## Product Lifecycle Management in the Telecommunications Industry: A Critical Perspective for Survival and Success

A whitepaper from:

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School of Management
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# C4iSN

CENTER FOR INTELLIGENT SUPPLY NETWORKS

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# Executive Summary

**Introduction**

With worldwide revenues exceeding $1.2 trillion dollars annually, the Telecom industry is one of the largest, serving the needs of an increasingly global and interconnected world. It is also one of the more complex industries due to the following characteristics:

- *Multiple products and levels*: The product, in the eyes of end-users, is becoming an "experience" that is based on the delivery of voice, video, and data as an integrated package across mobile and fixed infrastructure — which, deconstructed reveals multiple layers of hardware, software, and services.

- *Rapid technology innovation (and obsolescence)*: While convergence creates new opportunities for growth through innovation, competition is intense as companies race to gain first-mover advantage — which accelerates obsolescence at all levels.

- *Fragmented supply chains*: Far from the days of the vertically-integrated monopoly of the past, today's typical Telecom supply chain is a highly fragmented global operation where multiple enterprises (and supply chains) must collaborate to design, develop, and deliver a coordinated experience.

Taken together, these characteristics underscore the fact that Product Lifecycle Management (PLM) in Telecom is a multi-dimensional topic (as shown in Figure 1). The intent of this paper is to explore these dimensions and help the reader gain a broad perspective of PLM in the Telecom industry. In order to help "connect the dots" and present the "big picture", this paper is organized as a series of focused questions, which are summarized below:

**(I) What's happening in terms of end-user trends?**
- How are customer expectations changing?
- Why is innovation getting a lot of attention these days?
- How can PLM address the CEO's priority to innovate?

**(II) What are the key supply chain trends?**
- How has the Telecom industry chain landscape evolved?
- What is the supply chain structure that has emerged?
- What are the risks of not thinking through the lifecycle?

**(III) What are the key PLM considerations for Telecom?**
- Why is Product Lifecycle Management critical to Telecom?
- How do the Telecom players make money?
- Why is collaboration critical, especially in a globally distributed operation?
- Why is risk management becoming more important?
- What are the emerging growth areas in Telecom?
- What are the key PLM technology enablers for Telecom?
- Why should Telecom companies make PLM their priority?



End-user trends

Supply chain trends

Product lifecycle considera-

Figure 1: PLM in Telecom is a multidimensional challenge

# End-user trends

In the past, the Telecom industry was dominated by large, vertically integrated monopolies who dictated the terms of service (in a single category like voice or data over wireline, cable, etc.) to their customers. The objective of this network-centric business model was simple: maximize the profitability of large infrastructure investments by extending their lifecycles as long as possible. But since deregulation in 1984 (in the U.S.), the customer has been steadily moving towards the center of this universe as shown below in Figure 2:
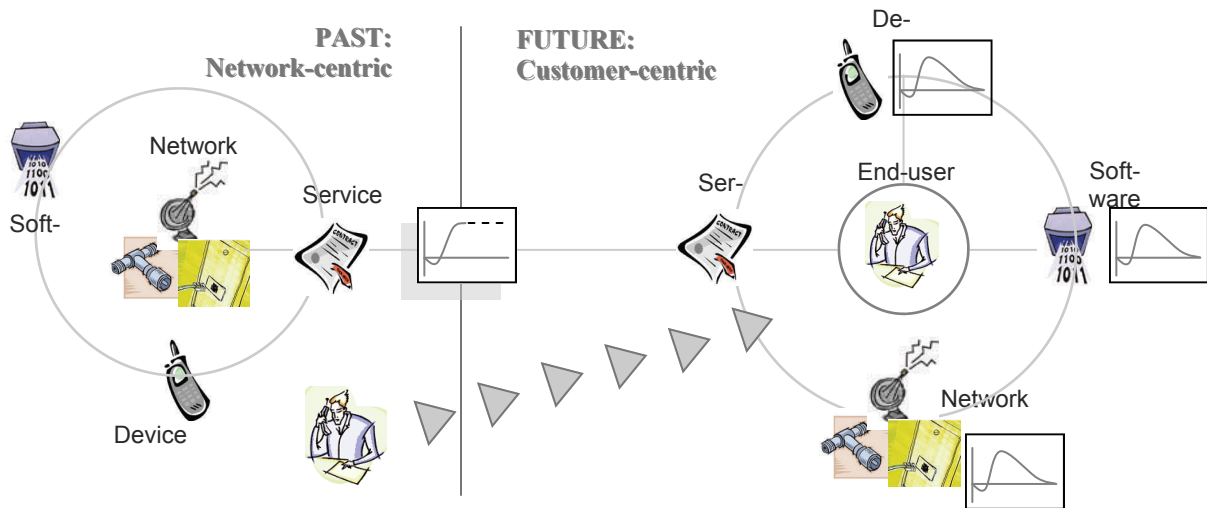


Figure 2: The shift towards a customer-centric universe

**Competition is the driving force.**
The asset-intensive nature of the service providers makes it challenging to be truly customer-centric in the Telecom business. Customer loyalty has been crucial to success in a business model that traditionally assumed a lifecycle of 10-15 years for its infrastructure investments. But rapid technology advances are undermining that model as service providers are under constant pressure to upgrade their infrastructure at significant cost — or risk losing market share.

**Customers want to buy an experience.**
Customer expectations have also changed along with the advances in technology. What used to be a utility device for voice communications is now increasingly becoming a multi-media entertainment device, forcing the service provider to be capable of delivering a bundled set of services — such as the triple-play offer of video, VOIP, data — via a high-bandwidth network (e.g., fiber to the premises) that is focused on the end-user "experience" — a significant challenge that requires synchronizing multiple product lifecycles.

**Maximizing the end-user service lifecycle is the goal.**
Considering the fact that it costs 5 times as much to acquire a new customer than to retain an existing one, it is the lifecycle of the service contract that's the new focus. Ultimately, it is this strategic realignment of multiple lifecycles of products, software, and services that is behind the many changes that we are seeing in the Telecom industry today.

