

Supply Chain Systems III: Software Selection & Implementation



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Agenda

- Software Selection
 - Software Architecture
 - Software Sources
 - Vendor Selection
- Software Implementation
 - General Guidelines
 - Case Study: Hershey Foods

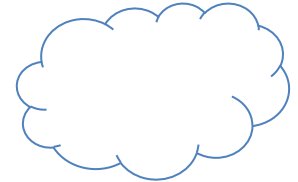
Software Selection – Architecture

Evolution of Software Architecture

- Mainframe (1970s)
 - Thin or “Dumb” terminals connected to mainframe computer using time-sharing. Customized software run in batches.
- Personal Computers (mid-1980s)
 - IBM PC or compatible. Sometimes connected to mainframe computer via expansion card but generally isolated.
- Client-Server (late 80s to early 90s)
 - IBM PC “clone” computers (thick or “smart” terminals or clients) connected by a network to a central server. Allowed multiple users access to same data.
- Wide Web and Web 2.0 (mid-90s to present)
 - IBM PC “clone” or laptop connected to company intranet or Wi-Fi.
- Cloud or Post-PC (today and beyond)
 - Any Internet enabled device (laptop, tablet, smart phone) connected to a network of remote servers hosted on the Internet to store, manage, and process data, rather than a local server or a personal computer.

Current Options

- On Location or On Premise
 - Firm hosts the software in their own facilities, on their own hardware, and within their own firewall.
- Cloud Computing
 - Deployment Models -
 - Public Cloud – hosted by third party at remote locations
 - Private Cloud/On-Premise – hosted within firm’s facilities
 - Hybrid Cloud – mix of public and private hosting
 - Computing Models – how much of the “computer stack” is run and maintained by a third-party
 - Infrastructure as a Service (IaaS)
 - Platform as a Service (PaaS)
 - Software as a Service (SaaS)



Cloud Computing

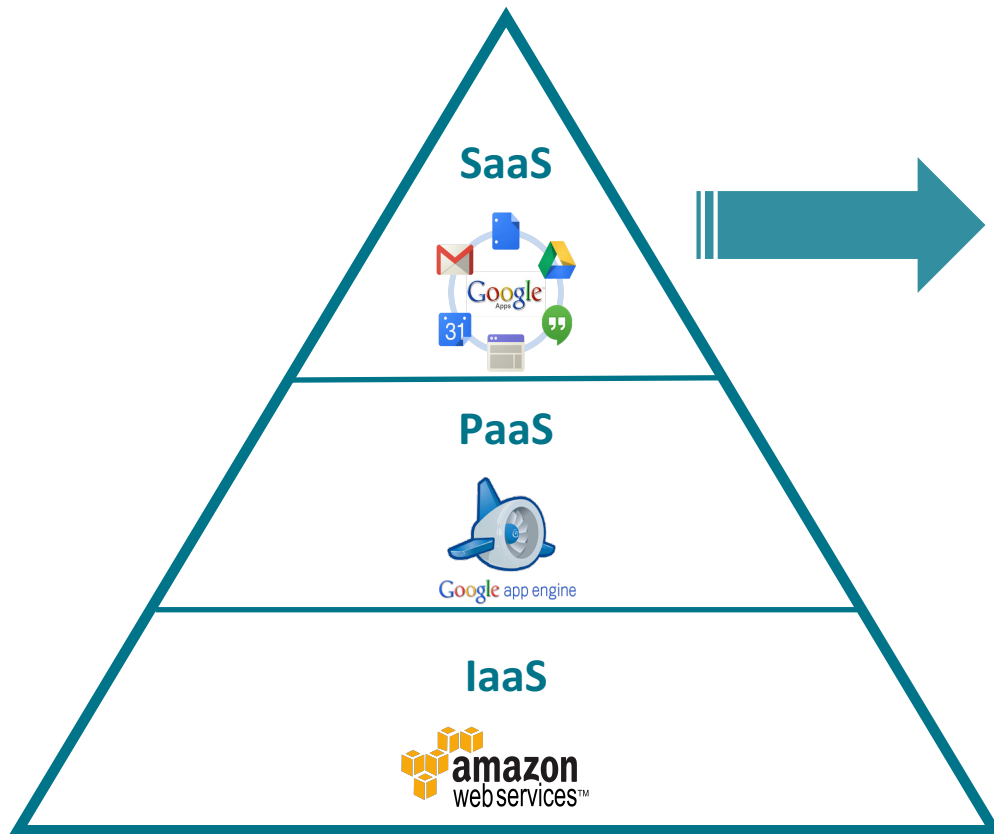
Cloud Computing Models

Rent/Subscribe Buy (Own and Maintain)

- Infrastructure as a Service (PaaS)
 - Third party provides firm with the computing infrastructure, physical or virtual machines and other resources. e.g., Amazon S3, Windows Azure, Rackspace, Google Compute Engine. Firm owns and manages the software application.
- Platform as a Service (PaaS)
 - Third party provides firm computing platforms to include operating system, database, web server etc. e.g., AWS Elastic Beanstalk, Heroku, Force.com, Google App Engine. Firm owns and manages the software application.
- Software as a Service (SaaS)
 - Third party provides firm with access to the application software and handles installation, setup, maintenance, and running. Firm is charged by use. e.g., Salesforce, Google Apps, Box, Dropbox, and edX.

