Toward a Packaging Information Process Model

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Abstract:

In many companies packaging is orphaned. Lacking a common platform for development and collaboration, knowledge management, engineering analysis and even database management, packaging departments are frequently not integrated with other enterprise information systems while at the same time being required to feed those systems manually. Unable to clearly articulate their needs to IT managers or gain priority with them, packaging plays second fiddle to what are considered more core functions of product development, manufacturing, marketing and procurement – all this is despite the fact that the impact of packaging decisions on total cost of product is huge. This paper is aimed at helping packaging professionals seeking tools to help clarify the information landscape in which they work so they can build visibility to those impacts.

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Introduction

Starting in the late 1990's everyone was saying that the Internet would forever change packaging. Of course, they said that about every type of business for which one could write a business plan. Many companies tried and failed to accomplish this, at a cost of many millions of dot-com dollars dumped on the dot-compost heap. While the Internet has improved visibility to the sales and distribution process, essentially the same players and cost structures prevail as have done traditionally.

There is something fundamental about the packaging process that will be changed by the Internet. That change, while latent in the mix of trends and variables that exist today, has not yet fully taken shape. That change isn't about the Internet, it is about the recognition of the increased value that a well-managed packaging process can bring to the enterprise and how the Internet can propel the evolution of that process by enabling the core functions, collaborations and integrations upon which that improvement depends.

In many companies packaging is orphaned. Lacking a common platform for development and collaboration, knowledge management, engineering analysis and even database management, packaging departments are frequently not integrated with other enterprise information systems while at the same time being required to feed those systems manually. Unable to clearly articulate their needs to IT managers or gain priority with them, packaging plays second fiddle to what are considered more core functions of product development, manufacturing, marketing and procurement.

In order to introduce a comprehensive and integrated solution that spans the many cross-functional areas impacted by packaging, both within and outside the organization, a significant business case must be made and sold up and across the enterprise. The complexity of this landscape is compounded by the accelerating trend toward globalization and outsourcing that makes the packaging problem even more remote from the variables driving the shape of packaging solutions. While companies rush to adapt legacy systems to reach out via the Internet to compress time and distance, for the most part packaging departments lack their own enterprise information systems to begin with. Rather, packaging departments are forced to map selected information into legacy systems of other departments.

To make a business case for revamping information systems for packaging (one that we believe is compelling) the very systems for which the business case is being made are needed. The problem with making the case is that there is, by definition, no baseline from which to foretell a brighter day. Today it is not enough to point to process efficiencies and reductions in errors up and down the supply chain. Packaging professionals will fail to gain the attention of executives without an elaboration of the full

impact of failing to fix the process and the full reward that befalls those that adopt a comprehensive packaging platform.

Web-based platforms for development, collaboration, analysis, and distribution seems ideally suited to packaging because of its minimal demand for IT resources and attention. But first packaging professionals must become acquainted with the complete technology framework within which they must function, define the interactions around packaging information, identify the internal and external participants and determine a hierarchy of value to those participants in order to focus resources for integration.

Building an understanding of the impact of packaging on total product cost of goods, customer satisfaction and brand identity is at the core of any effort to gain control of and improve packaging in the enterprise.

What follows is a first step in building a model that may help packaging professionals gain leverage on the complex problem of transitioning to a more evolved process.

Focus – Enterprise, Innovation

The immediate reference of this paper is on the product manufacturing enterprise wherein the principal forms of packaging in use take the form of products rather than fluids and flowable materials wherein the product takes the form of the package. The reason for this distinction is that the dynamic of innovation in the former is around each product and project, whereas in the latter the dynamic of innovation is around machinery, processes and materials R&D. To the extent possible we are interested in promoting the ability of packaging professionals to contribute to the competitive advantage of their companies through the introduction of technologies that enhance their daily interactions and activities.

Objectives

- Provide packaging professionals interested in establishing a more evolved packaging process, with the beginnings of a set of tools to profile their company's packaging information landscape.

- Determine the significant exchanges of information between each participant, department and system.

- Establish a means of clarifying a value hierarchy between the various groups in order to prioritize ongoing integration efforts and enhance high-value add collaborations.

Distinctions and Caveats

In the terms of this paper a "comprehensive" packaging system is one that provides:

- Knowledge Management and Decision Support

- Design Automation

- Engineering Analysis

- Centralized and complete database

- BOM Structure

- Analysis tools for packaging data

- Collaboration across the complete packaging supply chain

- Product Data Integration

- Environmental data

We will attempt to clarify some of the most complicated problems encountered when large organizations begin the process of identifying the value of a packaging information system. The danger is that many of the critical attributes of packaging, quality of innovation, and analysis are easily swamped when the large, but difficult to detect, opportunities are painted over by legacy information systems that are not tuned to the nuances of this domain.