# Focus on innovation

According to a recent survey of CEOs worldwide, innovation is now ranked the #1 business issue on their agenda[1]. The concern is not that companies aren't innovating today. Rather, the focus is on the need to do more and faster as a means to rapidly adapt in an increasingly dynamic business environment.
After all, cutting costs through efficiency can only go so far. Today's market leaders clearly recognize that a strategy for increasing top-line revenue must have innovation at the core of its growth engine.

**Innovation is more than just new product development.**
Another study by Boston Consulting Group and BusinessWeek showed that CEOs are thinking in much broader terms, and that their innovation mandate isn't just about new products[2] (i.e., product innovation) but that it included two additional dimensions:

*Process Innovation*: Innovation is also about redesigning the underlying business practices that help take these products to market profitably. A Telecom example could be the launch of a new service capability based on mobile RFID technology which requires the synchronization of multiple supply chains to ensure an integrated customer experience.

*Business Model Innovation*: Ultimately, innovation can also help re-evaluate the business focus and the requisite core competencies. In Telecom, this is evident as carriers who traditionally avoided contracts with extensive integration requirements are now actively pursuing these types of projects (and competing with traditional systems integrators) to ensure their long-term survival.

**Innovation comes from employees, partners, and customers.**
Another important aspect of the study found that CEOs recognized that people were at the core of any innovation initiative. They identified employees as the most significant source of innovation, followed by business partners and then customers. A relevant example is the Apple iPod: R&D initially wasn't sure of what it had, but once in the hands of customers, its application became evident — and the rest is history. The notion that innovation is no longer restricted to a select few inside the research labs of the organization — but actually being facilitated by the many on the outside — is very real to Telecom, given its ubiquitous nature.

**A lifecycle view helps understand the whole picture.**
Last but not least, the BCG-BusinessWeek survey discovered that almost half the respondents who identified innovation as a priority were disappointed in their returns on investment in that area. This is where Product Lifecycle Management (PLM) becomes an invaluable discipline because it represents the vital thread that brings together the top three sources of innovation —
employees, business partners, and customers — to successfully deliver on the growth and profitability objectives of the company and its supply chain partners.

[1] Global CEO Study 2006: Expanding the Innovation Horizon, IBM
[2] The World's Most Innovative Companies: BusinessWeek, April 24, 2006

# Innovation and PLM
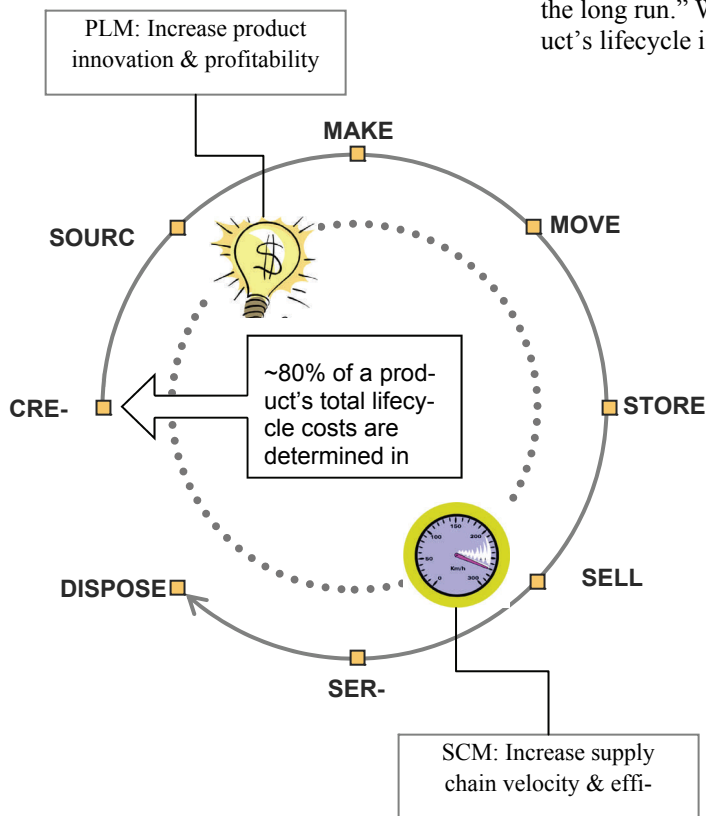
**Product Lifecycle Management is growing in importance.**
PLM isn't a new concept. Even before the term was coined, it was already a fundamental construct of any product-based business strategy. But it has captured the spotlight today because of its potential as a core discipline that can help address the innovation issue. With shrinking product lifecycles across the board, companies no longer have the luxury of assuming that "things will work out in the long run." When studies show that 80% of the total cost structure over a product's lifecycle is pre-determined during the concept and design phase (Figure 3), a shorter lifecycle dramatically increases the risk of not recouping product investments.

**PLM is everyone's responsibility.**
Traditionally, we've thought of product innovation as the domain of engineering. As the vertically-integrated enterprise of yesterday evolves towards a dispersed or virtual structure where many functions are being managed by business partners, the product lifecycle perspective becomes more important because it provides a holistic view across disparate enterprise silos in order to provide a coordinated response to the end-customer — who is ultimate driver of demand. Thus, PLM isn't just for the enterprise that designs a product — it needs to be embraced by every enterprise that supports it in the end-to-end supply chain.

**PLM helps align multiple lifecycles for profitability.**
In Telecom, delivering a unified experience to the end-user requires the synchronization of multiple lifecycles of consumer devices, software applications, and network infrastructure across a number of industry players. PLM provides the basis for the "design chain" that shows the critical linkages that need to be managed over the lifecycle of the end-user experience.

**PLM drives SCM.**
Product Lifecycle Management and Supply Chain Management are highly inter-related disciplines and should not be viewed independently (Figure 3). Because if we expect the rate of new product introductions to increase in the future, then inevitably, the supply chain supporting it must also dynamically change. Taken together, the opportunities for innovation dramatically increase because PLM and SCM expand the scope of innovation from product to process and business model innovation — which ultimately helps drive top-line growth and reduce bottom-line expenses.



Figure 3: PLM helps shape a product's financial profile while SCM helps to execute and adapt

PLM: Increase product innovation & profitability

~80% of a product's total lifecycle costs are determined in

SCM: Increase supply chain velocity & effi-

MAKE · MOVE · STORE · SELL · SER- · DISPOSE · CRE- · SOURC

# Industry evolution

The evolution of the Telecom industry reveals drastic changes among the players over the last two decades. Figure 4 depicts two contrasting scenarios:

- Under the old network-centric model, the supply chain strategy follows a "push-based" model in which the supplier is more powerful than the customer. The supplier controls or "pushes" supply and has the luxury of putting efficiency ahead of customer responsiveness.

