent capabilities of the company's users.
Steps 8 & 9	These steps are not just repeat of aforementioned steps, but an affirmation of the financial arrangements and inherent risks with upper management after the certified system integrator is finished with their modifications of the plan.
Step 10	At this point, if upper management is positive on the plan, a milestone has been reached in obtaining project approval.

Phase 2 – System Setup:

Steps 11 & 12	IT Tech orders and receives the hardware and software.
Step 13	Setup of computers, networks, and the software at participating company locations.
Step 14	IT Tech picks a key corporate engineer and a key plant level prototyping technician, for these three individuals will form the project implementation team.
Step 15	IT Tech trains corporate engineer and prototyping technician.
Step 16	Project team tests and modify the system to insure that all requirements are being met when using the prototyping system.
Step 17	This is a buffer week for the project team just in case something goes wrong in the development of the system.

Note: if something does go wrong at this stage, it is the responsibility of the project team to notify upper management of the problem.

Step 18 Additional validation of the prototyping system to insure specification compliance.

Step 19 A milestone is reached since the system is now set up and all troubleshooting is complete.

Phase 3 – Training & System Validation:

Step 20 All corporate engineers and plant level prototype technicians are trained in the use of the system. This training will be conducted in such a way by the project team, that each user will feel a sense of ownership in the prototyping system.

Step 21 Other affected parties in the company are encouraged to ask questions and participate during this step.

Step 22 Another validation of the system – this time by both the users and the project team.

Step 23 The pre-established target completion date for the project – in this case, week 14.

Step 24 The prototyping system integration is complete.

Phase 4 – System Follow-up:

Step 25 Established in order to make sure that the system is working as planned – after 2-3 weeks of user familiarity.

Step 26 Problems are eliminated or at least ameliorated.

Step 27 Completion of the prototyping system integration follow-up measures.

For additional understanding in the selection of hardware, software, labor, and training allowances, See Figures 4 & 5 for cost factor section criteria. The figures shown clearly explain the selection of each topic for the reader's convenience.

Hardware and Software Requirements

The basic system will consist of the following at each location (Also see Figure 1 & 3):

Corporate Engineering:

1. Two desktop computers (with mounted wireless adapters)
2. Wireless router
3. DSL Modem (Note: the company already has a DSL Internet line in place)
4. Server
5. Laser Printer

Plant Prototyping:

1. Two desktop computers (with mounted wireless adapter)
2. One laptop computer (with internal wireless computer card)
3. Wireless router
4. DSL Modem
5. Server
6. Laser Printer

The summary of hardware to be used between both locations will consist of:

1. *Desktop computers.
2. *Laptop computers.
3. 2.4 GHz 802.11 a/g std. Wireless Local-Area-Network (WLAN) for computer-to-server communication.
4. Wireless adapters and network cards (Laptop & Router).
5. DSL Broadband Internet connection.
6. *Servers, routers, and modems - (this includes components both at corporate headquarters and at the manufacturing plant).
7. Laser Printers.
8. LAN cables, printer cables, laser print cartridges, and miscellaneous assorted hardware.

*Minimum Specifications: Computers and servers to be 1.8 GHz, 1 GB RAM, 17" Monitor (Laptop: 12-inch Active Matrix), 80 GB Hard drive, 8x CD-ROM, Microsoft Mouse.

Software will include:

1. Informative Graphics' Brava! Enterprise.
2. Microsoft Windows Vista Business Operating System.
3. Microsoft Windows SQL Server 2005 Workgroup Edition.
4. Microsoft 2007 Office Small Business Edition (Includes Word, Excel, PowerPoint).
5. Norton SystemWorks 2007 Premier V10.0 SOP 5-User Package from Symantec.
6. 128-bit Wireless Equivalent Protocol (WEP) security software built into Wireless Adapters.

Cost Factor Estimates

Figures 4 & 5 identifies the financial impact of setting up a new integration prototyping system in terms of hardware, software, labor and training costs – explanation to follow:

	Item	Qty Each	Cost / Each	Qty Hrs	Cost / Hr.	Total Cost
Hardware	**Desktop Computer**: Dell Vostro 400 Mini Tower, 2.66 Ghz Dual Core, 2 GB DDR@ SDRAM, 16X DVD+/-RW Drive, 250 GB Serial ATA 7200 RPM HD, 20" Widescreen Digital Flat Panel Monitor, Win Vista Business OS, Integrated 10/100 Ethernet Card (ref: Appendix A)	4	$1,437	-	-	$5,748
	Wireless 2.4 Ghz Adapter / Router: Linksys Wireless-G Broadband Router with SRX200, 124 bit WEP (www.cdw.com)	5	$90	-	-	$450
	Laptop Computer: Dell Latitude D520 Dual Core, 2.00 Ghz, 2 GB DDR2-667 RAM, 8X DVD+/-RW Drive, 80 GB HD, 15-inch SXGA+ LCD Display, Win Vista Business OS, Std. NIC and 802.11a/g Wireless Link Card (Ref: Appendix B)	1	$1,351	-	-	$1,351
	Modem: Zoom 5654 X5 Ethernet/USB ADSL 2/2+ Modem with 10Base-T/100BASE-TX connection (www.cdw.com)	2	$400	-	-	$800
	Server: HP Smart Buy ProLiant ML110, 2.13 GHz Intel Dual-Core Xeon Processor, 1 GB RAM, 160 GB Hard Drive, 10/100/1000 Ethernet server appliance (www.cdw.com)	2	$749	-	-	$1,498
	Laser Printer: HP Color LaserJet CP4005dn (http://www.hp.com)	2	$1,399	-	-	$2,798
	Laser Cartridges (first setup): HP CP4005dn Series Black - Color cartridge can purchased at a later date	2	$162	-	-	$324
	Cables: 6-foot HP Hi-Speed USB Cables	5	$20	-	-	$100
	DSL Broadband connection not covered - already in place	0	$0	-	-	$0
	Incidentals not covered - Connectors, splice units, wall jacks, etc…	1	$500	-	-	$500
					Hardware - Total Cost:	**$13,569**

Figure 4. Hardware Costs

	Item	Qty Each	Cost / Each	Qty Hrs	Cost / Hr.	Total Cost
Labor / Training	**Phase 1** - Information Technology Technician	-	-	48	21	$1,008
	Phase 1 - Certified Systems Integrator	-	-	16	50	$800
	Phase 1 - General investment of Upper & Frontline Management in proposal review	-	-	8	120	$960
	Phase 2 - Information Technology Technician	-	-	70	21	$1,470
	Phase 2 - Corporate Engineer	-	-	48	25	$1,200
	Phase 2 - Prototyping Technician	-	-	48	15	$720
	Phase 3 - Information Technology Technician	-	-	60	21	$1,260
	Phase 3 - Corporate Engineer	-	-	24	25	$600
	Phase 3 - Prototyping Technician	-	-	24	15	$360
	Phase 3 - Investment to train other corporate engineers	-	-	24	61	$1,464
	Phase 3 - Investment to train other prototype technicians	-	-	24	61	$1,464
	Phase 4 - Information Technology Technician	-	-	24	21	$504
	Phase 4 - Corporate Engineer	-	-	24	25	$600
	Phase 4 - Prototyping Technician	-	-	24	15	$360
	Phase 4 - Investment to handle follow up issues by other corporate engineers	-	-	16	61	$976
	Phase 4 - Investment to handle follow up issues by other prototyping technicians	-	-	16	61	$976
					Labor / Training - Total Cost:	**$14,722**

Grand Total:

Hardware - Total Cost:	**$13,569**
Software - Total Cost:	**$4,561**
Labor / Training - Total Cost:	**$14,722**
Grand Total for Proposal:	**$32,852**

Note:

1. Hardware selected from CDW Advantage catalog (except where noted). Software from various places on the Internet.

2. Training hours & costs were estimated based upon the author's experience for project involvement of roughly 25% of available hours per week.

	Item	Qty Each	Cost / Each	Qty Hrs	Cost / Hr.	Total Cost
Software	**Informative Graphics' Brava! Enterprise** (Note: Price is estimated - IG would not reply to my emails for a quote - $345 is based upon the cost of Brava! Desktop)	5	$345	-	-	$1,725
	Microsoft Windows Vista Business Operating System - Already installed on computers (can be configured for 124 bit WEP communication) (http://www.provantage.com)	5	$0	-	-	$0
	Microsoft SQL Server 2005 Workgroup Edition - Only for servers, comes with 5-client access license (can be configured for 128 bit communication) (http://www.provantage.com)	1	$676	-	-	$676
	Norton SystemWorks 2007 Premier V10.0 SOP 5-User Package from Symantec - used for antivirus protection in addition to controlling passwords, file maintenance, and system analysis / optimization utilities (http://www.provantage.com)	1	$295	-	-	$295
	Microsoft 2007 Office Small Business Edition (Includes Word, Excel, Powerpoint) (http://www.provantage.com)	5	$373	-	-	$1,865
					Software - Total Cost:	**$4,561**

Figure 5. Software, Labor, and Training Costs

Fundamental to the success of any system integration project is the task of determining the total cost of implementation. For this study, the proceeding tables highlight the financial commitment on the part of the company to integrate the prototyping system.