Participants and Sequence

Key stakeholders in the packaging process align organizationally and departmentally into nine groups.

Group	Infra-structure	Initiate	Respond
Finance	X		
Legal	X		
Marketing		X	
Engineering/R&D		X	
Packaging			X
Pkg. Supply Chain			X
Manufacturing			X
Procurement			X
Logistics			X

Table 1

Table 1 shows the categories of participants listed generally in the sequence in which their activities or requirements play into the packaging life cycle. Finance and Legal appear prior to Marketing because the financial and legal framework within which products are developed and released exists prior to each project. Legal and Finance do not instigate products and projects. They represent part of the *a priori* infrastructure that provides guidelines and standards for the organization as well as specific approvals as in the case of regulatory compliance.

Likewise, Manufacturing, Logistics and Procurement do not instigate products, however they do interact with product and packaging information on a project-by-project basis. Their position in the sequence generally reflects the order in which interaction around projects begins. That is to say, while they also provide standards and guidelines for interactions with their operations they also participate directly in the execution phase of released packaging specifications on a product-by-product basis.

Depending upon the organization some of the stakeholders may be internal and some external, and this will vary between divisions or companies. In either case the content and flow of packaging information is not really affected. What does matter is the multiplicity of systems that may need to send and receive the data along with the integration issues that may result. In addition, the trend in industry is clearly to push specific functions and even whole operations outside of the "four walls" which adds greater challenge to managing critical information.

Group	Internal	Mixed	External
Finance	X		
Legal	X		
Marketing	X		
Engineering		X	
Packaging		X	
Pkg. Supply Chain			X
Manufacturing		X	
Procurement	X		
Logistics		X	

Table 2

Systems

Typically, information systems exist within each of the key operational areas of a company for collaboration within each department and communication with other operational areas. *Table 3* indicates the kind of systems typical within each of these operational areas. Most of the major ERP vendors have modules that span most of these key functional areas of business activity – except, of course, for packaging. IT dollars are directed toward the ongoing integration challenges of each of the "core" functions below.

Group	System	ERP Integration
Finance	ERP	X
Legal	Document Management	X
Marketing	MRM, MA	X
Engineering	PDM, ePDM	X
Packaging		0
Pkg. Supply Chain	ERP, ePDM, SCM	X
Manufacturing	ERP	X
Procurement	ERP, Strategic Sourcing, MRO	X
Logistics	ERP, WMS, SCM	X

Table 3

Packaging departments typically use a series of desktop point-solutions (*Table 4*) to achieve the development of specifications that are contained in documents for release. Typically, none of these desktop solutions are integrated with key information systems. Collaborations occur in an ad-hoc fashion through the

Application	Examples	Functions
CAD	AutoCAD, Catia, ProE, SolidWorks, CADKey	Create Structure
Graphics	Adobe Illustrator, Corel	View Art
Spreadsheet	Excel	Organize Data
Database	Access, MSSQL	Analyze Data
Word Processing	Word, WorkPerfect	Create Specs
Palletization	TOPS, Cape	Analyze Unitization
Drop Testing	Test Partner, GHI	Test Data Analysis
Document Conversion	Adobe PDF	Create Documents
Packaging Parametrics	Artios, Pkg, Score!	CAD Design Automation