- In the emerging customer-centric or demand-driven model, the customer is more powerful than the supplier as the customer effectively "pulls" the supply chain, and thus the supplier has to put responsiveness ahead of efficiency.

For sake of brevity, we summarize the evolution (of the U.S. market) through a series of snapshots to highlight key points relevant to the PLM discussion.

- **1980s:** Until its divestiture in 1984, AT&T played the combined role of service provider and technology OEM as shown on the left side of Figure 4. *During this time, the product lifecycle was fully controlled by AT&T up to divestiture; the PLM perspective began to fragment as the strategies of the operating companies and its manufacturing operations diverged in the late 1980s.*

- **Early 90s:** Wireless and cable growth takes off. Rapid advances in IP networking and wireless technologies shift power to the Network OEMs. Customers must still acquire phone, cable, wireless, and satellite services from different vendors, and competition is largely confined within those segments. *Product lifecycles for wireline, wireless, and cable technologies exist independent of each another.*

- **Late 90s:** OEMs shift to global sourcing strategies to contain costs. Outsourcing accelerates and practically every network OEM transfers its production assets and processes to contract manufacturers. *With the demise of the vertically integrated enterprise, the supply chain becomes fragmented.*

- **2000s:** A combination of factors — including overexpansion, fraud, complex regulation, and nonstop pricing pressures — come together to create an industry meltdown. As the industry starts its recovery in 2004, the structural changes continue. Service providers focus on developing the right portfolio to support the convergence of voice, video on data across wireline, cable, and wireless through consolidation. Network OEMs and their suppliers face regulatory pressures like WEEE (Waste of Electrical & Electronic Equipment) and RoHS (Restriction of Hazardous Substances), and licensing issues like 3G. Increasing obsolescence and cost pressures driven by global competitors are affecting all players. *In addition to supply chain fragmentation, there is also "design chain" fragmentation creating synchronization challenges across the portfolio of products and services demanded by the end-consumer.*

This brief summary captures the backdrop against which the major supply chain players find themselves in today's environment.
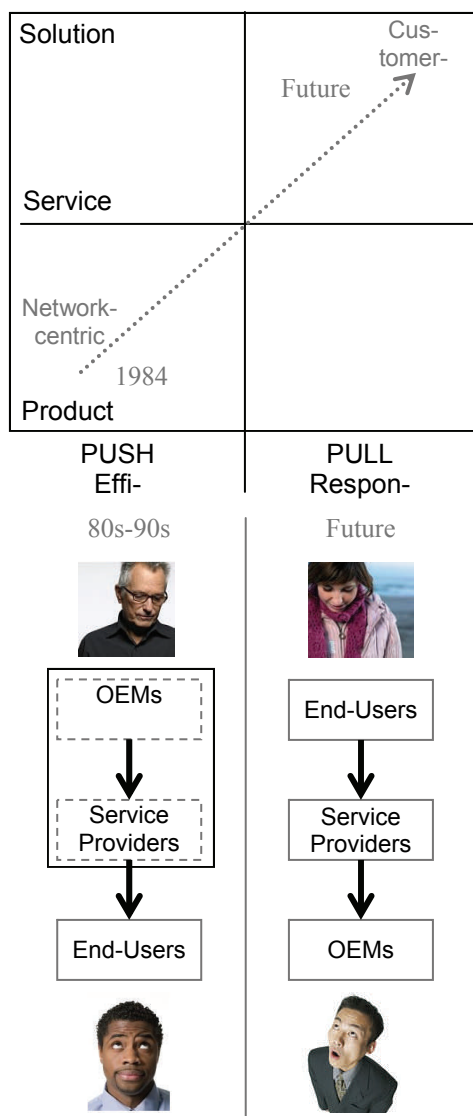


Figure 4: The power shift from the OEM to the End-user means supply chains must be reconfigured to deliver customer-centric solutions

# The "forward" supply chain structure

Despite the high degree of fragmentation, the Telecom supply chain can be grouped (as shown in Figure 5) into three "sub-ecosystems": (1) the Customer Service group; (2) the OEM group; and (3) the Supplier group.

