Chapter | 9

Product Life Cycles and Jobs

❖ Can Texas keep innovators at home and support product innovation, economic development and job creation?

Introduction

An idea does not magically morph into a consumer product. And products don't stay in the marketplace forever. Just ask the makers of the telegraph. Products and services have life cycles. A product life cycle is the series of stages a product goes through from the seed of an idea, to the essential science and engineering phases associated with creating a prototype, and then to marketing and sales. How long a product takes to complete a life cycle varies. The research and development (R&D) phase of some products, such as those involving the science of biotechnology, can last decades.

The timing associated with the product life cycle depends on the nature of the product or service each firm produces — in particular, whether it is a wholly new product or an enhanced existing product. Understanding the phases of a product life cycle is critical because the employee skills associated with each phase can vary. In the R&D phase, work may be performed by a small team of highly educated scientists or engineers. In the middle of the life cycle, when a product moves into the marketplace, teams of marketing and sales representatives become more important. Managers must understand the timing and the necessary talents involved in successfully bringing a product to market. So, too, must those responsible for worker education, training and job placement understand the phases of a life cycle. This includes the varying skill sets and staffing needs associated with each phase. Such an understanding is critical to supporting small business startups and to building successful worker placement strategies.

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Product Life Cycle

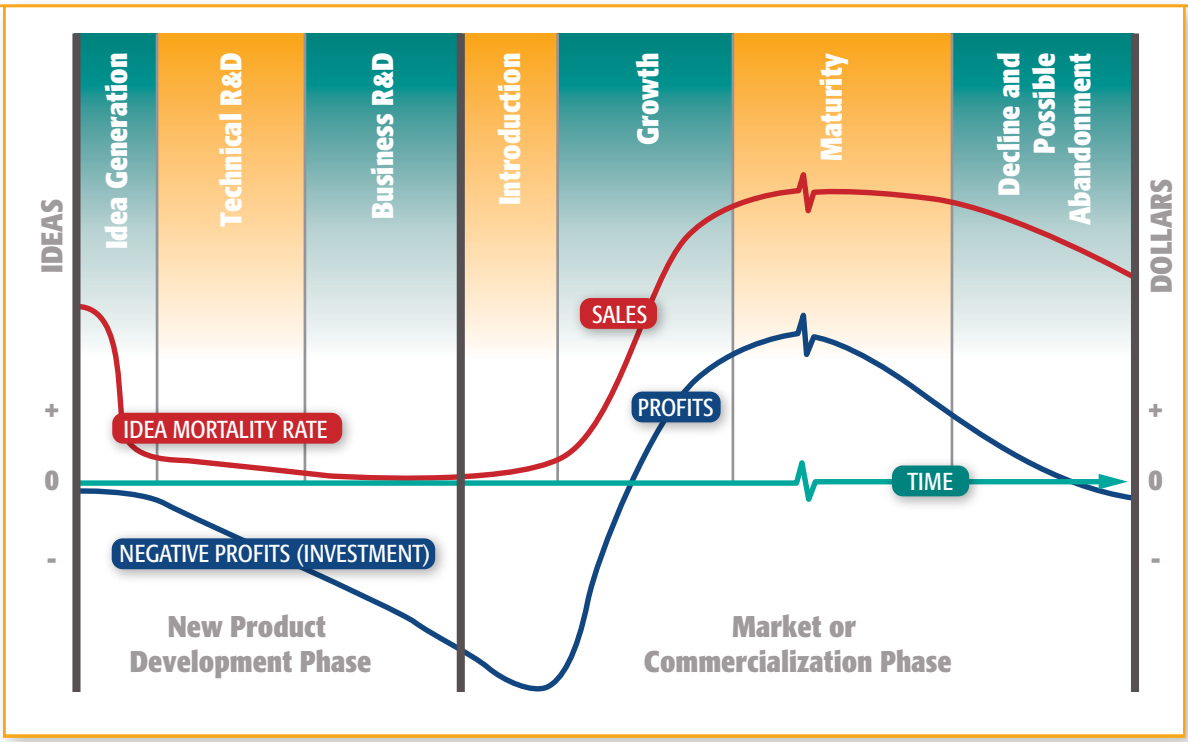


Figure 9.1

What's Happening

Figure 9.1 describes the phases of a typical product life cycle. As a theory, product life cycles apply to most products and services. Continuous new product innovation and outside competition generally ensure that even the "next big thing" in product innovation, for which Texas is so famous, will go through a life cycle that requires unique skills at various stages. Only when a product monopolizes the market, as in the case of the Kleenex brand of tissue, may the life cycle mature into many decades of production and stable employment opportunities. But even household names and products, such as Kodak cameras or Xerox copiers, are not immune to the process of eventual decline and abandonment.