Table 4

exchange of documents, faxes, phone calls, emails and couriers. Once a series of specifications is ready for release, packaging data (i.e. ASCII text) is manually entered into various information systems such as ERP, PDM and WMS systems while at the same time, formatted documents (i.e. drawing, specs, etc.) may be loaded into document management systems. Typically, these two different information systems are not linked or integrated with each other resulting in the inability of one system updating/transferring new information to the other with out manual (human) involvement.
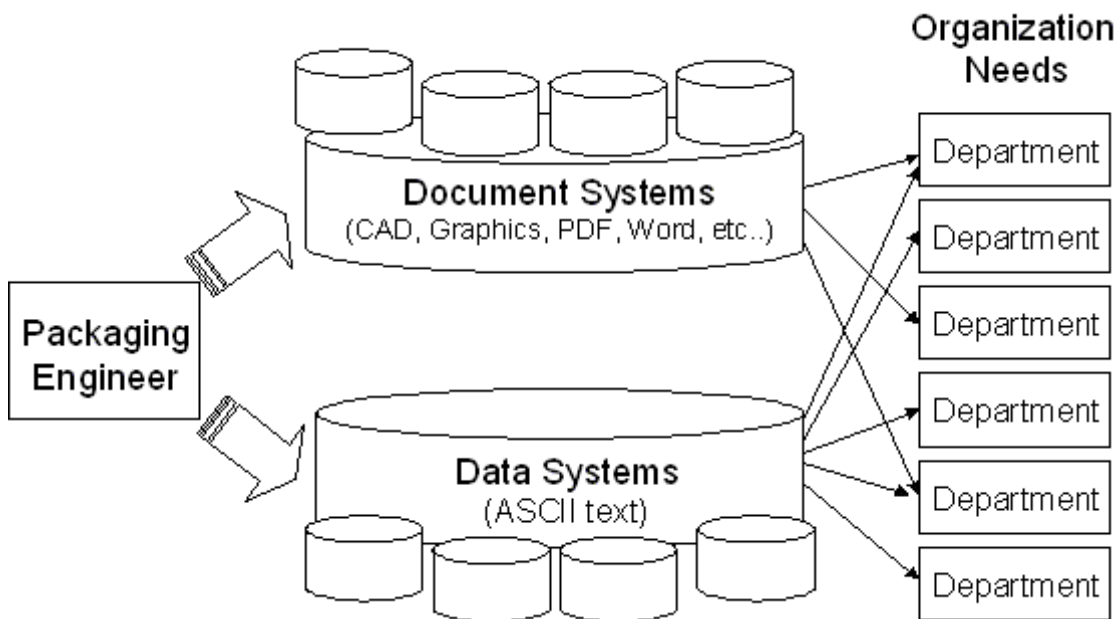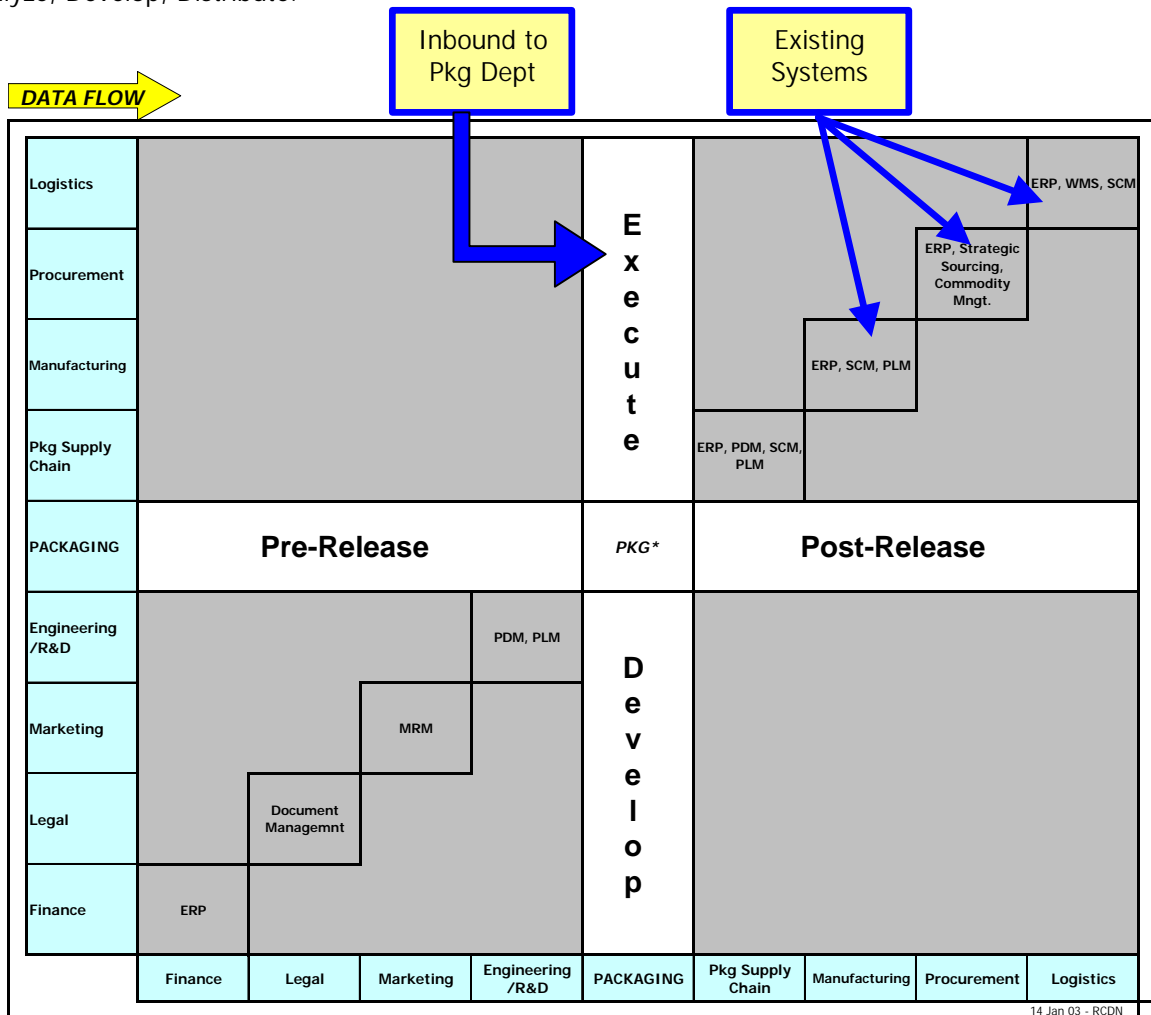

Figure 1

This leads to a concern around the quality of the data contained in each system. With two information systems, which in some cases have separate independent sub platforms, the challenge of maintaining accurate information in each is compounded. The engineer must remember that any changes to the packaging must be updated in the various systems or not loaded until the design is locked down. Even more challenging for information quality is that other groups in the product deployment cycle can make modifications through Approved/Official changes, but if the engineer is not notified or involved – other non-linked systems may not get updated.