Third Party Management Increases

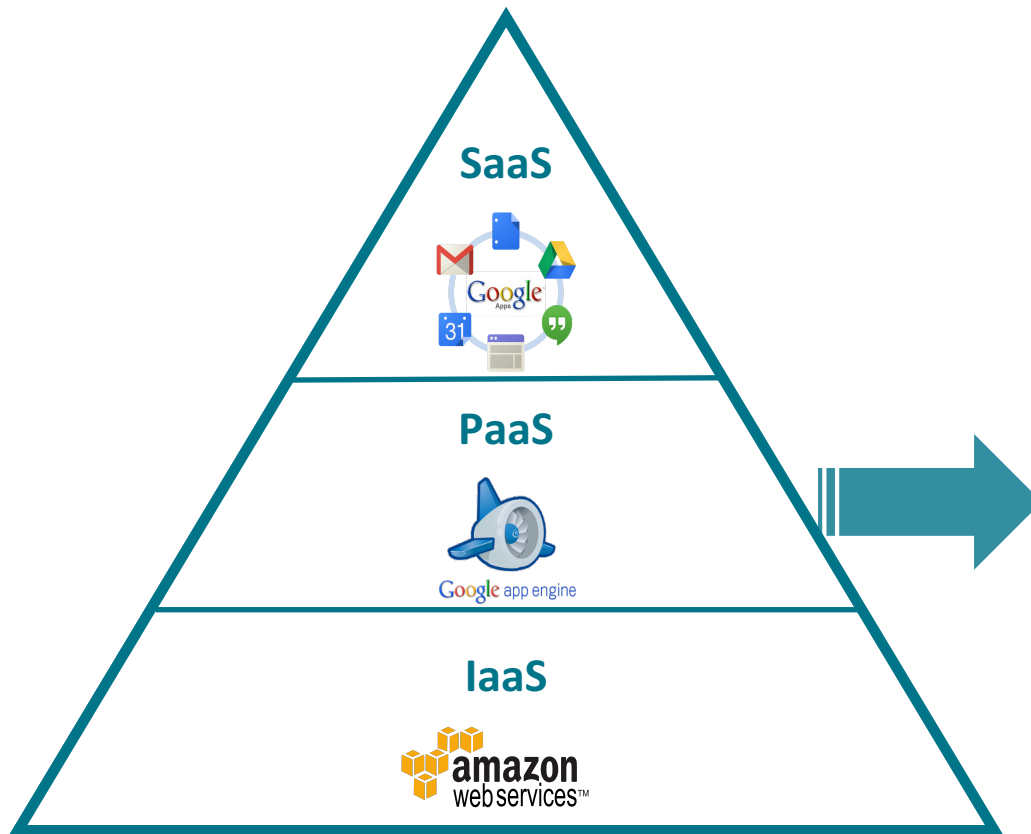
Cloud Computing – What are the advantages?



Software as a Service

- You can sign up and rapidly start using innovative business apps
- Apps and data are accessible from any connected computer
- No data is lost if your computer breaks, as data is in the cloud
- The service is able to dynamically scale to usage needs