The graphic shown in **Figure 9.1** is useful in displaying the general process of individual products, but it cannot be used as an absolute predictor, especially for entire sectors. Some products in various market segments are subject to longer life cycles, or they experience longer-than-expected durations in a given phase (e.g., extended technical R&D) than anticipated in the original business plan. This is particularly true in today's fluid global environment. Rapidly changing technological advances disrupt or make obsolete some products in the early stages of the life cycle. Apple's introduction of the iPad, for example, has put market pressure on Amazon.com's Kindle and the Sony Reader, despite their relatively recent new product launch.

Similarly, events such as a change in the supply chain for a new product or a company merger or acquisition may disrupt a product cycle time. Such disruptions can result in lost investment capital or unexpected job and dollar leakage from the home base or parent company. And bringing a product through the life cycle from an innovation or an idea to a money-making item is never easy. Much can go wrong, including an inability to attract sufficient capital to sustain the operation through to profitability. Most new

product ideas never pass through the entire life cycle to the profit-maximizing Maturity phase.

The key point is that, as new businesses start up, they frequently do not employ many workers. Most job creation usually occurs when the firm takes its product or service to market. That is when the firm needs workers for production, sales, marketing, accounting and other functions.

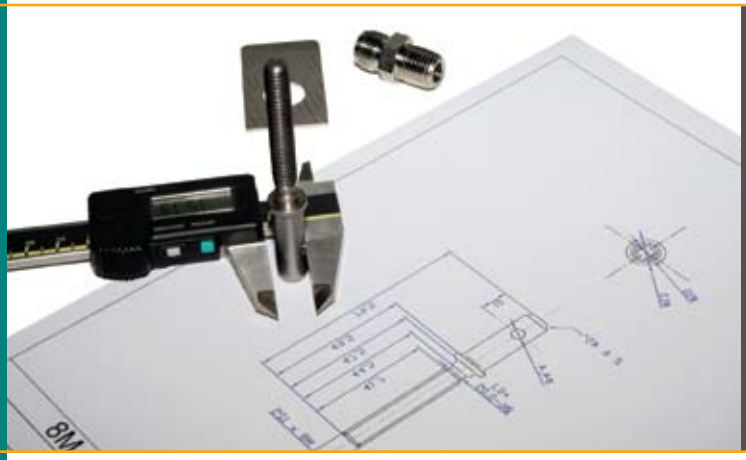
Thus, in the early stages of product development, the number of newly created job openings is likely to be small. Particularly for innovative technical or scientific products (as opposed to commodities or minor changes to existing products), early business formation may involve only a handful of highly skilled researchers, engineers or scientists. Minimal job growth usually occurs during the prototyping, testing and consumer market analysis phases (New Product Development phase). These activities may even be outsourced to professional consultants or remain among a cadre of original employees or colleagues, thereby creating no significant net new job growth.

Modest employment growth typically occurs only after a new product idea passes out of infancy into the Market or Commercialization phases — when the "first mover" firm begins to achieve significant market penetration. Significant job generation seldom occurs prior to the product passing into the Maturity phase of the product life cycle.