Packaging in the Nexus

So packaging professionals move all manner of information both within and outside the organization in many formats. We have established the approximate sequence of participation, and the major systems that come to play. Let's examine what these look like together in *Chart 1* as we begin to develop a sense of the information flows. With respect to packaging information, the packaging department stands at the nexus of flow, mediating pre- and post-release data. The Chart shows the sequence of participation, relation to development and execution phase and the enterprise systems that are used by each participant. The relationships take on this shape because packaging is part of product development. Package manufacturing is traditionally outsourced, and it is the role of the packaging department to interact with the packaging supply chain. *Chart 1* emphasizes the reach that packaging departments need to achieve in order to be the mediators of packaging data to perform its key functions: Aggregate, Analyze, Develop, Distribute.

*Packaging System forecast for Packaging Dept   Chart 1

What Goes Where?

We can now populate the matrix as shown in *Chart 2*. Packaging information from each participant is sent outbound (horizontally) to the appropriate participant by column.

DATA FLOW

	Finance	Legal	Marketing	Engineering /R&D	PACKAGING	Pkg Supply Chain	Manufacturing	Procurement	Logistics
Logistics					Warehousing and Shipping Parameters			Warehousing and Shipping Parameters	**ERP, WMS, SCM**
Procurement					Costs, Suppliers	RFQ, Purchase Orders		**ERP, Strategic Sourcing, Commodity Mngt.**	
Manufacturing					Capabilities, Mfg Locations, Ergonomics		**ERP, EMS, ODM, In- House Mfg**		Warehousing and Shipping Parameters
Pkg Supply Chain					Capabilities, Prototypes, Costs, CAD	**ERP, PDM, SCM**		Quotations, Dates	
PACKAGING		docs, exhibits for approval	Specs, prototypes, testing data, costs	Specs, prototypes, testing data	**PKG**	Specs, Assy instructions, QA requirements	Specs, Assy instructions, QA requirements	Specs, BOMs, Economic Buying Range, Regionality, QA requirements	Primary, Secondary and Unitload dimensions, weight
Engineering /R&D		Compliance Docs	Prototypes, Costs, Release Dates	**PDM, Outsourced Designers**	Product Data, Models, Prototypes				
Marketing	Forecasts	Artwork	**MRM**	Product Marketing Brief, Forecast release dates, Quantities	Product Mkt Brief, Pkg Prefs, Dates, Qtys, Graphics				
Legal		**Document Managemnt**	Labeling Requirements, copyright, compliance	Regulatory constraints, compliance, hazmat	Security, liability, hazmat, labeling				
Finance	**ERP**		Budgets, Revenue Goals						

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Chart 2

Notice that as we begin to populate the matrix that the upper left and lower right quadrants remain clear. This is an indication of a well-mediated exchange of packaging information. By passing the primary requirements that drive package development (lower left quadrant) through the packaging department we enable the packaging department to take charge of the process. This assures a correlation between the product-driven requirements and the suitability of the packaging solution (produced in the upper right quadrant). It is likely that when this matrix is used to profile the packaging department of any given company that there will be some packaging information in the upper left and lower right quadrants. When this is the case special care should be used to examine the appropriateness of this condition and to assure that there is sufficient control over that information.

Another advantage to using this model is that it clarifies the precise types of information that change hands in the process. By distinguishing between inbound and outbound information and the specific

destinations it now becomes clearer what the challenges are in gaining control over the flow of information and documents.

Adding a Value Hierarchy to the Model

Interactions that result in not only exchange – but also change – of information are the most valuable interactions. If nothing more were needed than exchange we would not achieve collaboration. This was the big flaw of the dot-com foray in the packaging sector. Exchanges added little value – whether of dollars or data – without an enhancement to the underlying products. And for packaging that is the basic problem – the packaging may not be clearly defined. Once the development process is frozen into a released set of specifications 80% of the costs are embedded, leaving only 20% of the problem to work on for those in manufacturing. The interesting opportunities for packaging professionals are in development, optimization, standardization and consolidation – activities prior to release.