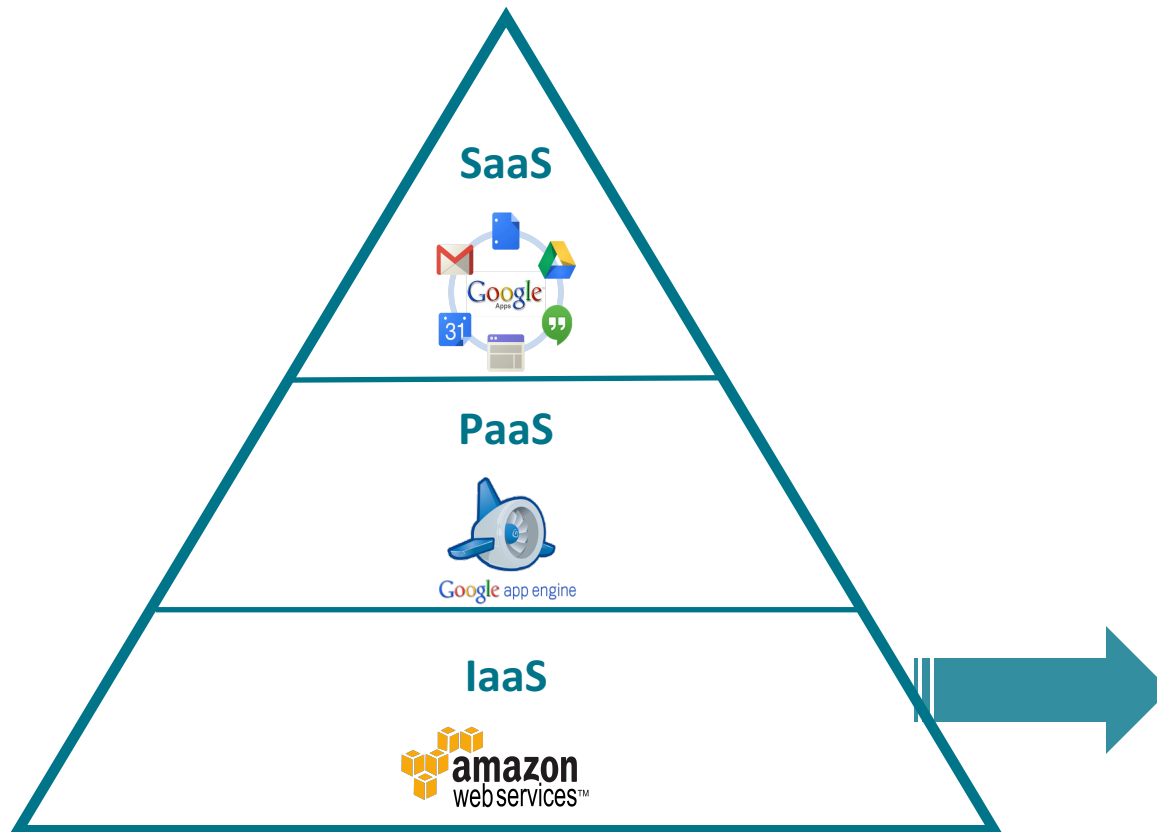
Cloud Computing – What are the advantages?



Platform as a Service

- Develop applications and get to market faster
- Deploy new web applications to the cloud in minutes
- Reduce complexity with middleware as a service

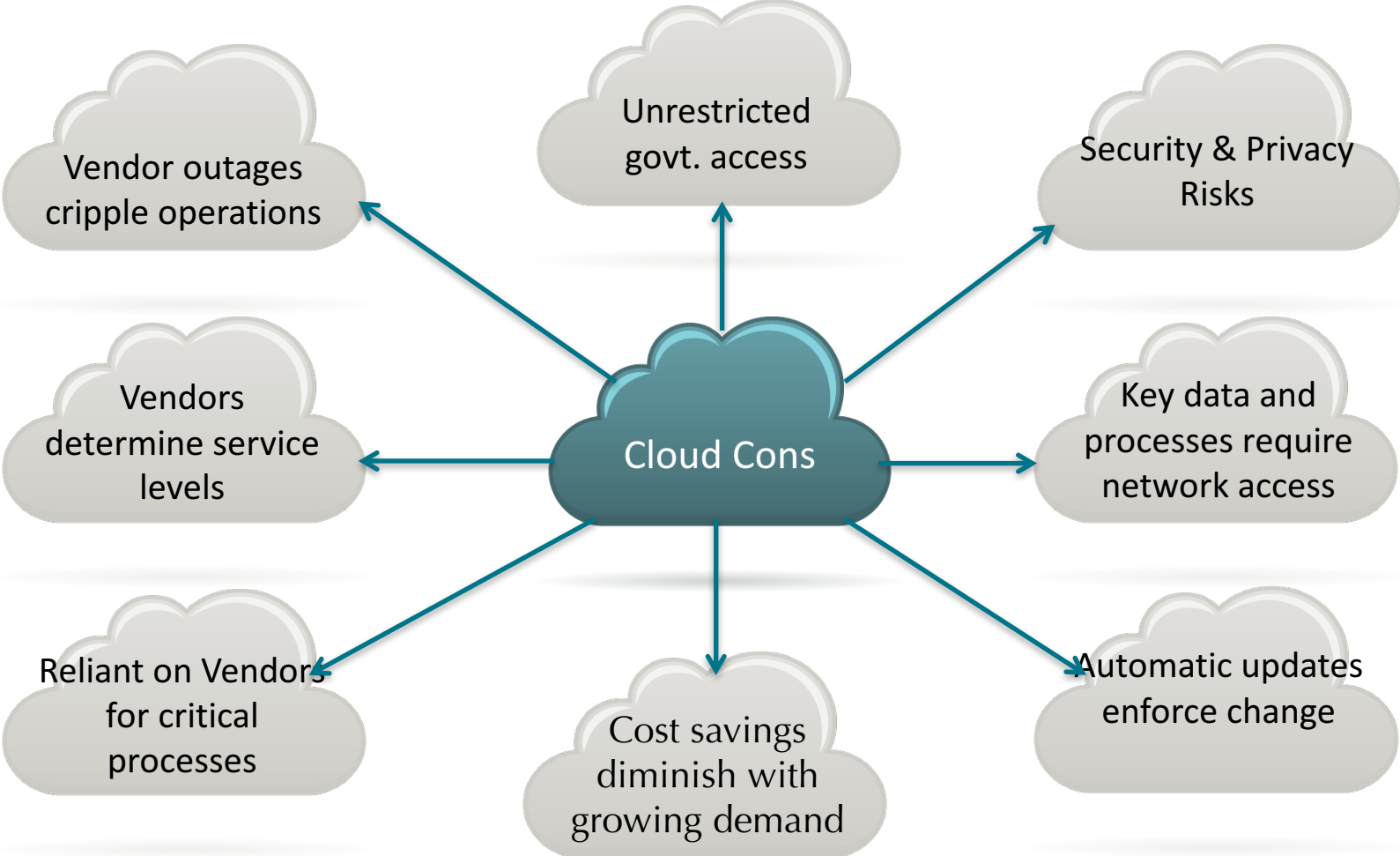
Cloud Computing – What are the advantages?



