

ARC WHITE PAPER

By ARC Advisory Group

MAY 2012

From Molecule to Consumer: Innovative New Solutions for CPG

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Executive Overview

The consumer packaged goods (CPG) industry is currently undergoing significant changes in response to a number of factors. These include the rise of internet commerce; emerging consumer markets on a global scale; better-informed consumers who want to be engaged in product development; value-conscious buyers looking for the best buy and highest quality; and rapidly changing global demographics across age, economic class, and ethnicity.

The challenges facing the CPG industry for the near term and into the next decade will be significant and how industry participants respond to these challenges will largely determine their respective market shares, brand awareness, and bottom-line profits.

How CPG industry participants respond to these challenges in the near term and into the next decade will largely determine their respective market shares, brand awareness, and bottom-line profits.

While CPG companies are working diligently to respond to current regional and global economic conditions and value-conscious consumers, CPG market research indicates that significant demographic and economic shifts will dramatically reshape both the growth and decline of specific CPG market segments for the foreseeable future. CPG companies will need to drive organic growth while delivering on the need to create brand value and meet profit targets

Thanks in part to the multiple ways that today's PLM solutions can address each of the areas that influence the overall consumer experience, the scope of CPG product development now extends well beyond concept, formulation, and packaging to include retail and the entire consumer experience. CPG product development from molecule (formulation) to consumer (marketing/retail) has become a reality for CPG companies.

While many trends influence product development and go-to-market strategies for CPG companies, a few emerging trends will have a more significant impact. The continuing shift of consumer demographics driven by both age and family composition along with the state of the economy around the world will impact what we make and where we make it. Private label growth and its impact on brand loyalty will require higher levels of differentiation and value. And finally, with consumers being more in control, social media and the in-store experience will heavily influence how we design our complete consumer experiences.

Technologies exist to help CPG companies address all of these concerns and deliver better, faster, smarter innovation while taking these trends into account. Leading CPG companies are using these technologies today, which will not only enhance their ability to connect their entire organizations but will also drive a significant competitive advantage.

Challenges Facing the CPG Industry

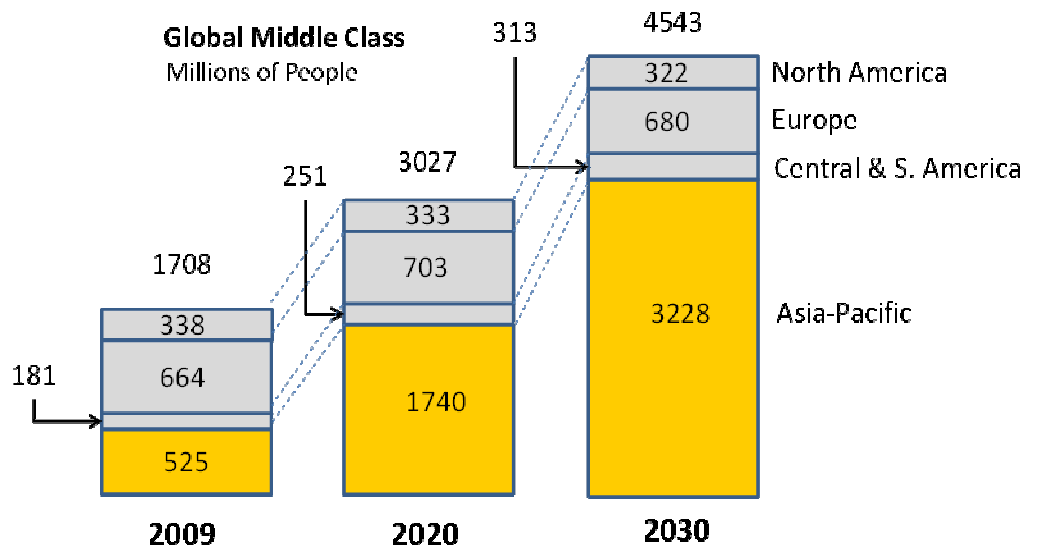
The consumer market is undergoing major changes. Both growth segments and declining market categories will be defined by the shifting global and regional demographics. Additionally, growth economies in the BRIC countries and Asia-Pacific are resulting in the emergence of new middle class of consumers with growing spending power.

In regions like North America, product developers and marketers have relied on middle class families as the primary target for CPG products. The U.S. population is getting bigger, older, and more racially and ethnically diverse. However, several demographic and economic factors will impact the basic makeup of the typical middle class family. These include fewer families with children, an aging population, and continued growth of low-income consumers. According to the U.S. Census Bureau, by 2036, households with children will outnumber those 65 and older without children by just 5 million, compared to 17 million in 2007.