Chart 3 provides a value hierarchy to the discussion. We rate each participant in the packaging process according to the following attributes:

- Low Value-Add – Non-participants in the project-by-project product development process
- High Value-Add – Key instigators and developers of product
- Passive Value-Add – Involved in execution of determined products and processes

Each square in the chart represents an interaction between two participants. Data flows are horizontal, so information in any given row is information outbound from that participant to the participant in the column. The high value-add relationships are characterized by iterative interactions cycling around the development process. In the case of packaging these high value interactions extend beyond the product manufacturing enterprise and out to the packaging supply chain. This is where new Internet tools can come into play. Web-based applications help lower the barriers to entry to the diverse levels of technical capabilities that exist in the global packaging supply chain. Many package manufacturers and distributors do not typically use the kinds of sophisticated tools common in the product R&D and engineering departments of their customers.
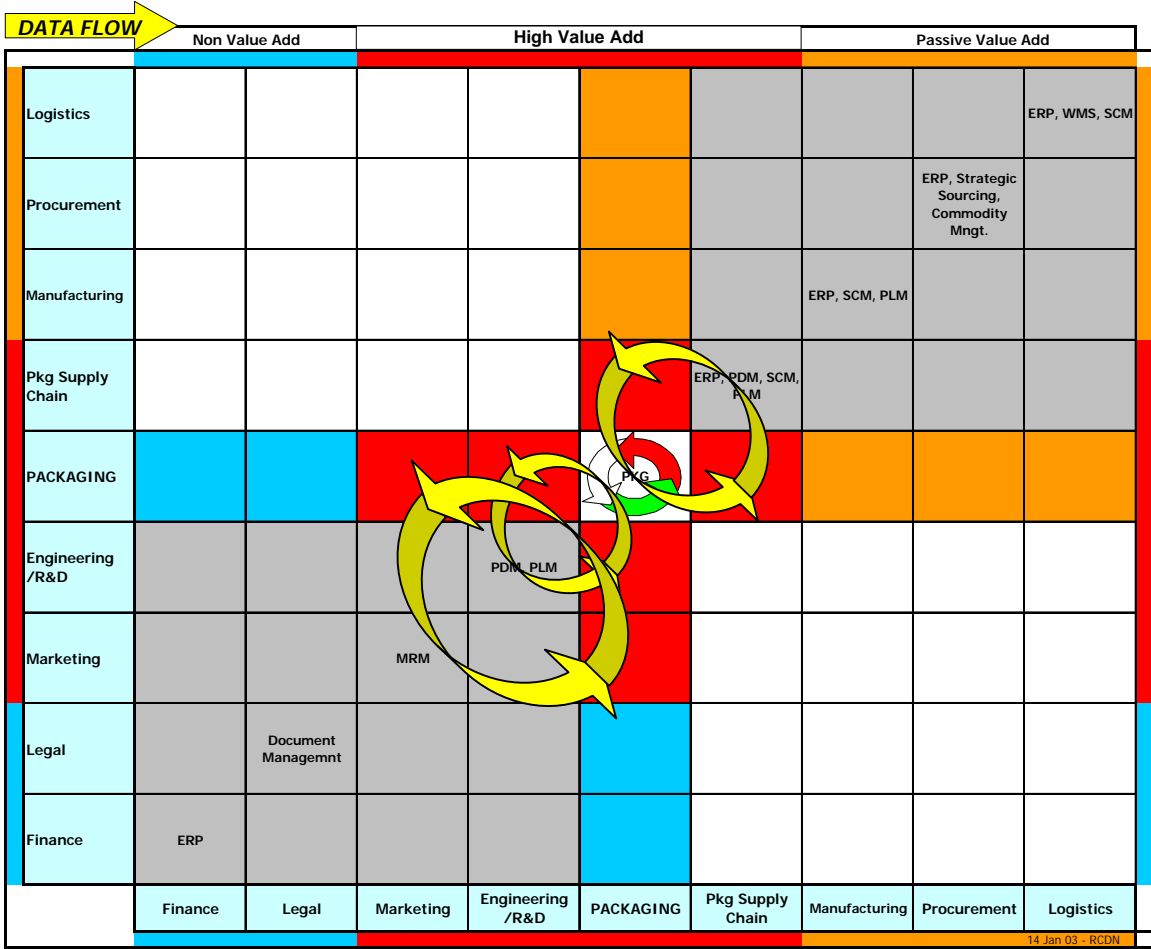
	Non Value Add		High Value Add				Passive Value Add		
Logistics									ERP, WMS, SCM
Procurement								ERP, Strategic Sourcing, Commodity Mngt.	
Manufacturing							ERP, SCM, PLM		
Pkg Supply Chain						ERP, PDM, SCM, PLM			
PACKAGING					PKG				
Engineering /R&D				PDM, PLM					
Marketing			MRM						
Legal		Document Managemnt							
Finance	ERP								
	Finance	Legal	Marketing	Engineering /R&D	PACKAGING	Pkg Supply Chain	Manufacturing	Procurement	Logistics

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Chart 3

Putting it all Together

As mentioned earlier, engineering R&D and Marketing are the initiators of products. Product information drives packaging development and configuration. Decisions made about packaging influence an entire array of direct product costs, indirect costs, and intangible attributes. It is possible to profile the information flows without regard to the location of the stakeholders – whether inside or outside the company. Partners that are able to "go with the flow" and integrate themselves into it will provide the advantages of their expertise without the friction of communication bottlenecks.