Infrastructure as a Service

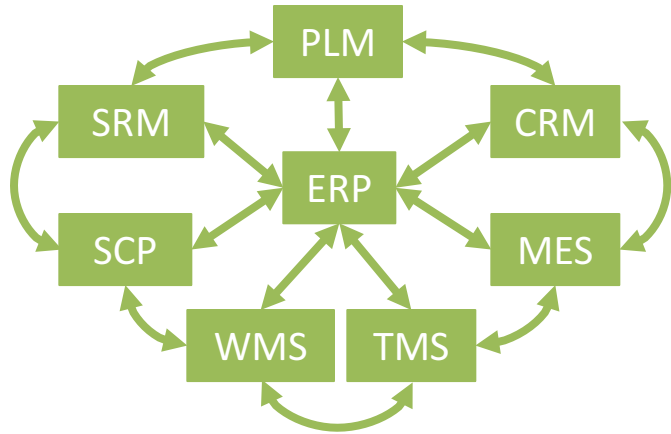
- No need to invest in your own hardware
- Infrastructure scales on demand to support dynamic workloads
- Flexible, innovative services available on demand

Cloud Computing – What are the disadvantages?



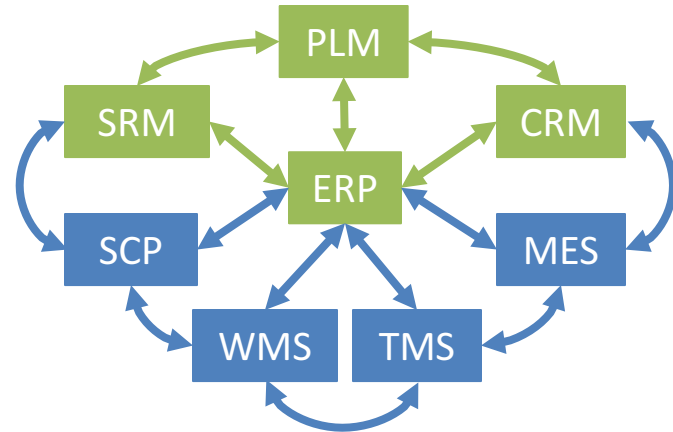
Software Selection – Sources

SCM Software Sources



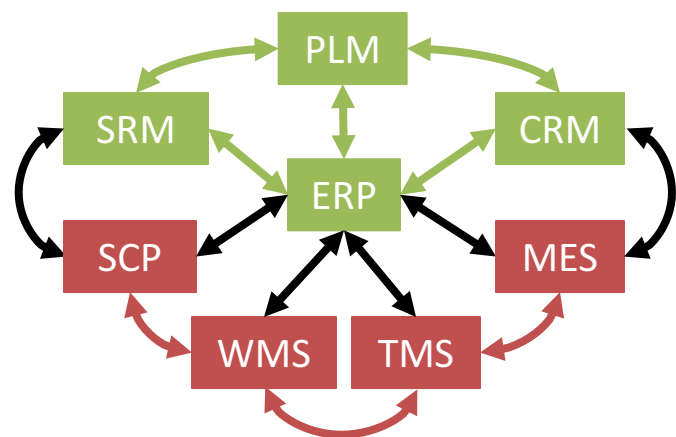
ERP Expansion

All SCM modules are from the same ERP vendor



Custom (In-House)

SCM modules are developed in-house by firm



Best of Breed

SCM modules are sourced from different providers

Pros and Cons for Software Sources

Source	Advantages	Disadvantages
Customized In-House System	<ul style="list-style-type: none"> • Best fit to the firm and its processes. 	<ul style="list-style-type: none"> • Exceptionally difficult and time consuming to develop • Most expensive total cost of ownership • Difficult to maintain • Can result in “inward looking” solution
ERP Expanded Systems	<ul style="list-style-type: none"> • Relatively fast implementation • Less expensive than in-house customization • Efficient from IT perspective • Easier to upgrade with ERP enhancements 	<ul style="list-style-type: none"> • Tends to be inflexible in terms of process • Could require change in business processes • Not guaranteed to be best solution approach
Best of Breed Solutions	<ul style="list-style-type: none"> • Best performing market solution for each function 	<ul style="list-style-type: none"> • Difficult to integrate different systems • Can have slow performance • Requires the use of middleware between the applications • Upgrading individual components can cause ripple effect problems
Best of Breed Platforms	<ul style="list-style-type: none"> • Very good, if not best, solution for each function with easier integration between individual modules 	<ul style="list-style-type: none"> • Requires the use of middleware between the applications