**(1) Customer Service group**: This group includes carriers and systems integrators who are focused on capturing the business and end-consumer segments. Along with their value-added service partners, their priority is customer acquisition and retention via the right portfolio of service offerings.
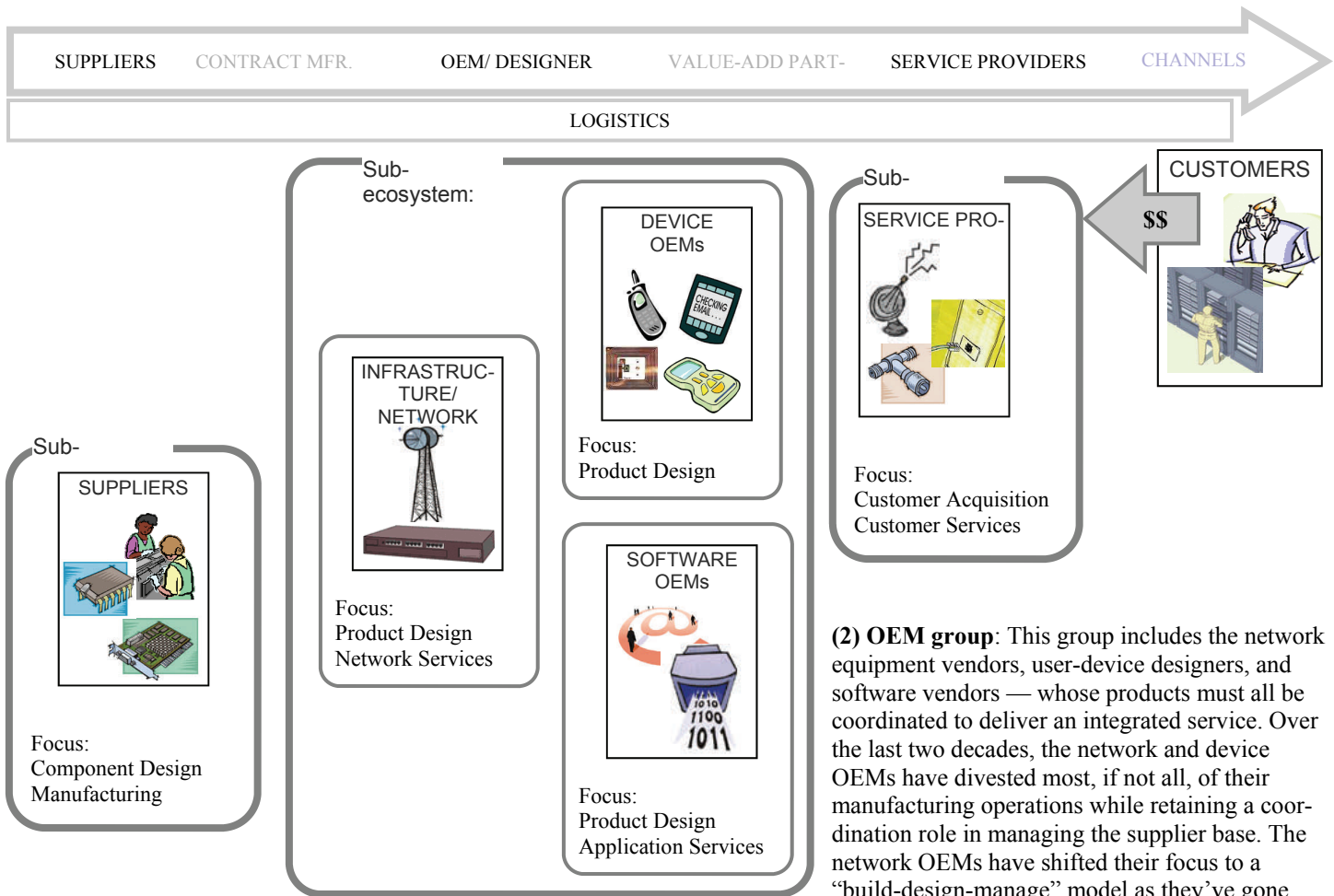


| SUPPLIERS | CONTRACT MFR. | OEM/ DESIGNER | VALUE-ADD PART- | SERVICE PROVIDERS | CHANNELS |

LOGISTICS

Figure 5: The "forward" supply chain structure Wave")

**(2) OEM group**: This group includes the network equipment vendors, user-device designers, and software vendors — whose products must all be coordinated to deliver an integrated service. Over the last two decades, the network and device OEMs have divested most, if not all, of their manufacturing operations while retaining a coordination role in managing the supplier base. The network OEMs have shifted their focus to a "build-design-manage" model as they've gone after services revenues to make up for declining product-based revenues. (The third group, i.e., the applications software OEMS, is discussed separately. See "Applications Growth: The Next Wave")

**(3) Supplier group**: This group includes the contract manufacturers and component suppliers where multiple tiers of supply are often involved. In addition to manufacturing, recent trends show contract manufacturers and suppliers taking on more design responsibilities from their OEM partners.

# The "reverse" supply chain structure

**Don't overlook the "reverse" supply chain**: The traditional view is that the supply chain ends when customer has purchased the product. However, a true end-to-end perspective needs to also consider the "reverse" supply chain (shown in Figure 6). Often overlooked, the "reverse" supply chain is quickly gaining importance for a number of reasons. Typical considerations include:

- Returns and refurbishment: As handsets become more complex, consumers may return working units that — with minor updates and/or spares — can be put back into the field. These processes represent huge cost savings that off-set increasing warranty costs.

- Recycling and disposal: Increasing regulations governing this area include RoHS (Restriction of Hazardous Substances) and WEEE (Waste of Electronic & Electrical Equipment) that can mean huge penalties for non-compliance, not to mention negative publicity.
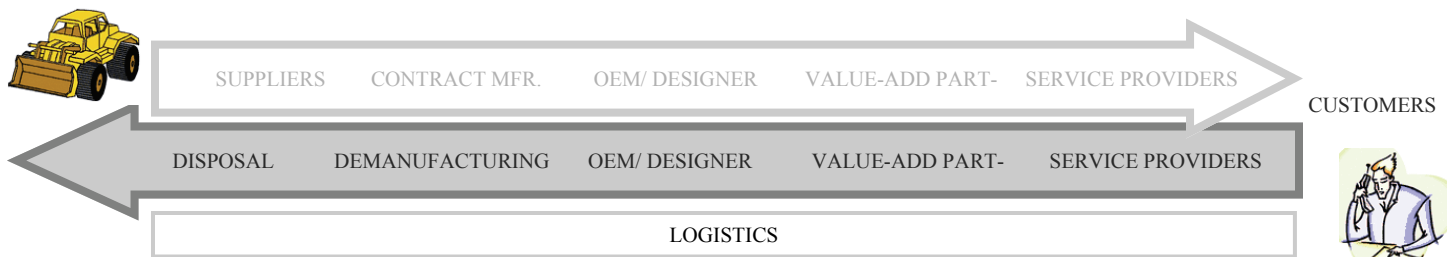
| SUPPLIERS | CONTRACT MFR. | OEM/ DESIGNER | VALUE-ADD PART- | SERVICE PROVIDERS |
| --- | --- | --- | --- | --- |

CUSTOMERS

| DISPOSAL | DEMANUFACTURING | OEM/ DESIGNER | VALUE-ADD PART- | SERVICE PROVIDERS |
| --- | --- | --- | --- | --- |

LOGISTICS

Figure 6: The "reverse" supply chain structure

With the increasing emphasis on corporate social responsibility and a socially conscious consumer, it's the brand owners who stand to lose the most on these issues, and thus, many companies are proactively addressing the reverse supply chain through a number of initiatives.

*The key point to make here is that it all starts by making the right decisions at the product design phase. Dealing with these issues as an afterthought can prove to be an unprofitable venture.*

# Product lifecycle considerations

**Putting together the "big picture" of PLM in Telecom**
So far, the previous sections discussed how (a) the customer expectations of a solution (end-user dimension) and (b) the Telecom landscape (supply chain dimension) have evolved over the last two decades. As illustrated in Figure 8 below, the objective of this paper is to highlight the multidimensional nature of PLM — and to underscore how key product decisions must be made in the context of the other dimensions.