DATA FLOW — Packaging Information Process Model

	Non Value Add		High Value Add				Passive Value Add		
Logistics					Warehousing and Shipping Parameters			Warehousing and Shipping Parameters	ERP, WMS, SCM
Procurement					Costs, Suppliers	RFQ, Purchase Orders		**ERP, Strategic Sourcing, Commodity Mngt.**	
Manufacturing					Capabilities, Mfg Locations, Ergonomics		ERP, SCM, PLM		Warehousing and Shipping Parameters
Pkg Supply Chain					Capabilities, Prototypes, Costs, CAD	ERP, PDM, SCM, PLM		Quotations, Dates	
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Engineering /R&D		Compliance Docs	Prototypes, Costs, Release Dates	**PDM, PLM**	Product Data, Models, Prototypes				
Marketing	Forecasts	Artwork	**MRM**	Product Marketing Brief, Forecast release dates, Quantities	Product Mkt Brief, Pkg Prefs, Dates, Qtys, Graphics				
Legal		**Document Managemnt**	Labeling Requirements, copyright, compliance	Regulatory constraints, compliance, hazmat	Security, liability, hazmat, labeling				
Finance	**ERP**		Budgets, Revenue Goals						
	Finance	**Legal**	**Marketing**	**Engineering /R&D**	**PACKAGING**	**Pkg Supply Chain**	**Manufacturing**	**Procurement**	**Logistics**

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Chart 4

Drilling Down

A major advantage of modeling packaging information with this model is that it makes manageable otherwise very unwieldy methods of displaying complex data interactions. We have seen many very large spreadsheets created to capture all of the activities and exchanges between participants and departments. By using this matrix it is possible to "drill down" from each square to worksheets that display all of the interactions from one group to another in sequence by phase of activity (Chart 5).
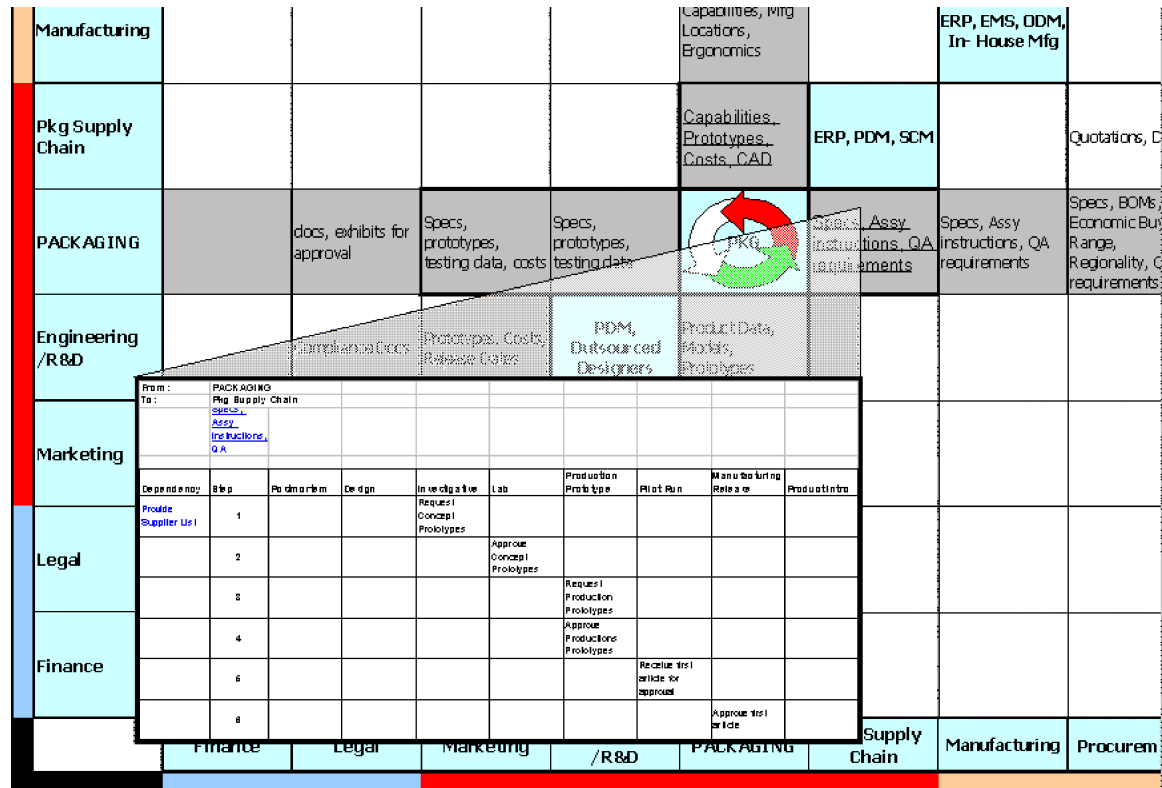