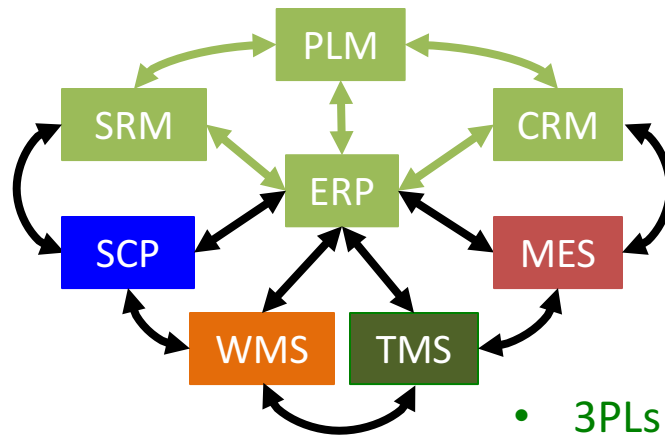
Outsourcing

Outsourcing Option

- Third Party Logistics (3PL) Providers

- Run the software and perform all business processes
- Eliminates need for hardware or software
- Can replace personnel within firm (maybe . . .)
- Various fee structures (fixed plus variable, time based, cost plus)
- Most common with smaller firms

- Mix of periodic and event based analysis
- Outsourced analytics
- Conduct network design



- 3PLs run fulfillment center
- Outsourcing of DC operations

- 3PLs and freight brokers
- Personnel can be co-located with firm
- Procurement and/or daily execution

Supply Chain Outsourcing

Reasons to Outsource:

- Reduced capital expenditures for software and hardware
- Lower costs via partner's economies of scale (efficiency)
- More flexible and agile IT capability
- Increased and clearly defined service levels at reasonable costs
- Expertise availability that is not affordable in-house
- Allows firm to focus on core business
- Provides continuous access to new technology
- Reduces risk of IT failure
- Allows for easy replacement of obsolete systems

Reasons to NOT Outsource:

- Security and privacy concerns
- Concern about vendor dependency and lock-in
- Loss of in-house expertise to a core function
- Concerns over availability, performance, and reliability
- High data migration costs
- Systems tied tightly to IT infrastructure
- Some key applications are in-house and mission critical
- Current in-house operations are as efficient as outsourced
- Corporate culture does not work well with partners

Software Vendor Selection

Generic Software Vendor Selection Process

1. Form a Project Team (Internal and/or External) & Objectives
2. Understand the Business and Needs
 - Review Current Business Processes
 - Prioritize Needs/Functionality: Must Have v. Should Have v. Nice to Have
 - Create Request for Information (RFI)
3. Create Initial Short List of Potential Solutions & Vendors
4. In-depth Review of Short Listed Vendors
 - Have vendors conduct realistic product demonstrations
 - Collect references from current users (visit if possible)
5. Create and Distribute final Request for Proposal (RFP)
6. Make the Decision
 - Negotiate contract, price and service level agreements (SLAs)
 - Establish an implementation plan

Vendor Selection – Criteria Other than Cost

- **Functionality** – does the system features fit the firm’s processes and needs?
- **Ease of Use** – how fast is the initial learning curve and on-going use?
- **Performance** – what are the processing speeds?
- **Scalability** – how well can the system expand and grow with the firm?
- **Interoperability** – how well does the system integrate with other systems?
- **Extendibility** – how easily can the system be extended or customized?
- **Stability** – how reliable is the system in terms of bugs and up-time?
- **Security** – how well does the system restrict access, control confidential data, and prevent cyber hacking?
- **Support** – how is the quality of the vendor in terms of implementation, support, training, thought leadership etc. ?
- **Vendor Viability** – how is the vendor’s financial strength and willingness to supply updates and enhancements? Will they be here in 3 years??

Using a scorecard can be useful in collecting and comparing vendor solutions.

Sample Evaluation Scorecard

Options	Initial Investment	NPV (5 years)	Time-to-go-Live	Features	Security	Scalability
A (ERP+)	\$9M	\$1.2M	9 mon	B	B+	A
B (BoB OP)	\$8M	\$0.9M	12 mon	A	A-	B-
C (BoB Cloud)	\$4M	\$1.1M	3 mon	A	B+	A
D (in-House)	\$12M	(\$1.4M)	18 mon	B	B	C
E (Outsource)	\$2M	\$0.5M	3 mon	A-	B	B+
F (Do Nothing)	\$0M	\$0M	\$0M	D	D	D

■ Things to Note:

- Scorecards should capture financial and non-financial attributes
- Non-financial criteria can be scored as rank, ratings, grades, etc. Beware of averaging scores!
- Actual scorecards will be much more detailed – could have one for specific features
- Selection can be made between vendors or between alternative hosting platforms
- Multiple Objective Analysis can be used in the selection process.