In the following discussion, we see that product lifecycle decisions can be particularly challenging in Telecom for the following reasons:

- Aligning the supply chain players is not easy because they all have different (and sometimes conflicting) strategies for making money.
- Globally dispersed operations create a tough coordination problem.
- Changing business conditions create uncertainty and risk, which is further compounded by short product lifecycles that drive up obsolescence costs.
- The solution is still evolving — with new growth segments like applications and content adding to existing levels of complexity

But with an effective PLM strategy, Telecom players can overcome the above challenges to successfully meet their growth and profitability objectives.
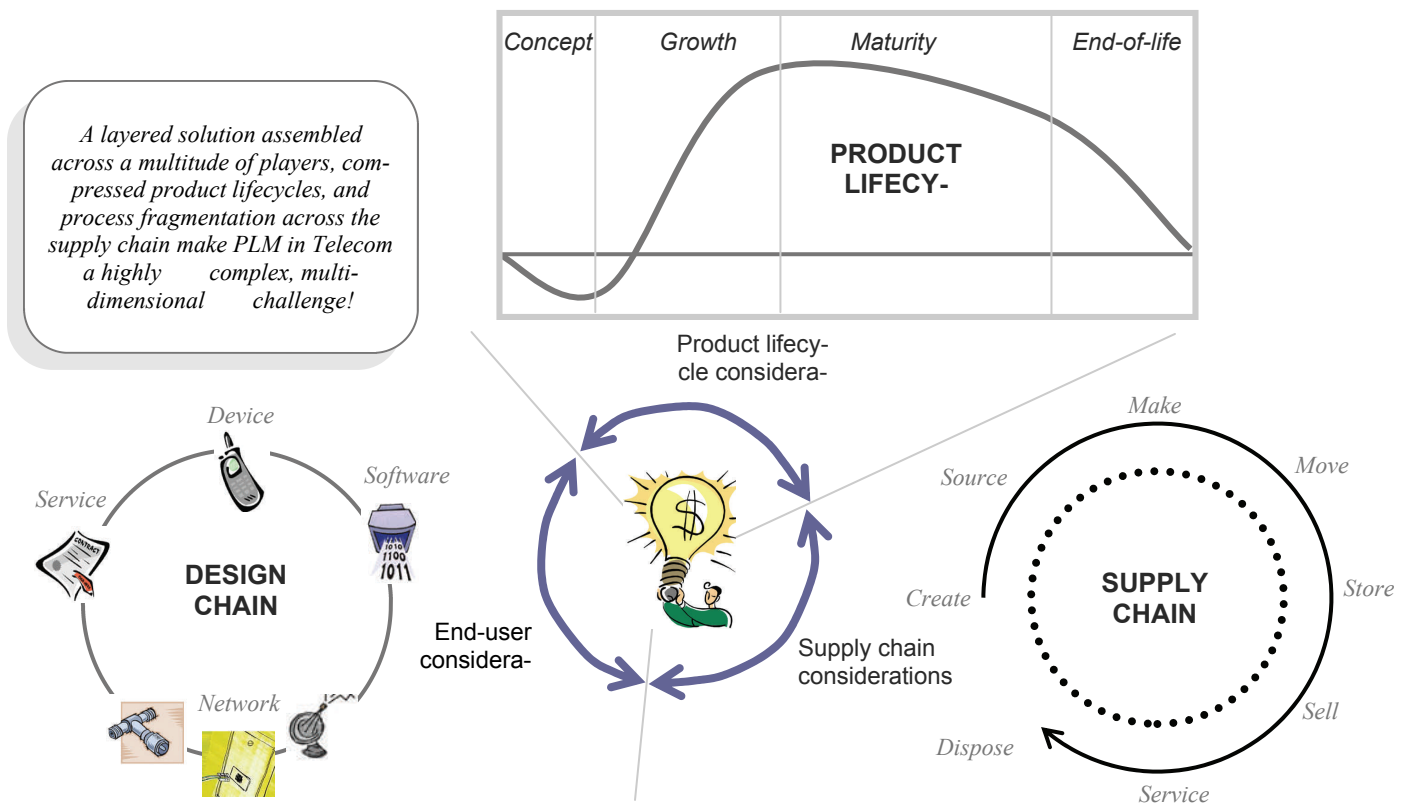
*A layered solution assembled across a multitude of players, compressed product lifecycles, and process fragmentation across the supply chain make PLM in Telecom a highly complex, multidimensional challenge!*