Chart 5

Dilution of Interest

This is all nice and orderly, but what happens – as is often the case – when the outsourced manufacturer for a product is responsible for package design, sourcing or procurement? In this case the packaging department is still responsible for the correlation between product requirements and packaging suitability. The position in the chart between Packaging Supply Chain and Manufacturing is switched. The key collaborative relationship becomes twice removed. And here is where the trend toward globalization and outsourcing really runs packaging into trouble. Now the transfer of product variables to the packaging supply chain is only as good as the ability of the outsourced manufacturer to discern the significant parameters and effectively communicate them to his package developer/supplier. This dilution of interest in the quality of packaging solutions extends to many areas of concern including Cost of Goods Sold, Customer Satisfaction and Brand Equity.

The beginning point to solving this problem is to connect all the players to a single, comprehensive, online packaging information system. Outsourced manufacturers are taking packaging information in incomplete and incorrect documents. It is sometimes easier for a contract manufacturer to transfer a complex product from one facility to another than it is to move the packaging production, since the packaging is managed through relationships and tribal knowledge of local suppliers rather than comprehensive systems that support packaging requirements.

The Measurement Gap

If either the product manufacturer or the package manufacturer had comprehensive and scalable, packaging centric, collaborative tools for the purpose of developing and managing packaging solutions we would have a different story on our hands. But this is not the state of the industry. Even without the complexities introduced by outsourcing, few companies have a grasp of the total cost impacts of packaging and the opportunities that can be gained by understanding them. Packaging materials – the traditional focus of cost-cutting efforts – only represent a small percentage of the total cost impacts of packaging on product. Savings can far exceed those made possible by simply reducing material costs.
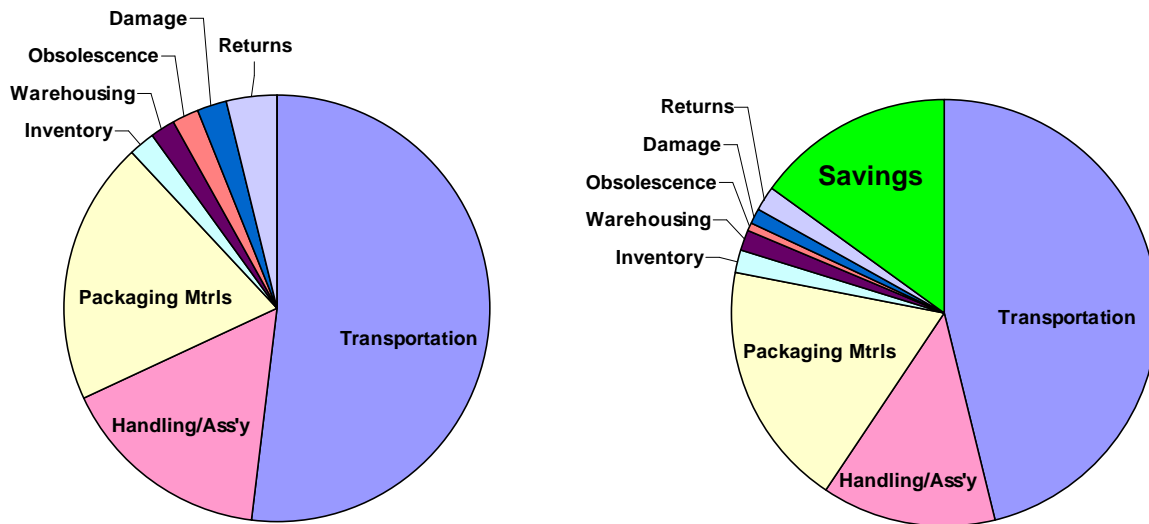

Chart 6

Chart 6 illustrates some of the areas that packaging decisions affect. Excluded from the chart is Product. This shows the cost of packaging materials and those areas that packaging decisions directly impact. The chart is an example from a theoretical company. However, using this approach a company, division, product line and product can be thus profiled. Establishing a comprehensive system for managing packaging information is a first step in gaining access and measuring the value opportunities that exist in many companies today.