Hardware costs total at $13,569, accounting for the purchase of the desktop computers, laptop computer, wireless 2.4 Ghz USB adapters, wireless routers, modems, servers, laser printers, cables, and various incidentals. Software costs total $4,561, accounting for the purchase of the Brava! Enterprise, Microsoft Windows Vista Business Operating System (comes loaded on computers), Microsoft SQL Server 2005 Workgroup Edition, Norton SystemWorks 2007 Premier V10.0 SOP 5-Uswer Package from Symantec, and Microsoft 2007 Office Small Business Edition. Labor and Training costs reach upwards to $14,722, with a total time commitment on the part of all involved at 498 hours. Therefore, the grand total for implementation of the prototyping system is $32,852.

Potential Problem Areas

The problems appear to be minimal at this level of the analysis, but possible issues could include the following:

1. Corporate and plant personnel could have difficulty in adapting to the new technology.
2. The cost of purchasing the Brava! Enterprise software, computers, and internet interlinking equipment could be higher than corporate could be willing to spend.
3. The Brava! Enterprise software could possibly be difficult to work with, which would further frustrate corporate and plant personnel in using it.
4. Brava! Enterprise may not link well with between corporate and plant level computers.
5. The security of the Brava! Enterprise software output (published CAD files, work instructions, bill of materials) may not be as secure as reported by the vendor.
6. Working with computers exclusively could take more corporate and plant personnel time than is presently expended with paper documents (this could reduce ROI considerably). This would also create associate resistance using the system, resulting in associates attempting to route around the Brava! system for information retrieval.
7. Prototype technicians may be more likely to damage desktop and laptop computers due to greater frequency of use and mobility factors (of the laptop).
8. Due to the constraints of corporate management, Return-On-Investment (ROI) requirements were not identified. Typically ROI is part of a proposal plan.
9. This could be a feasible plan; that is if a prospective company has adequate prototyping volume. Therefore, the implementation of this prototyping system integration plan would have to be analyzed for prospective companies on a case-to-case basis.

Recommendations and Conclusions

The aforementioned plan sets the stage for increasing prototype development efficiency in an intra-plant cooperative environment. Through the company investment of time and money, greater yields in the form of productivity should be realized. Yields should consist of reduced errors (found by having only one version of each document on each server), ease in communication (electronically transmitted information in real time with original and marked-up documents), ease in use (using standard GUI-type windows interface software), and centralized knowledge storage (stored on corporate server for all to view and utilize). The system proposed should be quite nimble for a corporation in that tasks will be standardized among the corporation with all using the same system.

Through this proposal, engineering technologists have been provided a system integration example (or template). The primary benefits of this paper to the reader is access ease of the article (available online) without cost (a textbook was not purchased). If the technologist is seeking approval of projects based upon ROI, which was not required for this proposal, a cost comparison of current versus projected new project costs would be necessary. Furthermore, in some cases additional project alternatives may be required to meet the needs of their employing organizations.

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Appendix A

Vostro 400 Mini Tower

~~**From $1,945**~~
Now from
$1,437
Lease from **$39**/mo. (48 pmts)
1

Estimate Payments | Apply

Discount Details

Preliminary Ship Date: 11/2/2007[2]

My Selections | All Options

- Vostro 400 Mini Tower

Date	10/20/2007 8:11:04 AM Central Standard Time		
Catalog Number	4 Retail 04		
Catalog Number / Description	**Product Code**	**SKU**	**Id**
Base: Intel® Core™2 Duo Proc E6750 (2.66GHz,4MB L2Cache,1333FSB)	V46750	[223-1770]	1
Operating System: Genuine Windows Vista® Business	VB3E	[313-5798] [420-6581] [420-7180] [420-7186] [420-7229] [420-7238] [420-7243] [420-7286] [420-7292] [420-7293]	11
Monitor: Dell 20 inch Widescreen 2007WFP UltraSharp™ Digital Flat Panel Display	2007WFP	[320-5666]	5
Memory: 2GB Dual Channel DDR2 SDRAM 800MHz - 2DIMMs	2GB800	[311-7366]	3
Primary Hard Drive: 250GB Serial ATA Hard Drive (7200RPM) w/DataBurst Cache™	250G72K	[341-4990]	8
Optical Drives: Single Drive: 16X (DVD+/-RW) Burner Drive	16XDVDR	[313-5456] [420-7241]	16
Video Card: 128MB NVIDIA® GeForce® 8300GS	8300GS	[320-5761]	6
Floppy Drive and Media Reader: No Floppy Drive	NOFD	[341-4742]	10
Modem and Wireless: No Modem Option	NOMODEM	[313-5469]	14