The Data

New technology applications will continue to enhance productivity and transform job sites and skill sets. Some industries, such as computer manufacturing and industrial machinery, are projected to increase output through this decade but will require fewer workers to do so. Jobs that can be replaced by the intelligent application of robotics technology, or can be automated by a computer-based program or algorithm, will likely undergo major changes. This process is not new to the 21st century. With increased productivity, defined as the ability to produce more product with fewer inputs, such as labor, a business becomes efficient and, ultimately, profitable.

Such disruptive technologies will also be used to reinvent the way business is conducted, where it is conducted and with whom it is conducted, leading to significant workplace and skills requirement transformations. Many economists, such as former Department of Labor Secretary Robert Reich, believe the 2008 recession and subsequent projected slow job market recovery are signs that corporations are rethinking their business models. Moreover, jobs in occupations that rely heavily on technology are projected to expand by almost twice the rate of all occupations. Earnings for these occupations are more than twice that for occupations that do not require mastery of digital technology. These occupations tend to be critical during the New Product



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Wages and Demand for Engineering and IT Occupations in Texas

Occupation Group	2006 Jobs	2016 Jobs	Net Change	Annual Job Openings	2009 Average Hourly Wages
Texas, economy-wide	11,135,900	13,525,200	2,389,300	486,725	$18.90
Engineering occupations	193,700	243,350	49,650	8,995	$44.06
Engineering-related & technician occupations	188,650	220,000	31,350	7,305	$22.99
IT nonengineering occupations	197,450	249,000	51,550	9,815	$33.54

Table 9.1

SOURCE Occupational projections by the Labor Market & Career Information Department of the Texas Workforce Commission

Development phase of a start-up business. **Table 9.1** shows wages and demand for engineering and information technology (IT) occupations in Texas.

Many small start-up companies require significant capital investment to unleash the power of a newly discovered technology, new product innovation or revolutionary business process. Finding patient investors willing to finance the early stages of a new idea is always a challenge — made more difficult by the credit crunch of 2008. The early investment of capital that occurs before a product is profitably brought to market is also known as the cash "burn rate." Cash burn rate implies that negative profits from such capital investments are accepted as the price one pays during the R&D phase of the life cycle in the hopes that a profitable end product will emerge. But investors will not bear that cost forever.

From an economic development perspective, such capital investments are also viewed with great hope as the down payment for future local jobs, assuming a company gains success and expands operations. Thus, both the investor and the community developer view large capital investments in the right company or right idea as critical to achieving their long-term objectives.

However, the decoupling of the traditional relationships among output, employment and the stock market can threaten the value of this investment for economic developers. For generations, plant closures and worker layoffs were associated with an ailing company, whose stock price was likely to suffer accordingly. Today, cuts in capacity are just as likely to be interpreted as efficiency measures, sending corporate stock prices higher. It is equally likely that worker layoffs will be offset by increases in productivity such that production levels might equal or exceed those of prelayoff levels. Such productivity increases, which yield decent profits with fewer workers, are a primary reason for the sluggish post-recession job growth.

This increased decoupling also applies to job creation and the product life cycle. When fledgling computer company Wyse Technology in Silicon Valley sought to expand its operations in response to booming demand, its executives took their investment capital and added new development teams in India and China. The increased revenues and profits showed up on the company books in San Jose, California, but almost no jobs were created there. According to an article in the *New York Times*, from 2003 to 2006 profits at the seven largest companies in

Silicon Valley increased by more than 500%, while employment in the San Jose–area labor market decreased by nearly 20,000 workers. Some job losses are due to outsourcing, productivity-enhancing technology displacement and other nonproduction factors, such as relatively high U.S. corporate tax rates and restrictive overseas profit repatriation rules. Interestingly, it is these hotly debated business-climate issues that may offer policymakers the greatest impact on long-term domestic job creation.

A rough illustration of the decoupling of sales and employment can be seen in the value-added-per-worker data, defined as the extent to which a firm's sales result from their own local production employees rather than from elsewhere in the world. The value of shipments for U.S. manufacturing grew 19.2% between 2000 and 2006, while value added per worker for the same period rose 50.8% from $165,244 to $249,138. These numbers demonstrate the real possibility that globalized business models can lead to increased revenues and profits with reduced or marginal domestic job growth.