Total Cost of Ownership

Total Cost of Ownership

Software License

Direct cost of the software system itself – assuming ownership. Usually paid up front.

Maintenance

Ongoing annual costs to guarantee upgrades and bug fixes.

Platform/Hardware

Cost of needed hardware to run the new software.

Training

Cost of training initial and on going personnel

Implementation

Cost of getting the system to go live! These vary widely between systems and firms.

Customization

Cost of modifying the system itself to fit the firm's processes. Nothing in SCM is used straight out of the box (vanilla).

System Integration

Cost of interfacing this system with other modules and modifying existing systems to fit.

Cost Benefit Example

- You have been assigned to lead the selection and implementation of a new SCM Planning Suite. One of the shortlisted vendors is KEB Associates, a leading vendor. To assist in the implementation, you have selected Triviatore, a well know SCM IT consulting firm.
- The following costs (in thousands of dollars) and growth rates have been estimated:
 - Internal team cost (Y0) \$1,000
 - Growth rate team cost 10% increase each year
 - Consultants cost (Y0) \$400
 - Software License (Y0) \$500
 - Maintenance 20% of license per year
 - Hardware \$600
 - Annual Benefits (Y1) \$2,000
 - Benefit Growth (after Y1) 30%
 - Discount Rate 15%
- What is the NPV and IRR for this solution under these assumptions?

Training Costs by year	
Y0	\$500
Y1	\$750
Y2	\$1,000
Y3	\$800
Y4	\$400

- Recall that for NPV expenses in the first year (year 0) is not discounted since it is now!
- For IRR you include the first year cash flow.

Cost Benefit Example

Year	Internal Team	Consultants	Software (Lic. & Maint)	Hardware	Training	Benefits	Annual Cash Flow	Cumulative Cash Flow
0	\$1,000	\$400	\$500	\$600	\$500	\$-	\$(3,000)	\$(3,000)
1	\$1,100		\$100		\$750	\$2,250	\$300	\$(2,700)
2	\$1,210		\$100		\$1,000	\$2,925	\$615	\$(2,085)
3	\$1,331		\$100		\$800	\$3,803	\$1,572	\$(514)
4	\$1,464		\$100		\$400	\$4,943	\$2,979	\$2,466
Totals	\$6,105	\$400	\$900	\$600	\$3,450	\$13,921		

Net Present Value = $NPV(0.15, 300, 615, 1572, 2979) - 3000 = 462.5 \text{ \$k}$
 Internal Rate of Return = $IRR(-3000, 300, 615, 1572, 2979) = 20\%$
 Payback (undiscounted) after 4 years.

Things to Note:

- These calculations are highly dependent on assumptions in discount rate (NPV), implementation and training costs, and value of benefits.
- The benefits assumption influences the decision to invest in SCM IT, but not the specific vendor selection since it is (usually) applied to all options.
- The important thing is to pick a figure of merit and apply it uniformly across the options.
- Total Cost of Ownership captures those on-going costs that are frequently forgotten.
- Sensitivity analysis is a must to see how robust the investment is.

“It usually takes twice as long with twice the number of resources as planned to achieve half the promised benefits”
rule of thumb for implementations

Software Implementation

Implementation Approaches

Moving from an old multi-module system to a new multi-module system.

	# Modules Converted	# Locations Converted	Comments
Direct or Big Bang	All	All	<ul style="list-style-type: none"> • Switch from the old to new system occurs on one day • Pain of switch concentrated for entire firm • Fastest implementation time, but highest risk • Post-implementation productivity drop • High potential for system wide failures due to insufficient testing/training
Parallel	All/Some	All/Some	<ul style="list-style-type: none"> • Old and new systems kept on for testing period • Lowest risk of failure, but highest cost and longest implementation time • Employees do double entry work
Pilot	All	One	<ul style="list-style-type: none"> • Full implementation of all modules at one location • Identify bugs or issues that are corrected prior to larger rollout • Contains any potential failure from infecting all locations • Tests individual modules and integration simultaneously
Phased or Rolling	One	All	<ul style="list-style-type: none"> • Implementation of one module at a time across the network • Longer implementation duration than direct, but with lower risk • Users have more time & learn as they go - no dip in performance after • Learn and fix as you go – better process for later implementations • Loss of managerial focus over time and a continuous state of change • Potential for missing data during transitional implementation period • Might require temporary bridges from old to new systems during transition

Implementation – Best Practices I

- Secure senior executive commitment
 - Secure ability to gather and use resources
 - Empower team managers to make decisions
- Form interdisciplinary team(s) to include staff from:
 - Project management – keep project on track
 - Process owners and end users – keep the right functionality and usability
 - Information technology and development – ensures integration and scalability
 - Organizational change management – ensures that the firm will adopt new system(s)
- Create a clear and specific scope document
 - Select appropriate implementation approach - set real expectations
 - Specify the modules to be implemented and how - Avoid scope creep (or gallop)
 - Understand business process and key requirements
 - Determine how to match business processes to the systems capabilities/requirements – Every software implementation project is unique!