Figure 8: "Connecting the dots" to the show the multidimensional context of PLM

## Margins vs. market share: Which comes first?

Since the overarching objective is to make money, let's start by looking at the financial profile of a product lifecycle. As shown in Figure 9, the traditional sequence of management objectives at each stage is the following:
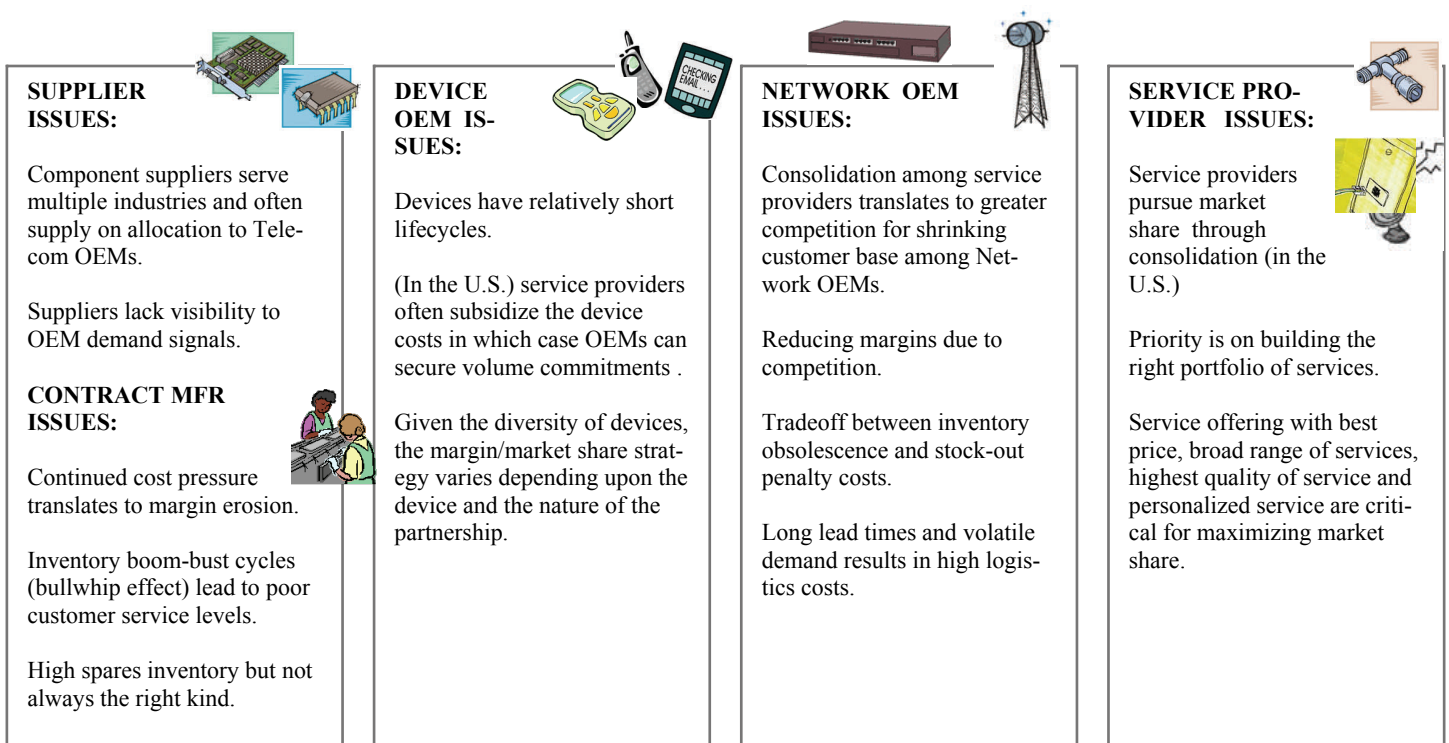
1. *Concept to Launch*: Reduce time-to-market
2. *Launch to Volume*: Maximize margins before competition grows
3. *Maturity to Retire*: Maximize market share and extend product life
4. *End-of-Life*: Minimize service and obsolescence costs

While the above strategy is designed to maximize margins first and market share later, some players in the Telecom supply chain *focus on market share (or volume) first and margins later.*



Figure 9: The financial profile mapped to the product lifecycle

**Pre-IPO disclosure**: In its SEC filing, Vonage, the largest independent VOIP service provider, reiterated that it is continuing to pursue growth rather than profitability in the near term and expected to report more losses.

**It's different for each player.**
The panels below highlights the typical business issues that drive how each group approaches the margin/market share decision. It is by no means an exhaustive list but underscores the point that all players are not "marching to the same beat." This misalignment of management objectives among the players is the root cause of inefficiency and conflict, and in large part, explains why the Telecom evolution has been so painful.

**SUPPLIER ISSUES:**

Component suppliers serve multiple industries and often supply on allocation to Telecom OEMs.

Suppliers lack visibility to OEM demand signals.

**CONTRACT MFR ISSUES:**

Continued cost pressure translates to margin erosion.

Inventory boom-bust cycles (bullwhip effect) lead to poor customer service levels.

High spares inventory but not always the right kind.

**DEVICE OEM ISSUES:**

Devices have relatively short lifecycles.

(In the U.S.) service providers often subsidize the device costs in which case OEMs can secure volume commitments .

Given the diversity of devices, the margin/market share strategy varies depending upon the device and the nature of the partnership.

**NETWORK OEM ISSUES:**

Consolidation among service providers translates to greater competition for shrinking customer base among Network OEMs.

Reducing margins due to competition.

Tradeoff between inventory obsolescence and stock-out penalty costs.

Long lead times and volatile demand results in high logistics costs.

**SERVICE PROVIDER ISSUES:**

Service providers pursue market share through consolidation (in the U.S.)

Priority is on building the right portfolio of services.

Service offering with best price, broad range of services, highest quality of service and personalized service are critical for maximizing market share.

# Collaboration is essential for PLM success

**Fragmentation creates a myopic view of the product lifecycle.**
One of the reasons why the Telecom industry has lagged in PLM adoption is the high degree of fragmentation in the ecosystem. It is difficult to proactively shape the financial profile of the product when it is distributed across so many different players. As shown in Figure 10, tracing the product lifecycle from design, through component sourcing, manufacturing, to final deployment and maintenance within worldwide service markets reveals a truly global operation spanning multiple enterprises.

Ultimately, if "better, faster, cheaper" is the end-goal, then collaboration is the means to achieving this, as illustrated in the following scenarios:

*Better: Customer requirements*
Traditional in-house R&D operations are recognizing that collaboration with customers and partners is key to improving "throughput" rates from concept to product. For example, Proctor and Gamble has set a goal where 50% of its new product ideas must come from outside P&G's labs.[3]

*Faster: Design portability*
In order to support a "build anywhere, design anywhere, and deploy anywhere" strategy, there has to be a way to capture and share the "digital DNA" of the product, allowing virtual product development teams to work concurrently to accelerate time-to-market.

*Cheaper: Component reusability*
The potential for cost savings is significant when design engineers and procurement can collaborate with suppliers across the globe to source parts. This not only reduces cost but it also collapses the design cycle time by finding an exact match or modifying an existing specification.



Figure 10: When supply chains become globally distributed, the critical links that provide a holistic view of the end-to-end product lifecycle are often broken.

**PLM requires a collaboration platform.**
Unlike an Enterprise Resource Planning (ERP) system which represents the "system of record" for a single enterprise, the system of record for PLM must be capable of supporting a highly collaborative environment across multiple enterprises. Without this, the critical links that provide a holistic view are broken. Not only does this result in silo-based decisions but it can be fatal to a timely product launch in an environment where the windows to maximize margins are continually shrinking.

With the above capability, Telecom players can exploit a powerful collaborative environment that can smoothly tie together the all supply chain participants — from the carrier/service provider; through network equipment vendors; software vendors; system integrators; and component suppliers.