Additionally, non-Hispanic white consumers will dominate the aging population and the majority of new families will be largely multi-cultural in less than two decades. It will be important for CPG companies to adapt to these shifts to gain the attention and brand loyalty of the aging Baby Boomers, multi-cultural families, and lower-income consumers of the future. While the aging population increases, the size of the typical American family will shrink according to demographic projections, with a continued decline of households with children and fewer children per household. This will most likely be offset to some extent by the increase in multi-ethnic families, but overall, there will be fewer children in the typical middle class family, which will impact revenue from products targeting those segments. Additionally, average household incomes are expected to remain unchanged or fall slightly in the next decade. Based on these projections, household spending will grow at a slower pace. The consumer for CPG

products will be looking for the best value: the best quality for the best price.

On a global scale, demographics in emerging economies are re-defining the consumer market. Countries like China, Brazil, and India have fast-growing economies that fuel a growing and more affluent middle class that will create market demands for more consumer goods. However, China also has a very large aging population segment with one citizen in three over the retirement age by 2030. Conversely, the number of people of working age will begin to decline after 2012. Overall, there are growing aging populations in the developed countries and in emerging middle class economies.



Source: Organization for Economic Co-operation and Development (OECD); Development Centre

CPG Industry Must Respond to Changing Markets

This change in the CPG market translates to growth in certain segments such as medications and remedies, health aids, vitamins for the aging demographic; basic cooking essentials such as flour, sugar, and oils, for low-income families; as well as ethnic health and beauty products for multicultural middle class segments. Some of the slower growing categories could include toys, sporting goods, breakfast foods, and baby care products.

The current demographic and economic shifts will provide both opportunities and challenges for the CPG industry. CPG companies that anticipate and develop new product strategies to meet the coming consumer demands will have a distinct competitive advantage. They must be able to respond

with innovative new products, re-positioned products, new packaging targeted to growth sectors, and above all, have the ability to maintain or enhance brand equity; providing brand value to the emerging segments. A number of important consumer trends will define the CPG market and the products and brands that comprise this market. The economy has had a significant impact on consumer behavior and a “new normal” of consumer frugality will have lasting effects on the packaging and marketing strategies of CPG brands.

Consumer Behavior Trends Drive Packaging and Brand Marketing Strategies

Current consumer trends are driving the landscape of the CPG market and will shape the brand strategy and packaging approaches significantly. Some of these trends include:

- **Private Label Growth:** Private label brands have grown significantly in the past few years and appear poised to continue steady growth going forward. Value-conscious consumers look for ways to spend smart while maintaining the quality of established brand names. Some private brands are morphing into “brands” of their own.
- **Innovation Drives Loyalty:** Dominant brands with strong consumer loyalty tend to hold on to market position even in a climate of consumer frugality and a trend toward lower-priced products. However, CPG companies are finding that they need to reinvest in even their strong brands by creating different product formats or adding innovative packaging to create competitive advantage. For example, Heinz introduced new ketchup bottle shapes to enhance usability for consumers. This relatively simple new bottle design increased sales by 20 percent and market share by 6-7 percent. The basic ketchup recipe remained unchanged, but an innovative bottle shape increased sales significantly.
- **Unique Packaging Drives Trial:** Innovative packaging can improve the consumer experience. In a CPG market where differentiation will be critical, novel packaging can provide consumers with something new. CPG providers are beginning to understand that the entire consumer experience before, during, and after the store visit is gaining importance and can be a significant driver for repeat purchase. More environmentally sustainable

“green” packaging continue to be good business. It not only demonstrates a CPG company’s values, but affords an opportunity to engage the consumer on a new level. Consumers have an increased awareness of their impact on the environment. CPG companies have an opportunity to provide sustainability as a component of the overall consumer experience. If done well, it can contribute to expressing the brand value and provide an opportunity for consumers to express their own sustainability beliefs.

- **Store Experience Takes Precedence:** With today’s technology, consumers have the ability to minimize their media exposure. This trend places greater emphasis on the in-store experience. CPG companies have the opportunity to leverage cutting edge applications to create a virtual store and determine how products are best displayed, shelved, and made available to the retail buyer. Conversely, large retailers like Wal-Mart and Target use the same applications to determine best store locations, influence buying patterns, and make more accurate inventory projections.
- **Consumers Now In Control:** Smartphone technology enables consumers to be more in control, impacting purchase decisions. The new marketing paradigm will be based on social groups and the social behavior patterns exhibited by these groups. This suggests a profound shift from the long standing demographic and psychographic approach. The formation of communities of social groups is based on natural human behavior traits and will impact decisions regarding choice of products and services. The emergence of communities based on social groups serves to concentrate and coalesce the shared interests and even cultural commonalities, which can provide very specific information on exactly what this group will buy. Marketers will need to leverage these new touch points to strengthen brand equity and drive/co-create new products.