So What?

The initial fallout of globalization in the United States was the loss of many labor-intensive, production-oriented manufacturing jobs, such as those in the garment and apparel industries. Subsequent waves of job destruction have affected white-collar occupations, such as computer programmers, systems analysts, accountants and other financial workers. Workers performing routine tasks at all levels for which a computer algorithm can be formulated or a robot can be programmed will find their jobs in jeopardy of moving to the lowest-cost or most economically efficient location, regardless of where a company finds itself within a typical product life cycle or where the initial product innovation or entrepreneurial initiative took place.

Life cycle theory tells us that the most significant levels of job creation occur later in the cycle, especially during the Commercialization or Mass Production stages. Increased access to lower cost production in other parts of the world may cut short the regional job creation chains typical during the Mass Production stage of the product life cycle. This phenomenon is referred to as job leakage.

Thus, these new business arrangements may reduce the total number of local jobs created that are typically associated with new technology innovation and small business startups. Historically, middle-class workers held many of the production-oriented jobs created in the growth phase of the product life cycle, yet if production doesn't stay, then local jobs are more precarious.

Even higher skilled workers are not immune to the decoupling of job growth and the product life cycle. According to a 2008 report from the Duke University Fuqua School of Business, "[Offshoring] is about sourcing the talent needed to sustain the innovation engine of a company." The study additionally noted that "U.S. companies simply cannot find enough of the high-end analytical minds they need at home" and are increasingly looking offshore to address activities such as new product development, research and development, engineering and knowledge intensive services. While new technology invention and new product innovation are critical to regional economic prosperity, innovation without commercialization and commercialization without elongated local supply chains are not likely to unleash high levels of job creation.

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Chapter 9 | Suggested Strategies

Think Globally, Plan Regionally

Successful industrial recruitment can boost a regional economy, providing new jobs, added income to the community and the possibility for an extended regional supply chain. For example, the $1.2 billion Toyota manufacturing facility in San Antonio injected a huge economic stimulus to the Texas and San Antonio economies. But plant locations are rare and often come with commitments for large taxpayer subsidies. As such, recruitment efforts should be viewed as secondary strategies for expanding a regional economy and not as the long-term approach to regional job creation, community income gains or wealth accumulation.

Futurists argue that many of the most important products and services for the coming decade have yet to be invented. Emerging, breakthrough, enabling and potentially disruptive technologies may have long time horizons before their economic impacts are manifest. Some technologies, but not all, will result in job creation. Others may enhance the productivity of each worker and thereby increase output, sales, profits and wealth accumulation for the company, while creating few if any jobs in the local community. Job creation and small business investment are not necessarily synonymous.

A fundamental distinction exists between the objectives of workforce preparation and economic development. Workforce development ensures the availability of skilled labor to meet employment demand. And it ensures that job seekers have the skills they need to reach their full earnings potential through employment resilience and career advancement planning. Economic development, on the other hand, is more about increasing (or at least sustaining) the flow of money into a region. While job creation is clearly a desired goal, not all economic development initiatives result in considerable job creation or increased employment demand.

While emerging technologies (e.g., nanotechnology) will affect the economic landscape in significant ways, the number of regional jobs likely to arise, especially early in the product life cycle, should be a consideration before investing community resources in the workforce preparation aspects of an initiative. There may not be a guarantee that jobs will be available immediately for new workforce entrants, displaced workers or other job seekers. Investments in research and development, entrepreneurship, innovation and technology transfer may generate significant economic results but little measurable job creation.

Before economic developers, elected officials and local workforce board members approve spending of public dollars they need to consider product life cycles. Jobs are tied to product life cycles, and product life cycles and job life cycles are evolving faster in the global economy. Consideration of the job creation potential and the life cycle of products promulgated by newly recruited companies or start-up businesses should be a part of any tax abatement strategy or public concession, such as education and training or infrastructure.