[3] The World's Most Innovative Companies: BusinessWeek, April 24, 2006

# Managing risk

In contrast to the vertically integrated enterprise of the past, increasing supply chain fragmentation and rising customer influence have resulted in loss of direct control. This in turn, has elevated the need for Risk Management, and PLM offers a number of avenues to risk mitigation:

**Portfolio Management**: A portfolio is a common approach to diversifying against risk, and therefore players at each level must maintain a continuous flow of innovation to ensure that they have the right product mix over time.

**Transition Management**: Shrinking product lifecycles underscore the need for transition management where the timing of new product introductions and end-of-life planning are critical to maximizing revenue and margins.

**Aligning multiple lifecycles**: Given the rate of technology change, obsolescence risk is a major problem for all players in Telecom. For those who are responsible for delivering a bundle of multiple products and services, it creates a "double jeopardy" situation: They must deal with an added dimension of complexity to ensure that multiple product lifecycles are aligned to minimize obsolescence while continuously extending lifecycles at each level (as shown in Figure 11 below).
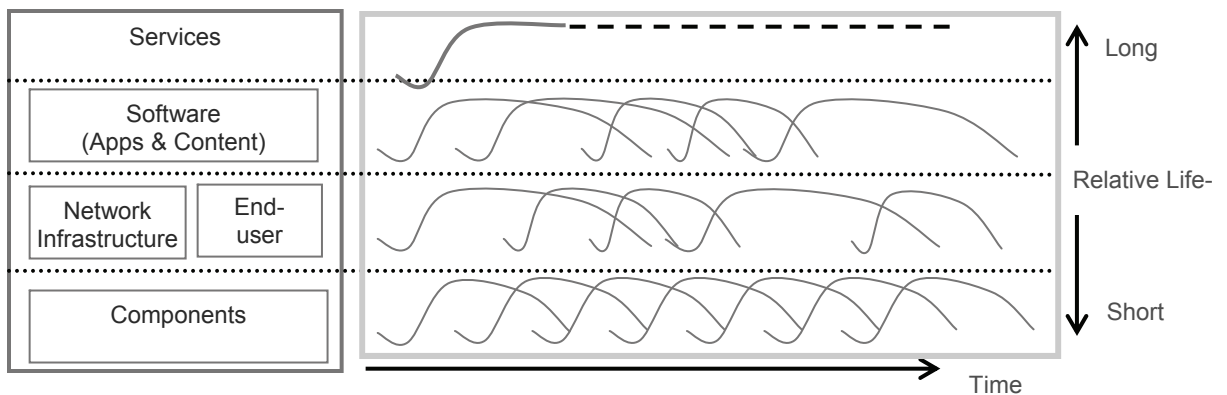
> **Obsolete Networks**: Verizon is seeking out buyers for two large networks of landlines…while undertaking an estimated $20 billion fiber upgrade to sell services that are Internet-based, rather than focus on traditional phone services, which is a shrinking business.



Figure 11: An intelligent portfolio approach can be used to  phase-in/phase-out multiple lifecycles to achieve positive ROA

> **Oversold**: Cell phone carriers push video services but only 28% of subscribers of mobile phones are video-ready, and only 1% of those with video capability use it.
>
> Kiplinger's Personal Finance

Ultimately, dealing with risk is a management decision that has to balance the financial objectives with the operational "reality on the ground" to enable a product strategy that keeps the company in positive earnings territory.

In terms of PLM capabilities, it underscores the need to have timely data, the ability to model the risk variables and understand how to manage the various relationships, and help make sound decisions in a collaborative fashion.
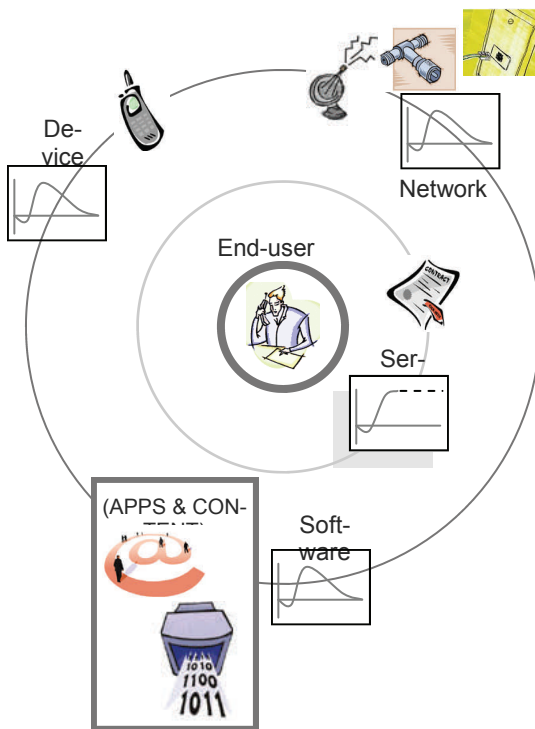
# Application services growth: The next wave



Figure 12: Software applications and content represent a new set of "digital" supply chains that need to be coordinated for a unified customer experience

**Getting ready for a new wave of lifecycles**

Taking responsibility for ensuring the right end-user experience requires a shift from traditional thinking in terms of devices and infrastructure to services, an area that is exploding in growth and opportunity. Key trends in the applications software and content space include:

- **VOIP, Skype, Email, Instant Messaging**: These new technologies are changing our communication medium as well as the social protocols. The increasing need for constant connectivity through these applications is adding strain on the existing infrastructure.
- **Gaming**: In markets with fast networks like Korea, gaming is an important part of the service equation. Nowhere is this "experience" better illustrated than the "alternative social universes" created by MMORPG (massively multiplayer online role-playing games). For example, as of March 2006, *World of Warcraft* has more than 6,000,000 players worldwide. Over 1 million of these players live in the U.S., making it the most popular MMORPG in the U.S. Another 1.5 million of these are from the Chinese launch on July 7, 2005. At any given time, there are at least 500,000 subscribers are online[4]. This is now serious business as advertisers start to purchase virtual real estate within these games.
- **Music**: Services like Apple iTunes are revolutionizing the world of music, and as of February 2006, the service had sold over 1 billion songs, or more than 80% of the worldwide online digital music sales[5].
- **Video**: IDC is forecasting online video services to grow to $1.7 billion by 2010, up from just $200 million in 2005[6].
- **GPS**: As Global Positioning Systems become mainstream, companies like Disney are leveraging their family-friendly brand with Sprint to offer a service package consisting of location verification, group calling plans, Disney content, and more.
- **RFID**: RFID adoption in the supply chain is on the rise. But without proper planning and foresight, it also represents uncertainty and risk for Telecom service providers and systems integrators bidding on multi-year, and sometimes, multi-billion dollar contracts.