Product Development Requirements for CPG

Within the three main areas of new product innovation: product, package and shelf design; new challenges and opportunities exist. Each of these

areas requires a unique set of experiences, technology, and solutions to enable innovation in today's work environment of doing more with less. While the process begins in the discovery stage with ideation and concept development and testing, critical intellectual property is created during product and package development. In addition, three areas of influence for both trial and repeat purchase impact our ability to connect with consumers in mind, in store, and in use.

Formula Design: A Critical Step in Product Development

For CPG companies the formula is the *IP kernel* that is most important. The formula forms the very foundation of the innovation process. It helps create differentiation in the marketplace and can help CGP companies win with consumers. However, there is a recognized gap in serving the formulation needs of the industry and linking these tightly to the overall bill of material, package design, and the label.

At this point, the "in use" moment of truth comes into play. This involves the actual experience of the consumer during product use. This moment of truth strongly influences repeat purchase. Does the product deliver against its promise? Formulation requires R&D to develop a product formula that most closely meets the product concept. Formula design is a complex process that deals with a number of issues before the first prototype is test marketed. To create new consumer products, formulators must combine raw materials under strict regulatory guidelines into safe, stable, efficacious, and cost-effective formulations.

Among other requirements, the formulator/chemist must: 1) manage changing market requirements; 2) develop dozens and sometimes hundreds of prototypes; 3) stay informed on new raw materials and the latest research; 4) create formulations that meet the varying multi-national regulatory requirements; 5) understand the impact of each raw material on the formula cost; 6) ensure that the final formulas are stable. Moreover, a comprehensive formulation solution functions as one of the best forms of risk mitigation by ensuring accuracy and brand integrity long before the product reaches the shelf or is used by the consumer.

Clearly, CPG formulators have more to do than ensconce themselves in a lab and mix ingredients. They must manage complex R&D methods and procedures along with searching and sourcing raw materials, accessing all information for regulations for all global regions, and tracking and managing formula data. Formulators need intelligent software that helps them

with this entire process; software that will help them create more sustainable new products in less time, reduce re-work, and eliminate non-value-added tasks.

Packaging: Critical Component for CPG Industry

Designing the packaging concurrently with product design is important. The packaging represents the biggest impact on the “in store” moment of truth for the consumer. This deals directly with customer experience with the product in the context of the store and the shelf. Recently, packaging has received greater recognition for its role in influencing a purchase decision and building brand equity. Everything from the package design, simulation of the package form, fit, and function, to the package within the packaging machine production environment, to the impact of the package on the consumer experience are all essential elements of the CPG product development process.

Today’s design applications provide package designers with the tools needed to create eye-catching designs that appeal to consumers. Designers can try out shapes that provide package fit, form, and function to meet packaging machine requirements, as well as provide pleasing aesthetics and lines. These enhance the consumer experience, promoting retail sales. Packages can be tested to determine the characteristics of shape, fit, function, ease of use, strength, and even the optimum design for packaging machines and filling lines. Simulation plays a large role in the CPG industry today, from package testing to simulation of batch process mixing operations. Additionally, with today’s design tools package designers can incorporate the list of ingredients onto the label, accurately and in accordance with regulations.

The New Retail Environment: Providing the Customer Experience

Today, the scope of CPG product innovation extends beyond concept, formulation, and packaging, to include retail and the in-store consumer experience, the “moment of truth.” The notion of the CPG product development process extending from molecule (for-

mulation) to consumer (marketing/retail) has become a reality for leading CPG companies. Moreover, CPG companies now have the ability to create, test, and modify consumer experiences in an in-store 3D environment that can help maximize

One of the ways that the CPG industry is moving directly to the retail sector and engaging the consumer is through PLM solutions that provide the consumer with a 3D virtual shopping experience.

the overall consumer experience.

CPG companies are not only simulating and testing chemical designs for formulated products and packaging designs, but now use simulation tools and applications to create the entire virtual retail environment. This enables them to simulate and test a virtual retail store and determine how their products will best fit into the real retail environment for the optimum customer experience and enhanced retailer results.

PLM Connects People and Data to Integrate CPG Business Processes

The unique value proposition that PLM brings to the overall CPG business processes (formulation, packaging, retail, etc.) is to integrate all these processes into a single end-to-end process. PLM enables all stakeholders across the various CPG business functions to access, share, and exchange information, data, and processes. Most importantly PLM enables stakeholders to assess the impact and constraints that each CPG business process will have on the overall product development. Moreover, PLM enables a CPG company to integrate and streamline this development from the innovation and concept phase, through formulation, packaging, to the retail shelf. PLM connects people, information, processes, and knowledge in a timely, accurate, and always-available manner.