Appendix A - Continued

Sound: Integrated 7.1 Channel Audio	INAUDIO	[313-5672]	17
Labels: Windows Vista® Premium	VPD	[310-8626]	750
Speakers: No speakers (Speakers are required to hear audio from your system)	NOSPKRS	[313-5461]	18
Keyboard: Dell USB Keyboard	USBKYBD	[310-9322]	4
Mouse: Dell Scroll Mouse	SCRLMSE	[310-9326]	12
Wireless Network Adapters: Linksys WRVS4400N Wireless-N Security Router, VPN and QoS	718665	[A0718665]	244
Office Productivity Software: No Pre-installed Productivity Software	NOSFW	[420-7281]	22
Security Software: Norton Internet Security 2006 90-day Subscription	NIS0690	[420-7374]	25
Adobe Software: Adobe Acrobat Reader	ADOBEAC	[420-7275]	15
Warranty & Service: 2 Year Limited Hardware Warranty with Next Business Day On-Site Service	Q2YOS	[412-0359] [960-7871] [970-0141] [983-4250] [983-8540] [988-0387] [988-0388]	29
Optional Support Services: Gold Technical Support, Vostro, 2 Years	GTS2YR	[461-3749] [960-7861] [983-4240]	31
Dell DataSafe Online Data Backup: 10GB for 1yr Online Backup by Dell Datasafe	DASF10G	[420-7368] [987-7479]	34
Standard Vostro Services Tools: 1 Year Dell Automated PC Tuneup	PCTUNE	[420-7367] [960-8851]	35
Standard Vostro Services Tools: Dell Network Assistant	NTASIST	[420-7189]	21
Internet Access Service: No ISP requested	NOISP	[420-7280]	37
Purchase Intent: Purchase is not intended for resale.	NOT4SEL	[462-4506]	138
Network Interface: Integrated 10/100 Ethernet	INT	[430-2501]	13

Appendix B

Latitude D520 Dual Core

~~**From $1,819**~~
Now from
$1,351
Lease from **$36**/mo. (48 pmts)
1

Estimate Payments | Apply

Discount Details

Preliminary Ship Date: 10/26/2007[2]

My Selections | All Options

- Latitude D520 Dual Core

Date	10/20/2007 8:22:38 AM Central Standard Time		
Catalog Number	4 Retail 04		
Catalog Number / Description	**Product Code**	**SKU**	**Id**
Latitude D520: Intel® Core™ 2 Duo T7200 (2.00GHz) 4M L2 Cache, 667Mhz Dual Core	D52T72	[222-5386]	1
Operating Systems: Genuine Windows Vista® Business, with media	VB3E9	[466-2838]	11
LCDs: 15 inch SXGA+ LCD Panel	15S	[320-4680]	2
Memory: 2.0GB, DDR2-667 SDRAM, 2 DIMMS	2G2D6	[311-5687]	3
Hard Drives: 80GB Hard Drive, 9.5MM, 7200RPM	80D72	[341-2980]	8
Module Bay Devices: 8X DVD+/-RW w/Roxio and Cyberlink Power DVD™	8XDVRVB	[313-5044]	16
Wireless LAN (802.11): Dell Wireless™ 1490 802.11a/g Dual-Band Mini Card	DW1490	[430-1964]	19
Miscellaneous: Latitude D520	1D520P	[465-2820]	82
Processor Branding: Intel Core 2 Duo Processor	IC2DNB	[310-8319]	749
OS Labels: Vista Premium Label	VPRN	[310-8758]	750
Batteries: 6 Cell Primary Battery	6C	[312-0409]	27

Appendix B - Continued

AC Adapter: 65W A/C Adapter	65AC	[310-7283]	15
Floppy Drive: No Floppy Drive	NFD	[340-8854]	10
Mouse: Dell USB 2-Button Black Optical Mouse	DUSBK	[310-8061]	12
Resource CD: Resource DVD - Contains Diagnostics and Drivers for Vista	RDVD	[310-8763]	26
File System: NTFS File System for all Operating Systems	NTFS	[420-3699]	37
Warranty & Service: 3 year Limited Hardware Warranty with Mail-in Service	T3YRR	[950-7480] [960-9682] [982-5768] [984-1147] [984-1148]	29
On-Site System Setup: No Onsite System Setup	NOINSTL	[900-9987]	32
Purchase Intent: Purchase is not intended for resale.	NOT4SEL	[462-4506]	138
Internal Keyboard: Internal English Keyboard	ENG	[310-7589]	4