**Understanding customer expectations for the "digital" supply chain**

The above examples represent a growing percentage of new revenue sources that are associated with a "digital" supply chain. While they have far fewer constraints than the physical supply chain, it underscores the importance of PLM capabilities like Requirements Management which help understand customer expectations as they evolve in order to build and deliver the right products.

The rapid evolution of workgroup, media, and content and services is a new dimension for Telecom players. Especially for service providers, the danger of losing sight of these trends is that of fighting the "old war". Given the bundling complexity that lies ahead, any player whose brand name is on the end-customer invoice has to recognize this and take the lead on orchestrating the upstream supply chains — or risk being reshuffled in the service hierarchy, or worse, getting cut out of the picture altogether.

[4] http://en.wikipedia.org/wiki/World_of_WarCraft
[5]http://en.wikipedia.org/wiki/ITunes_Music_Store
[6] http://www.idc.com/getdoc.jsp?containerId=prUS20114806

## Mapping PLM capabilities to Business Drivers

Technology is a critical enabler of PLM , and a growing number of solutions are available to address the breadth and depth of challenges in the Telecom industry. Business transformation is a journey and to ensure ROI at each step, PLM initiatives must be closely aligned with key business drivers, such as:

- **Increasing velocity of innovation**. The accelerating rate of change requires a dual focus on improving the yield of innovation AND decreasing time-to-market — a challenge for all players in Telecom.

- **Optimizing resources**. Global competition is shrinking the window of opportunity for companies to recoup their intellectual property investments. PLM capabilities are critical to achieving cost and quality targets essential for time-sensitive opportunities.

- **Meeting business and regulatory requirements**. Existing mandates already ban the use of hazardous substances and require recycling. Companies must approach compliance as a strategic initiative rather than as just a reporting activity — thereby building regulatory compliance directly into all phases of the product lifecycle.

- **Maximizing globalization advantages**. By enabling a worldwide ecosystem of employees, partners, customers and contract manufacturers to launch products in today's marketplace, global innovation networks minimize operational risk, reduce variability and drive process improvement.

The Siemens PLM Software solution for the Communications industry helps achieve the above business objectives through the following capabilities (listed in Figure 13) that are key to the industry players:

| PLM Capabilities for Telecom | Increasing velocity of innovation | Optimizing resources | Ensuring business & reg. compliance | Maximizing globalization advantage |
|---|---|---|---|---|
| Program Planning and Control | ✓ | ✓ | ✓ | ✓ |
| Program Execution Management | ✓ | ✓ | ✓ | ✓ |
| Requirements Management/Systems Engineering | ✓ | | ✓ | ✓ |
| Lifecycle Information Management | ✓ | ✓ | ✓ | ✓ |
| Equipment Configuration Mgmt & Change Control | ✓ | | ✓ | ✓ |
| Digital Simulation & Validation | ✓ | ✓ | | ✓ |
| Strategic Sourcing | ✓ | ✓ | | ✓ |
| Vendor Information Management | ✓ | ✓ | | ✓ |
| Compliance Strategy, Planning & Reporting | | ✓ | ✓ | |
| Outsourced Manufacturing Management | | ✓ | | ✓ |
| Manufacturing Execution | | ✓ | ✓ | ✓ |

Figure 13: Key PLM capabilities supported by the UGS PLM Software solution

# Concluding thoughts

The rate of change in terms of technology advances as well as the structural changes in the Telecom industry continue to accelerate. The future looks to promise more upheaval and instability unless companies are ready to do something about it. Product Lifecycle Management enables companies to successfully manage through these challenges. A few final considerations:

**PLM is critical to a holistic perspective**: It is the vital thread that preserves the end-to-end perspective of a company's products and services, throughout the forward and reverse supply chains.

**PLM starts with the customer**: For PLM to succeed, it MUST view the end-customer requirements as the point of alignment. Ultimately, everything in the Telecom supply chain is funded from a line item on the end-customer's bill, and therefore must be aligned as such. Too often, PLM is viewed as something that starts with engineering and that view is no longer valid.

**PLM drives SCM**: The assumption that supply chains are static does not hold when product lifecycles are shrinking and customer expectations are changing. And when products change, so does the process of how they get delivered to customers.

**PLM accelerates the innovation loop**: When truly aligned with SCM, PLM completes the cycle by connecting all the primary sources of innovation: employees, partners, and customers (Figure 13).

**PLM is critical to adapting to change**: By being closely aligned with customer expectations, PLM helps to rapidly develop and deploy the right products to market in such a way that maximizes their growth and profitability potential.
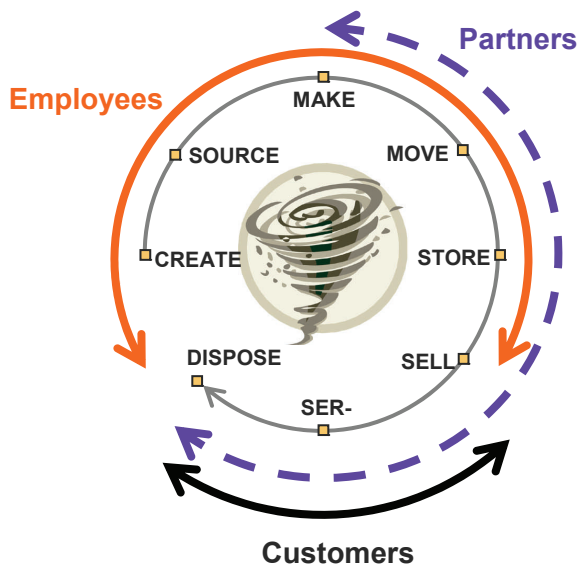
Figure 14: PLM connects employees, partners, and customers to accelerate the innovation loop

To learn more about PLM Solutions for the Communications industry, visit www.siemens.com/ugs.