Dassault Systèmes Offers End-to-End Solutions for CPG Innovation

Dassault Systèmes (3DS), a leading global PLM supplier, has developed an end-to-end solution for the CPG industry. The best way to describe this solution is to place CPG lifecycle in the context of an iterative innovation spiral. There are 3DS solutions that address and enable each of the major CPG product development areas.

The 3DS innovation spiral for CPG begins with *Defining the Brand*; the product concept and the creative process so necessary to bring new and innovative products to the market. Here 3DS solutions provide CPG companies with the ability to gauge consumer reaction to product concepts, build communities to collaborate with consumers and analyze how product concepts might impact the market.

Along with the ideation and concept development efforts, *Defining the Innovation Portfolio* creates the right balance of initiatives to achieve our overall business goals. 3DS provides solutions that not only help manage individual projects meet their time, cost and schedule targets, but creates visibility into the entire portfolio.



CPG-Retail Social Industry Experience: Transforming How Companies Innovate from “Idea to Consumer”

Then there is the need for *Discovering the Formula*. Product formulas must be created or modified to deliver against the target audience needs, ensuring regulatory compliance and quality control across the globe. 3DS provides best-in-class formula design solutions that enable companies to deploy strategies that leverage cost containment, regulatory compliance and faster time to market.

For *Design the Package*, 3DS packaging design solutions allow product developers to rapidly design and render packaging, artwork and labeling in 3D.

Next in the innovation spiral comes *Make the Product*, where production line dynamics and packaging designs can be simulated realistically and vali-

dated. 3DS solutions provide CPG production engineers with the ability to simulate and optimize complete production line efficiency.

Build the Store and Sell it on the Shelf completes the innovation spiral for product development. Here, 3DS applications for creating 3D virtual retail environments provide the user with the ability to use 3D media to create a virtual shopping experience to reach consumers and to strengthen and fulfill product brand strategies.

Dassault Systèmes' search-based technology, **Exalead**, adds a new level of information and creative potential to both the CPG product development process and the retail domain. Exalead's comprehensive search abilities, both inside and outside the enterprise, allow CPG companies to use real-time data to make critical market decisions. **Netvibes**, Dassault Systèmes' newest acquisition, then enables this real-time information to be displayed via a personalized dashboard. According to 3DS, this delivers an "information intelligence experience" for real-time monitoring, social analytics, knowledge sharing, and decision support.

Recommendations

Clearly, the CPG product development cycle has expanded in scope beyond the traditional areas of formulation and packaging. To compete profitably in today's highly competitive market, CPG companies must be able to leverage a product development process that spans from concept to consumer.

To compete profitably in today's highly competitive market, CPG companies must be able to deal with a product development process that spans from concept to consumer.

They must be able to bring innovative new products to market while maintaining and sustaining brand equity and customer loyalty. Moreover, they must be able to expand their ideation and creation process while monitoring the pulse of the consumer market and engaging consumers to understand their needs, wants, and beliefs. Lastly, they must

also understand the needs and requirements of their retail partners. All these requirements result from the expanding scope of the CPG product development cycle and the CPG companies that leverage the solutions available in the market today will emerge the winners.

ARC Advisory Group believes that Dassault Systèmes recognizes the unique challenges facing the CPG industry today and understands that companies have to approach CPG product development as an end-to-end

process across multiple areas, using unique solutions and applications. 3DS offers a comprehensive set of solutions that address today's expanded scope of product development needs. CPG companies should consider that all product, process, and production domains of the CPG product lifecycle have to flow together in a continuous and uninterrupted stream of development to the consumer. ARC believes that 3DS solutions for the CPG industry can provide industry participants with the ability to develop better, faster, smarter consumer-centric innovation.

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Acronym Reference: For a complete list of industry acronyms, refer to our web page at www.arcweb.com/Research/IndustryTerms/

API	Application Program Interface	HMI	Human Machine Interface
B2B	Business-to-Business	IOP	Interoperability
BPM	Business Process Management	IT	Information Technology
CAGR	Compound Annual Growth Rate	MIS	Management Information System
CAD	Computer Aided Design	OpX	Operational Excellence
CAE	Computer Aided Engineering	PDM	Product Data Management
CPG	Consumer Packaged Goods	PLC	Programmable Logic Controller
CPM	Collaborative Production Management	PLM	Product Lifecycle Management
CRM	Customer Relationship Management	RFID	Radio Frequency Identification
DM	Digital Manufacturing	ROA	Return on Assets
EAM	Enterprise Asset Management	RPM	Real-time Performance Management
ERP	Enterprise Resource Planning	SCM	Supply Chain Management
		WMS	Warehouse Management System

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