Implementation - Best Practices II

- Build extensive testing into the project plan (you can't do too much)
 - Functional testing – does the software do what we think it should do?
 - Interface/Integration testing – does the software interface with other systems as it was designed to?
 - Acceptance testing – does the software operate in the manner expected? Are there any gaps?
 - Regression testing – has anything changed or been broken due to new release?
- Include extensive user training into the project plan
 - Reduces “loss time” during and after implementation
 - Improves and speeds up system buy-in – no one likes a new system!
 - Ensure that users understand how the new system will help them in their day-to-day jobs as well as support overall business objectives
- Use low risk settings to model new processes (conference room pilots)
- Try to simplify whenever possible
- User adoption will make or break an implementation!

Implementation Results

		Best of Breed	ERP Extension
Who led the implementation?	Technology Provider	49%	14%
	Third-Party	22%	40%
	In-House	17%	33%
What was time to implement?	≤ 12 months	71%	37%
	> 12 months	23%	59%
Was implementation finished on time?	Early / On Time	56%	37%
	Late	36%	56%
Was implementation finished on budget?	Under / On Budget	59%	40%
	Over Budget	32%	49%
What was the time to ROI?	≤ 9 months	34%	11%
	> 9 months	36%	48%
	Not there yet!	12%	19%

Case: Hershey Food Company I

Hershey Foods – Background



- Background as of 1997:
 - Founded in 1894, Hershey Foods Corporation is a US based manufacturer of chocolates and other candy products. Their 1997 annual revenue exceeded \$4.3 billion with a net profit of almost \$340 million.
 - Key products include: Hershey Kisses, Mounds, Reese's Peanut butter Cups, Milk Duds, Reese's Pieces, Jolly Ranchers, Twizzlers, and York Peppermint Patties.
 - Hershey sold through a variety of large and small retailers using a very efficient logistics supply chain designed for high-volume, low-cost distribution.
 - At this time, the company was using a mix of different legacy systems to include home-grown tools and mainframe applications (e.g., Manugistics, HR, etc.)
 - Sales for Hershey's products tended to peak in the fall with 40% of all sales occurring between Halloween and Christmas with slowest sales in late Spring.
 - Information Technology was not seen as a critical function at Hershey at this time. There was no CTO and the head of IT was only a vice-president.
 - Senior management had concerns about their current legacy systems:
 - Not Y2K compliant – meaning that the systems might not work on 1 January 2000 due to dates being stored as two rather than four digits in older systems.
 - Not able to scale limiting the ability of Hershey to grow the business

Hershey Foods – Decision



- Decision:
 - In late 1996, senior management approved project Enterprise 21 with the following objectives:
 - Become Y2K compliant,
 - Modernize hardware and software to enable growth (upgrade and standardize the hardware, shift to a client/server architecture, move to TCP/IP protocols, etc.),
 - Better coordinate and communicate data and deliveries to retail customers to reduce their own (and the retailer's) inventory and improve the level of service,
 - Enable customer service reps to confirm delivery dates directly with customers and if needed be able to promise future availability (ATP),
 - Install bar coding across all plants and products in order to reduce production costs, track materials, and improve overall logistics management, and
 - Help Hershey re-organize its business processes to improve service and enhance competitiveness.
 - The project would deliver a single integrated platform ready for switch over in April 1999 with an expected cost of \$110 million.

Hershey Foods – Enterprise 21



- Enterprise 21 consisted of the following components:
 - **SAP AG's R/3 Enterprise Resource Planning (ERP) suite** to include modules for finance, purchasing, materials management, warehousing, order processing, and billing.
 - **Siebel Systems Customer Relationship Management (CRM)** stand alone software to support management of customer relations and tracking effectiveness of promotions and price changes.
 - **Manugistics Supply Chain software** to manage the transportation, production, forecasting, and scheduling.
- **IBM Global Services** was selected to integrate the software provided by the three vendors.
- Hershey initially opted for a phased implementation approach rolling out the different ERP modules individually to allow for testing.

Hershey Foods – January 1997



- Status as of January 1999
 - Enterprise 21 had moved along fairly well with some exceptions.
 - The following SAP modules were implemented and running: finance, materials management, and purchasing.
 - Other modules were behind schedule:
 - SAP critical order processing and billing
 - Siebel's pricing and promotions tracking package
 - Manugistics planning and scheduling applications

- Decision:
 - Convert to a big-bang implementation approach in order to ensure that all modules were installed by the Fall of 1999.
 - New cut-over date scheduled for July 1999.

Case: Hershey Food Company II

Hershey Foods – July-Sept. 1999



- Status as of July 1999
 - Hershey was running with ~ 8 days of supply – higher than normal in order to cover any issues from implementation.
 - Delivery to distributors started failing. Cycle time extended from the normal 5 days to 12 to 15 days. Many were simply not being filled.
 - Retailers started replacing Hershey product on their shelves with competing products from Nestle and Mars.
 - Shockingly, while orders were not being filled, the inventory on hand started increasing!
- Status as of September 1999
 - Hershey announced that employees were “having problems entering orders into the new systems and the new systems were not transmitting orders to warehouses”. Did not assign blame to either software or implementation.
 - Hershey’s stock price dropped 8% in a single day
- Immediate Results:
 - Hershey lost \$150 million in sales due to the ERP implementation failure!
 - Stock price dropped 35% by the end of October.
 - Profits in Q3 dropped by 19% and sales dropped by 12%.

Hershey Foods – What Happened?



- Partial Root Cause:
 - SAP R/3 required all inventory stocking locations to be in the Master data.
 - However, during peak times, Hershey would use any location possible to include temporary facilities – which were not captured in the SAP master data.
 - Gap was due to lack of coordination between technical implementation team and operations.
- Post-mortem – destined to fail! . . . in retrospect, of course!
 - All software companies said it was not their fault – individual systems worked
 - Project management ended up being the consensus scapegoat.
 - Unrealistic implementation deadlines with insufficient time buffer for adequate testing (recommended 3-6 weeks per module)
 - Important modules like transportation and warehousing got pushed to 3rd quarter.
 - Using a Big Bang approach for implementing 3 software systems at once was wrong approach (three cooks in the kitchen)
 - Consulting team did not actually have past SAP-Manugistics integration experience.
 - There was insufficient emphasis on training - employees had to learn 3 new systems at once during peak season
 - Senior management did not have large IT experience and were not kept up to date on the ongoing implementation

Hershey Foods – What Next?

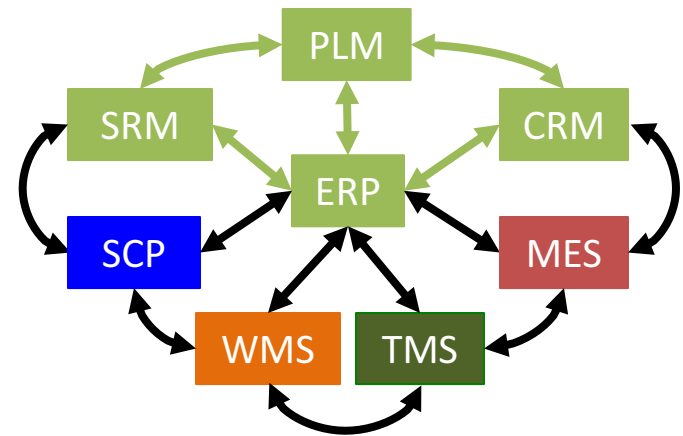
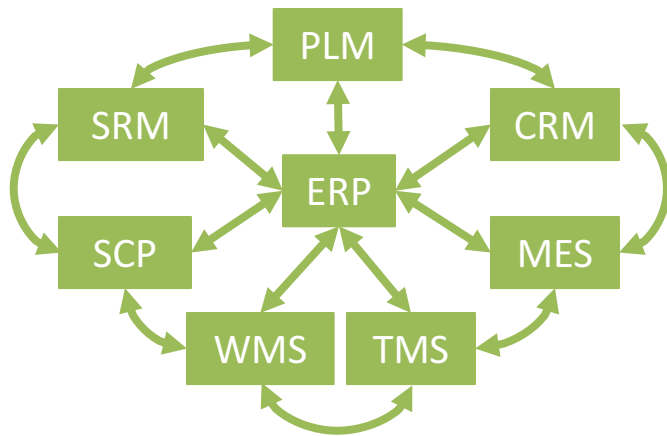


- Hershey recovered relatively quickly
 - Appointed new CIO, George Davis, from Computer Sciences Corporation.
 - Implemented a rigorous software testing regimen.
 - Increased training for users.
- In July 2001 Hershey implemented SAP R/3 4.6
 - Required changing business processes – more streamlined
 - Installed in 11 months – ahead of schedule
 - Delivered at 20% below budget
 - Included piloting of “dry runs” for new implementations, e.g., processing empty pallets with barcodes to identify any issues prior to general roll out.
 - Built a new 1.2 Million square foot DC – reduced order cycle time by half
- Current stock price is 5x its low point in January 2000!

Key Points

Software Vendor Selection

- Intertwined decision Architecture and Source
 - On Premises versus Cloud
 - In-House vs. Best of Breed vs. ERP Extensions vs. Outsourced
- Selection process
 - Multiple attributes – scorecard approach
 - Total cost of ownership



Implementation

- Approaches
 - Big Bang vs. Parallel vs. Pilot vs. Phased
- Best Practices –
 - Secure senior executive commitment
 - Form interdisciplinary team(s)
 - Create a clear and specific scope document
 - Build extensive testing into the project plan (you can't do too much)
 - Include extensive user training into the project plan
 - Try to simplify whenever possible

Questions, Comments, Suggestions? Use the Discussion Forum!



“Athena – relaxing on the sofa”
courtesy Lana Scott



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