Packaging as an Online, Horizontal Service across Divisions

Another source of complexity is that packaging departments are frequently fragmented between divisions of the same company. However, the activities of developing and managing packaging information systems can often lead to leveraging packaging information across divisions in order to leverage purchasing, share best practices and perform analysis and consolidation – driving savings into different aspects of the impact of packaging. A lot of flexibility accrues when the packaging departments are supported by a common system (i.e. web-based). This kind of online service this system lends itself to the kind of cross-fertilization needed in packaging development and is commonly impeded by rigid and siloed information systems.

Volume, Value, Velocity – Drivers to Integration Priorities

The nature of packaging as a horizontal process, a key driver of total cost of products and a largely untapped area of value capture across the extended enterprise raises the question of how to implement an improvement to the process within the budgetary and organizational constraints of businesses today. Clearly, most packaging departments would benefit immediately simply by having a centralized repository for packaging information with leveragable data. The next step would be to prioritize any integration efforts. *Table 5* provides an attempt to prioritizing those efforts. It has been our experience that the first integration should be with product data, since product data is what is driving package development. However, each company varies as to where the pain points lie.

Volume refers to the quantity of data that must be moved through the packaging process. For example, when an automobile manufacturer releases a new model year thousands of parts hit the deck at the same time for package configuration and development. Velocity refers to the speed at which response must be made to new information. A new product introduction for a hot new market must run rapidly through design alternatives and iterations to achieve an optimized result on time before product launch. Value in this instance refers to the ability of various participants in this example to modify and innovate to maximize the results and the ultimate success of the product. Value can also obtain from analysis of existing packaging systems to consolidate and optimize solutions. Table 5 provides an example rating the 3 V's for a sample company. In the last column, "intrinsic to net", the visibility provided by integration is intrinsic to the architecture of an online, browser-based application. In this example it is clear that the first – and maybe only – integration priority is with product engineering.

Group	Volume	Value	Velocity	Total	Intrinsic to Net
Finance	2	1	1	4	
Legal	0	0	0	0	
Marketing	3	3	3	9	X
Engineering	3	3	3	9	
Packaging	3	3	3	9	X
Pkg. Supply Chain	3	3	3	9	X
Manufacturing	2	1	2	5	X
Procurement	2	1	3	6	
Logistics	3	1	2	6	
TOTAL	21	16	20	57	

Table 5

Strategic Vision

Today, more than ever, packaging departments are straining to contend with the challenges of their jobs. And never have their jobs been more important. However, most packaging professionals spend significant amounts of time moving information around, responding to inquiries and uploading information in redundant systems. Few have enough time to spend applying their expertise to solving the really high value-add problems in packaging. But if they did have the time they would soon find that despite the fact that they spend all their time moving information around that there just isn't sufficient information to perform the accurate analysis that leads to optimization, standardization, consolidation and total cost reduction.

This paper is an effort to provide some concept models and possible tools that packaging professionals could use to articulate their problems to the executives in their companies that actually have the ability to make and fund changes. Profiling the information landscape for packaging can be a daunting task, and it is hoped that having a matrix to begin gathering data can help.

With the ever more complex environment in which companies operate it can be very difficult to preserve the design rationale for packaging systems and then assure that they remain responsive to that rationale throughout product lifecycle. Distinct challenges to this need arise from the separation of packaging from the rationale that drives it as the outsourcing model proliferates.

Next steps in this pursuit is to develop an analysis methodology that can capture the key interactions between participants and departments in a company, identify the information systems used, characterize the value of the information stored in these systems, and determine the best approach for that company to use. This next step is beyond the scope of this paper but it is hoped that we have brought interest to this concept so future work in these areas can be pursued.

Additional Reading

"Serious Play: How the World's Best Companies Simulate to Innovate", Michael Schrage, Tom Peters (Hardcover - December 1999)

"Beyond Ideas: There's always a good reason for failure, but never a good reason to fail.", Michael Schrage, CIO Magazine, September 1, 2002

"Managing Packaging as a Horizontal Process", Tim Lalley, Corporate Packaging Engineer, Hewlett-Packard, February 18th, 2002 Dimensions02

"Selling Packaging to your CEO", Paul G. Russell, published in the Dimensions.01 Symposium proceedings, February 27, 2001. Presented at Dimensions.01 Symposium, Presented at 2001 IoPP Annual Membership

"New Products: Supplier Collaboration", Lucine A. King – Forrester Research, Inc., March 2001

"Packaging will Follow Product", Robert DeNola, Purchasing 2010 Vision Series. Manufacturing.net - July, 2001

Key to Initializations

CEM	Contract Electronics Manufacturer
ePDM	Enterprise Product Data Management
ERP	Enterprise Resource Planning
MA	Marketing Automation
MRM	Marketing Resource Management
ODM	Original Design Manufacturer
PDM	Product Data Management
PLM	Product Lifecycle Management
SCM	Supply Chain Management
WMS	Warehouse Management System

Notes: