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Evaluating a new plant startup in the rigid plastics packaging industry

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EVALUATING A NEW PLANT STARTUP IN THE RIGID PLASTICS PACKAGING INDUSTRY

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Abstract

This qualitative study examined the startup phase of a new manufacturing facility in the rigid plastics packaging industry. Thirteen personnel were interviewed for their impressions of the startup experience, and were asked for their recommendations for the type of leadership, training and knowledge sharing, and organizational systems and support needed for a new plant startup to succeed. Participants noted both successes and challenges related to the plant manager, training and support delivered, and communication and other organizational systems in place. Participants offered several recommendations, including improving leader selection and preparation; optimizing training resources, schedules, and materials for each area; improving coordination, communication, and training for visiting support staff; and adapting human resources, project management, and equipment. Based on these findings, several recommendations for executive leaders, project management, and organization development consultants were identified. The key suggestion for continued research is to repeat the study with an enhanced research design.

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Chapter 1

Introduction

Organizational growth and performance hinge upon the effective deployment of productive knowledge in new facilities. However, getting those facilities fully operational can be difficult and time consuming. Interestingly, we understand little about what determines the performance of that process (Salomon & Martin, 2008, p. 1266).

To develop and sustain competitive advantage, a firm must do more than simply create distinctive knowledge-based assets; it must also exploit the resulting advantage efficiently (Nelson & Winter, 1982). To leverage its advantage, a multiplant firm must effectively extend that advantage to new facilities across various locations. However, making technologies viable in new facilities is often a difficult and time-consuming process (e.g., Hatch & Mowery, 1998; Kogut & Zander, 1992; Martin & Salomon, 2003a). Moreover, the success of that process stands to substantially affect firm performance.

Salomon and Martin (2008) recognized that firms vary substantially in how quickly they are able to build new plants. These differences—specifically, being able to build out a new plant quickly—forms the basis for lasting competitive advantage (Martin & Salomon, 2003a; Winter & Szulanski, 2001). Consequently, Salomon and Martin (2008) examined the strategic determinants affecting the time to build.

The present study examined one new plant startup to determine what occurred and what recommendations emerged for leadership, training and knowledge sharing, and organization systems and support, as reported by employees.

Purpose of the Study

The purpose of this study was to identify what personnel need in order to rapidly achieve steady and sustainable performance during the startup phase of a new manufacturing facility in the rigid plastics packaging industry. Four research questions were examined:

1. What were employees' impressions of the startup experience?
2. What recommendations do employees provide regarding the type of leadership needed for a new plant startup?
3. What recommendations do employees provide regarding training and knowledge sharing needed for a new plant startup?
4. What recommendations do employees provide regarding the organizational systems and support needed for a new plant startup?

Study Setting

The study was performed in a multinational rigid plastics packaging company headquartered in Europe with more than 159 production sites worldwide across more than 40 countries. The case site was in the US. The company operates with a hierarchical structure and employs approaching 16,000 individuals globally, with about 1,100 in the US.

The company produces various plastic packaging products for consumer goods in personal care, homecare, food, beverages, and oils and lubricants. The company has grown steadily over its history, opening on average five new plants per year. The company specializes in rapid startups and has created a standardized process to guide each startup. The process is overseen by various global groups with responsibilities over physical construction, program and project management, recruiting and training. The company has created templates to guide each phase of the startup to promote success.

Despite its standardized process, a recent startup process, referred to in this study as the *ABC Plant*, faced substantial challenges related to hiring, turnover, and technological complexity. These challenges affected the cost, productivity, and quality of the product line. It was important for the study organization to understand what occurred at the ABC plant startup in order to learn from the experience and determine how, if at all, the standardized process needs to be adapted to more rapidly achieve productivity and profitability in future plant startups.

Study Significance

Effectively navigating the process of a new plant startup is central to achieving organizational growth and performance within the manufacturing sector (Salomon & Martin, 2008). However, doing so is no small feat. Moreover, as in the case of the study organization, even when a company has in place well-developed and standardized procedures to guide and govern the startup process, challenges can arise to undermine the overall effort.

This study examined one case of a startup and produced important findings useful for the study organization and potentially similar organizations struggling to navigate the new plant startup process. Specifically, the study generated findings about the aspects that did and did not go well, leading to insights about what aspects of the startup process may need attention and modification. Specific attention was given to the type of leadership, training and knowledge sharing mechanisms, and organizational systems and supports that are believed to promote startup success, from the perspective of a range of personnel who were deeply involved in the process. These insights may be useful for revisiting and revising new plant startup processes so that future startups may not experience the same delays, costs, and difficulties.

Organization of the Study

The present chapter provided the background for the study, including its purpose and study setting. The study significance and my background as the researcher also were discussed. Chapter 2 reviews literature relevant to the present study, including a discussion of the rigid plastics industry and new plant startups.

Chapter 3 describes the methods used to conduct the present study, including the research design, procedures for recruiting participants, assuring confidentiality and consent, and collecting and analyzing data.

Chapter 4 presents the results of the study. Chapter 5 provides a discussion of the findings, including conclusions, recommendations, limitations, and directions for future research.

Chapter 2

Literature Review

The purpose of this study was to identify what personnel need in order to rapidly achieve steady and sustainable performance during the startup phase of a new manufacturing facility in the rigid plastics packaging industry. This chapter provides a review of literature relevant to the study. Information about the rigid plastics industry is presented first to provide context for the study. Next, new plant startups are discussed, including definitions, a discussion of the startup process, influences on startup outcomes, and personnel needs during new plant startups.

Rigid Plastics Industry

The Global Packaging Industry is a growing industry. Rigid plastics packaging materials have certain inherent properties that make them ideal for consumer packaging materials. They are tough, durable, lightweight, easily moldable, and convenient to transport and not as brittle as glass. All those characteristics make it a perfect choice for the packaging of bulk and unit material. The rigid plastics packaging industry can be divided in four segments: rigid plastic bottles, rigid plastic bulk containers, rigid plastic caps and closures, and rigid plastic blisters. Cost per unit of production is low, and these packaging materials have a wide scope of applications in various industries. Packaging has become an everyday item and its usage is tightly linked to overall economic growth.

The global packaging market consists of five main types of packaging: paper and bags (including paper bags and cartons), which holds the biggest market share (34%); rigid plastics (27% market share); flexible plastics (11% market share); glass (11% market share); and beverage cans (10% market share).

By end-use, the rigid plastics packaging market can be divided into six categories: food, beverage, healthcare, personal care, industrial, and other end-use sectors. By resin type, the rigid plastics packaging market is divided into five categories:

1. Polyethylene Terephthalate (PET): a clear, tough resin with good gas and moisture barrier properties (e.g., for oxygen, water, and carbon dioxide). This resin is commonly used in beverage bottles and many injection-molded consumer product containers. PET has clear and optically smooth surfaces for oriented firms and bottles. The material has high impact capability and is shatter resistant. It also has excellent resistance to most solvents, and is capable for hot-filling. The resin is most commonly used to produce plastic bottles and jars for food and beverages.

2. High Density Polyethylene (HDPE): offers excellent resistance to most solvents and has higher tensile strength compared to other forms of polyethylene. It is a relatively still material with useful temperature capabilities. HDPE is used to make bottles such as unpigmented bottles, often used to package products with short shelf lives (e.g., milk). The superior chemical resistance of HDPE has made it a popular choice for packaging many household and industrial chemicals such as detergents and bleach.

3. Low Density Polyethylene (LDPE): a tough, flexible, and relative transparent resin, predominately used for film applications where heat sealing is necessary. Although mostly used as a flexible plastic, LDPE can be used for the manufacturing of plastic trays and squeezable bottles. LDPE has excellent resistance to acids, bases, and vegetable oils.

4. Polyvinyl Chloride (PVC): a resin offering high impact strength, brilliant clarity, and excellent processing performance. It is resistant to grease, oil, and chemicals. In addition to its stable physical and electrical properties, the material has good chemical resistance, weatherability, and flow characteristics. In rigid packaging applications, PVC can be used to make blister packs and clamshells.

5. Polypropylene (PP): a strong resin that has good chemical resistance and a high melting point, which makes it good for hot-fill liquids. It has excellent optical clarity, and low moisture vapor transmission. This resin also is inert towards acids, alkalis, and most solvents. It is used in both rigid and flexible plastic packaging. For rigid packaging, PP often is used to make containers for yogurt margarine, takeout meals, and deli foods. It can also be used to make medicine bottles and bottle caps and closures.

History of the industry. *Plastic* originally meant something that is pliable and easily shaped. Only recently has it become the name for a category of materials called polymers. *Polymer* means “of many parts,” and polymers are made of long chains of molecules. Polymers abound in nature. Cellulose, the material that makes up the cell walls of plants, is a very common natural polymer.

In 1860, the development of plastics was supposed to have started by Phelan and Collander, a US based pool and billiard ball company. They allegedly offered a prize of $10,000 to the person who could design the best substitute for natural ivory. One of the contestants developed a cellulose derivate which was later patented under the name Celluloid which has been quite successful on the market. During the next decades plastic has gained more and more of importance. After the turn of the century, Leo Hendrik Baekeland, who was a Belgium-American chemist, developed the first completely synthetic plastic.

In 1920, a German chemist called Hermann Staudinger had a breakthrough in terms of development of plastic material. His success story triggered more and more research. New plastic products were developed during the 1920s and 1930s. This includes Nylon, Plexiglas, and Teflon in 1950. After World War II plastics were being used in place of metal in such things as machinery and safety helmets, and in other devices. A German chemist called Karl Ziegler developed polyethylene in 1953 and an Italian chemist called Giulio Natta developed polypropylene. Those two type of plastics are still the most common used ones today. In 1963 those two scientists received the Nobel Prize in Chemistry for their research in polymers. The efforts to develop new plastics is still ongoing currently and new and exciting ways to use plastics are constantly being developed.

Current size of the industry. By 2014, the global consumer packaging market has a value of about US$ 820 billion including the industrial end-markets. The value of the world market for Rigid Plastics Packaging is estimated at US$ 142 billion as of 2014 and has the potential to reach US$ 190 billion by 2020. The growth forecast for the period 2013 to 2018 is 5.2%, making this type of packaging the fastest growing in the plastics industry (Smithers PIRA, 2013). Growth has been driven by strong demand from the food and beverage packaging industries, as a big share of food sold through grocery stores is packaged, and as beverage producers opt for plastic ahead of glass and metal for reasons of cost efficiency. The US is the largest market for rigid plastics packaging, whereas Eastern Europe is the fastest growing market in that type of packaging due to a significant shift towards plastic packaging in fast growing beverage markets – mostly soft drinks, but also beer.

The key players in the Rigid Plastics Industry are the following companies: Amcor, ALPLA, Berry Plastics, Graham Packaging, Logoplast, Plastipak, Silgan, etc. Five out of those seven players are US based and two are European based.

Industry trends. Although the growth of the Global Packaging Industry is different across regions, depending on the level of development of the region, there are some factors which influence the overall growth of this industry on a rather long-term basis. Those factors include the ageing of the world population; the trend towards smaller households; the increasing requirement for convenience among consumers; rising health awareness among consumers; the trend towards the ‘on-the-go’ lifestyles among increasingly time-poor consumers; growing requirements for brand enhancement/differentiation in an increasingly competitive environment; new packaging material development; the move towards smaller pack sizes as the incidence of families eating together at the dinner table become less common; increasing awareness of environmental issues, and the adoption of new regulatory requirements on packaging recycling.

Looking at all those factors, the one which was ranked the highest in regards to being important and influential on the industry growth is the ‘Health awareness’. The lowest ranked one was the ‘Ageing of the world population’.

On the other hand the Packaging Industry is facing some serious challenges. As the macroeconomic environment has been challenging is some countries, the pressure on consumer spending went up. The economy in Europe has been somehow uncertain and the raw material and energy prize inflation has had a negative impact on the packaging producers overall.

With the growing concern of environmental issues and the introduction of new environmental legislations, the Packaging Industry and especially the Plastic Packaging Industry is facing a huge challenge on how to respond to consumers in a way that they keep their faith in this type of packaging solution. The Plastic Packaging Industry is trying to find solutions by reducing the amount of packaging used by light weighting of materials and by using PCR (post-consumer resin) in the packaging (e.g., plastic bottles).

Key metrics. TechNavio, a British based market research company, predicts that the Global Plastic Packaging Market will grow at a compound annual growth rate of 6.06% from 2014-2019 with a predicted growth of 4.72% for the rigid plastics packaging market. This is compared to other types of packaging such as glass (3.9% compound annual growth rate) and corrugated boxes (3.98% compound annual growth rate).

Success in the global packaging industry is associated with the following success factors: management of raw material inflation, the reduction of waste, effective capital expenditure, operational performance measurement, product and customer profitability management, innovation and global supply chain management. Management of raw material inflation refers to the necessity of companies in the packaging industry to manage the stability of their input raw material costs and pass through as much of the raw material price inflation as possible to the customer. They are typically in a very vulnerable position as their customers are very often powerful consumer goods companies that put a tremendous price pressure on them as they want to be competitive on the market. *Reduction of waste*: Due to increasing environmental concerns the packaging companies are investing in more sophisticated machinery in order to increase their process stability to more effectively manage their waste as well as they are attempting to reduce the material content which is in the plastics industry called 'light-weighting'.

In terms of effective capital expenditure, the capital intensiveness is relatively high in the packaging industry due to the sophisticated machinery which is required to meet the quality standard the customer requires. Management needs to be experienced in managing the balance between maintaining the existing equipment and investing in new technology in order to be able to be competitive. A beneficial matrix to assess performance in that area is the "spread" between EBITDA and capex (Capital expenditure) → EBITDA – capex.

In order to achieve continuous operational excellence, it is important to measure the right things. Therefore it is important to have the most meaningful KPI's (key performance indicators) in place. "Whatever gets measured gets delivered" (Ernst & Young, 2008).

Regarding product and customer profitability measurement, management needs to have the possibility to rank their customers by profitability. Companies that fail to do so risk ending up with a high number of low-margin products which take up the available capacity without making any profit.

In terms of innovation, demographic changes such as the decline of the nuclear family, increase in average age, and increase of single households and increased market share, competition have changed and will continue to change the packaging industry. To respond to those changes, packaging companies have to be innovative and need to come up with new shapes, new materials, more colors, and deliver short-run lengths in an economic way. Additionally they need to be close to the end-market consumer by fostering and nurturing collaborative relationships with the customers, as they are closer to the end-consumer.

The factor of global supply chain management refers to managing the costs involved to produce the packaging. As packaging overall yields a typically low-value product, production site location is a key driver of economic performance. Price decreases as distance between the packaging plant and customers fill line decreases. Some packaging companies are even located in the customer's building and thus feed the packaging (i.e., plastic bottles) directly into the customer's fill line. This approach is called an in-house solution.

In terms of revenue, the global rigid packaging market is expected to grow moderately during the forecast period. The major customers of rigid packaging are distributed across various verticals such as F&B, pharmaceuticals and healthcare, and consumer goods.

New Plant Startups

Definitions. New plant startup refers to the process of creating a new manufacturing facility within an existing organization (Salomon & Martin, 2008).

Several variables are used to determine the success of a new plant startup. These variables are discussed in the following sections.

Time-to-build. Time-to-build is defined as the time it takes to complete a manufacturing facility. The economics literature has identified the time-to-build manufacturing facilities as an important strategic consideration for firms (Pacheco-de-Almeida & Zemsky, 2003). New manufacturing facilities represent substantial and lasting investments for firms. In fact, the average cost of a new, full-scale semiconductor plant has been estimated at upwards of $1 billion (IC Knowledge, 2001). Not surprisingly, commitments to new facilities with such high stakes can have a substantial impact on firm performance (Salomon & Martin, 2008). Several variables are believed to influence time-to-build, as outlined in the remainder of this section.

Facility capacity. This is measured as its monthly wafer fabrication capacity (expressed in thousands), with the supposition that larger plants take longer to build. Salomon and Martin (2008) found in their study of semiconductor plants that facility capacity was positive and significantly related to time-to-build; however, the economic significance of this effect was small.

Facility cost. Overall cost of the plant represents the inflation-adjusted cost to build the plant. As a correlate of plant size and scope, it might be expected that facility cost is positively related to time-to-build; however, to the extent that facility cost proxies for the time-cost trade-off when building a plant (Mansfield et al., 1982, Pacheco-de-Almeida & Zemsky 2003), it might be negatively associated with time-to-build. Salomon and Martin (2008) found in their study of semiconductor plants that facility cost was positive and significantly related to time-to-build; however, the economic significance of this effect was small.

Resource costs. Resource costs refer to the value of the resources used to accomplish the new plant startup (Galbraith, 1990). Past studies have established that substantial costs are associated with any plant startup.

Pre-transfer planning and engineering costs. These costs are typically incurred prior to the actual plant startup and include documentation and codification of technology, including engineering desires, equipment setup and use, and process layout; documentation of management responsibilities such as inventory control methods, quality assurance, and shipping requirements; training; costs to ship, assemble, and test equipment, tools, and instrumentation; and salaries sand other personnel expenses associated with pre-transfer activities (Galbraith, 1990).

Post-startup management and control costs. These costs reflect those resources typically applied after the actual technology startup and include relocating a temporary engineering team to the new facility; non-optimal parallel or simultaneous co-production elsewhere in the organization; post-startup communication efforts between the new startup and other parts of the organization; and designing and maintaining accurate post-startup reporting and control systems (Galbraith, 1990).

Productivity and know-how loss. New startups require transition through a startup phase wherein skills from other plants much be relearned at the new facility (Galbraith, 1990). Productivity and opportunity costs are incurred as the plant proceeds through this phase. These costs reflect those resources typically applied after the actual technology startup and include relocating a temporary engineering team to the new facility; non-optimal parallel or simultaneous co-production elsewhere in the organization; post-startup communication efforts between the new startup and other parts of the organization; and designing and maintaining accurate post-startup reporting and control systems (Galbraith, 1990). Galbraith asserted based on his review of plant transfer and startup research that much of a firm's productivity loss is due to misplaced documents and lost small equipment. He added that a transition team should provide the new startup with know-how typically not available in written documents, allowing for long-term engineering continuity and training.

New plant startup process. Building a new plant is a long and carefully planned process (Salomon & Martin, 2008). The process usually begins with a forecast of demand conditions, startup equipment requirements, and the firm's ability to meet demand. If the firm determines that it cannot adequately meet demand without constructing a new facility, it then determines its equipment needs, the projected budget, the capacity, and considers possible locations for the plant. This takes several weeks to complete.

After the firm has determined that it should build a plant, it will generally announce publicly its intentions to do so (Salomon & Martin, 2008). This is when the pre-startup phase begins. In a detailed study of 48 new plants started by established firms, Doeringer, Klock, and Terkla (2002) found that parent firms often provide considerable technical assistance in plant design and equipment layout, work organization, and designing specific human resources practices related to training, worker participation, and performance incentives. Parent firms also supply senior managers who "are knowledgeable about the state-of-the art high-performance management practices and are well-versed in their corporation's approaches to operations management" (Doeringer et al., 2002, p. 47). Such assistance is particularly important, because firms require time (and often multiple attempts) before generic practices can be successfully tailored to the needs of the new plant venture (Balasubramanian, 2011). For instance, even a very successful company like GE has a history of mixed results in new plant startups (Butler, 1991). Another illustrative example comes from Steelcase (an office furniture manufacturer), who tried at least four times between 1989 and 2002 to establish effective work teams in its North American manufacturing plants (Mann, 2002). Similarly, BF Goodrich's implementation of gainsharing in one of its plants took at least two years of rework (Masternak, 1993). This uncertainty puts new plant ventures of entrepreneurial entrants at a disadvantage when they try to develop their capabilities and implement practices. In contrast, new plants of established firms can leverage their parent firms' prior experience to enhance the speed of learning. Second, and over the longer term, new plant ventures benefit from their parent's experience in strategic renewal. Established firms are more likely than new entrants to have faced environmental changes. Hence, they are more likely to have integrative knowledge (Agarwal & Helfat, 2009; Chen, Williams, & Agarwal, 2011; Zahra, Sapienza, & Davidsson, 2006) that allows them to reconfigure firm resources to fit new problems and opportunities (Baker & Nelson, 2005; Ganco & Agarwal, 2009; Helfat & Lieberman, 2002). For instance, Holbrook, Hounshell, Cohen, and Klepper (2000) describe how de novo firm Fairchild, though initially successful, eventually failed as "expansion eroded the close relationship between R&D and production" (p. 1027). On the other hand, Motorola, a diversifying entrant, overcame the same problem by "[breaking] up the existing organizational structure and replac[ing] it with product groups with responsibility for both R&D and production" (p. 1024).

Concurrently, or soon thereafter, the firm orders all necessary equipment, begins to design the layout of the plant, and develops an overall project plan and schedule. The firm breaks ground thereafter (the specific time varies based on the complexity of the startup) and the physical construction begins. During the base build, the foundation gets laid, the plumbing is installed, and the physical structure goes up. The firm then installs the production machinery and the equipment testing begins to assure that the products will be satisfactorily produced. Testing continues until the firm is satisfied that the equipment works properly and that it thoroughly understands how to use the equipment. Although there are still some kinks left to work out, the firm now officially opens its doors for production and begins its ramp-up. During the ramp-up phase the firm produces salable product, but production is not yet perfected. Yield (the proportion of output that is of sufficient quality to sell) is generally low. The ramp-up phase continues until the plant reaches its target yield and intended capacity, a milestone marking the completion of the implementation process (Hatch & Mowery, 1998).

Although firms subcontract various portions of the activity to construction firms and equipment manufacturers, they generally manage and coordinate the entire project, and perform many of the tasks involved, including technical tasks. Moreover, there exists substantial heterogeneity across companies in how they manage and coordinate the activities, and how effectively they implement their technologies (McDonald, 1998).

Influences on startup outcomes. Scholars from various disciplines recognize the potential impact of knowledge transfer, deployment, and implementation on organizational success and viability (e.g., Teece, 1977; Galbraith, 1990, Winter & Szulanski, 2001), little attention has been devoted to how such effects manifest in the time it takes to make new facilities viable. Balasubramanian (2011) added that prior firm experience, firm capabilities, and the industry environment are known to be important determinants of new-venture performance.

General factors. Salomon and Martin (2008) examined the competitive, firm, and technology characteristics combined to affect the time it takes firms to get their facilities fully operational. As such, the dependent variable of interest is time-to-build, meaning the time it takes a firm to build and ramp up operations at a new manufacturing facility (Koeva, 2000; Pacheco-de-Almeida, 2003). They concluded that the time to build manufacturing facilities is externally determined by a host of competitive, organizational, and technology characteristics.

Technological complexity. The difficulty and complexity of the technology to be implemented within the new plant substantially affect the process and the time needed to make the plant operational (Salomon & Martin, 2008). Scholars in the industrial organization economic tradition have focused on the effects that the time it takes to make technologies viable in new facilities (i.e., time-to-build) have on production and profit at the industry level. Early empirical work examined time-to-build to assess performance differences across industries rather than firms (e.g., Ghemawat, 1984; Koeva, 2000; Lieberman, 1987a; Mayer, 1960; Mayer & Sonenblum, 1955). Studies conclude that heterogeneity exists across industries in the time it takes to build plants. In this tradition, research generally models such heterogeneity as an exogenous, industry-specific constraint that impacts some outcome of interest. For instance, Pacheco-de-Almeida and Zemsky (2003) examined how firms choose to invest in production capacity given a delay in the time it takes to get production facilities online.

With respect to the deployment and transfer of knowledge to new facilities, scholars have focused on how characteristics of the technology to be employed constrain or encourage expansion. Work from an evolutionary, knowledge-based perspective highlights that the complexity and tacitness of the knowledge to be deployed in a facility stand to impede knowledge transfer (Kogut & Zander, 1992, 1993; Martin & Salomon 2003a, 2003b; Simonin, 1999a, 1999b; Teece, 1977). Complex knowledge is inherently difficult to convey (Mansfield et al., 1982; Teece, 1977). Teece (1977), for example, found that complexity increased the costs of implementing productive knowledge. In the same vein, Simonin (1999b) showed a negative relationship between complexity (and tacitness) and the ease of transferring marketing know-how. Szulanski (1996) studied how characteristics of the knowledge and the parties involved influence perceptions of transfer and implementation efficacy. He found that knowledge stickiness increased the difficulty of the transfer of best practices within organizations. Firms, however, can fruitfully develop strategies to address these challenges (Galbraith, 1990). For instance, Winter and Szulanski (2001) argue for replication as strategy. They maintain that firms may develop capabilities to routinize knowledge deployment. Intel's "Copy Exactly!" approach to building semiconductor plants stands as an example of such (McDonald, 1998): Every facet of existing productive knowledge should be replicated down to the finest detail when deploying technologies in new facilities. Further, Martin & Salomon (2003a) argue that competitive heterogeneity exists among firms in their abilities to transfer knowledge efficiently, with predictable governance and performance consequences.

The nature of the technology being deployed in a new facility stands to have a substantial impact on time-to-build. Technology complexity plays a critical role (Galbraith, 1990; Kogut & Zander 1992, 1993; Teece, 1977). Complexity increases with the number, variety, sophistication, and interactions among components, especially when the know-how represents an advance relative to the state of the art (Scuricini, 1988). Firms that implement complex, state-of-the-art technologies often deal with less codified knowledge for which they lack requisite process understanding - the "know why" and the "know how" - to produce reliably, and at high volume (Bohn, 1994). To put complex technologies to productive use, firms must first gain an understanding of those technologies (Edmondson, Winslow, Bohmer, & Pisano, 2004). Because complex knowledge is difficult to understand, express, and replicate accurately (Argote, 1999; Nelson & Winter, 1982), the need for coordination is greater (Teece, 1977), greater ex ante experimentation is required (Bohn & Terwiesch, 1999; Terwiesch & Bohn, 2001), and troubleshooting is often more difficult (Hatch & Dyer, 2004). In fact, Terwiesch and Bohn (2001) document ramp-up problems at semiconductor plants associated with the launch of new products and production processes. Likewise, Galbraith (1990) found that complex technologies are associated with greater productivity loss after plants are opened, and a longer time to recover from such loss. For these reasons, we expect complexity to increase the time it takes to effectively implement technologies in new production facilities, thus increasing time-to-build. Salomon and Martin (2008) found in their study of semiconductor plant startups that plants, the more complex the technology, the longer it takes to get new plants up and running.

Competition. Competition also affects the startup of new plants (Salomon & Martin, 2008). Business actions do not occur in a void. Firms are constantly vying for position, trying to beat competitors to market (Chen et al., 1992). Competitive dynamics and interfirm rivalry focus firm attention and motivate responses to other firms' actions (Chen, 1996). Whenever actions taken by incumbents or entrants are perceived as threatening in nature (e.g., threatening a firm's market position or its potential to earn above normal returns), the focal firm will *generally respond vigorously* (Chen et al., 1992; Schumpeter, 1934). In the context of time-to-build, when faced with competitors making large resource commitments to build similar (or more advanced) facilities, the focal firm has incentives to beat its competitors to market in order to preserve its position. We therefore expect firms to strategically speed their plant investments in an attempt to make their facilities viable sooner when more rival facilities with similar, or superior technology, are being built.

Organizational systems and conditions. Foundry status. Foundries are subcontracting facilities that manufacture other firms' designs. This may affect implementation due to the time needed for coordinating with the other firms (Salomon & Martin, 2008).

Joint venture status. Relative to wholly owned plants, joint ventures are likely to suffer from communication and knowledge-sharing difficulties across partners, which should increase time-to-build (Kogut & Zander 1992, 1993). However, in Salomon and Martin's (2008) study of semiconductor plant startups, they concluded that joint ventures may also allow partners to pool complementary resources and thus ease facility construction (Mitchell, 1989).

Domestic v. foreign status of parent firm. Organizational factors relevant to time-to-build include the domestic/foreign status of the parent firm and a firm's ability to benefit from various sources of experience (Salomon & Martin, 2008). Through their impact on the process of knowledge deployment, these factors can significantly influence the time it takes a firm to build its facilities. Scholars in the international business literature argue that foreign firms face disadvantages relative to domestic firms operating in their home environment. This is referred to as the "liability of foreignness" (Zaheer, 1995). Foreign investors bear additional costs due to information asymmetries, cultural differences, coordination difficulties, and local biases (Caves, 1996; Martin & Salomon, 2003a; Zaheer, 1995). Empirical results consistent with this theory show that foreign firms generally have higher labor costs (Lipsey, 1994; Mincer & Higuchi, 1988), are subject to more lawsuits (Mezias, 2002), take longer to achieve economies of scale in production (Galbraith, 1990), suffer from lower profitability (Zaheer, 1995), and experience a higher probability of failure (Zaheer & Mosakowski, 1997). Moreover, physical distance compounds the costs of deploying knowledge, and learning can be impeded when the source and recipient of the knowledge are not collocated—especially when they are in different countries (Galbraith, 1990; Hatch & Mowery, 1998; Kogut & Zander, 1992; Teece, 1977, 1981). For these reasons, we expect foreign plant investments to be subject to higher coordination and communication costs, which will translate into greater time-to-build. Salomon and Martin (2008) found in their study of semiconductor plant startups that plants owned by foreign parents take longer to build than their domestically owned counterparts. On average, it takes firms about 2.28 months longer to get plants operational in foreign locations. This result supports existing findings that demonstrate the substantial constraints that national differences place on knowledge implementation in new facilities (Galbraith, 1990; Martin & Salomon, 2003b; Teece 1977, 1981). Furthermore, it provides additional empirical substantiation (and a precise estimate) of the liability of foreignness (e.g., Zaheer, 1995). However, it would be beneficial to conduct further research to determine when the negative effect of having a foreign parent company subsides.

Knowledge transfer. Knowledge transfer has long occupied a prominent, if not always explicit, place in research on strategic management and corporate expansion (Salomon & Martin, 2008). Deploying and extending productive knowledge to new facilities is inherent in corporate growth. The speed and effectiveness of that process can determine a firm's ability to penetrate new markets, preempt and respond to rivals, and adapt to market changes. Scholars have examined how knowledge transfer influences firm performance (e.g., Argote, 1999; Levin, 2000; Teece, 1977; Winter & Szulanski, 2001), how technology transfer considerations affect governance (e.g., Martin & Salomon 2003a; Mayer & Salomon, 2006), and under what conditions firms exploit knowledge across organizational and national boundaries (e.g., Edmondson et al., 2004; Galbraith, 1990; Ingram & Simons, 2002; Martin & Salomon, 2003b; Szulanski, 1996). However, little attention has been given to the process of deploying knowledge-based assets in new facilities, and how knowledge transfer impacts operational performance. A stream of studies going back at least to Argote and Epple (1990) and Argote, Beckman, and Epple (1990) has shown that experience with knowledge transfer results in learning that can improve productivity and quality (Bohn & Terwiesch, 1999; Hatch & Dyer, 2004; Szulanski, 1996; Terwiesch & Bohn, 2001), decrease production costs (Darr et al., 1995; Darr & Kurtzberg, 2000), increase innovative output (Hatch & Mowery, 1998; Salomon & Shaver, 2005; Salomon, 2006), improve profitability (Ingram & Simons, 2002), and enhance survival (Ingram & Baum, 1997; Baum & Ingram, 1998).

Organizational learning. Another organizational factor relevant for time-to-build is organizational learning (Salomon & Martin, 2008). In this study we view learning as a process of accumulating, encoding, and leveraging insights gleaned through experience (Argote, 1999; Fiol & Lyles, 1985; Huber, 1991; Levitt & March, 1988). Two forms of learning can be helpful. The first is experiential learning. This form of learning-by-doing accrues as a firm repeatedly engages in an activity (for a review, see Argote [1999]). In this context, the relevant experience is that which accrues from prior deployments (e.g., building previous plants). The second form of learning is based on industry-level experience. This type of learning refers to the insight that a firm gains as other firms "do" - i.e., by encoding the experience of others within the industry (Argote et al., 1990; Ghemawat & Spence, 1985; Ingram & Baum, 1997; Lieberman, 1987b).

With respect to learning from one's own experience, past deployments develop a "discipline of practice" that creates more efficient replication routines (Nelson & Winter, 1982, p. 77). This provides the opportunity for firms to encode experiences into routines that they may exploit when engaging in future deployments (Levitt & March, 1988; Martin & Salomon, 2003b; Nelson & Winter, 1982). Consistent with this intuition, Teece (1977) showed that the costs of transferring technological know-how across plants decreased in firm experience. Likewise, Galbraith (1990) found that prior experience resulted in greater productivity when transferring technology to new plants. More generally, we expect a firm's experience to translate into enhanced efficiency when building new plants.

Salomon and Martin (2008) found in their study of semiconductor plant startups that each prior domestic plant built by the firm prior to the focal investment decreases time-to-build by 7.2 days. Given that the sample average is almost 6, this equates to more than one month saved for a typical firm relative to an inexperienced firm building the same plant. This implies that domestic experience can provide the firm with a set of routines and/or templates that it may meaningfully employ in future projects (e.g., Jensen & Szulanski, 2007; Szulanski & Jensen, 2006).

Cumulative industry experience. Besides learning from their own experiences, firms also learn from others (Argote et al. 1990, Ingram and Baum 1997, Baum and Ingram 1998). They benefit from accumulated industry expertise, in this case, the cumulative experience of those that have come before them (Argote, 1999; Argote et al., 1990; Ghemawat & Spence, 1985; Lieberman, 1987b). Firms may learn by benchmarking competitors, hiring employees with an in-depth knowledge of industry practice, contracting with suppliers who have a long industry history, or via more informal channels such as trade associations, industry conferences, and networking among scientists, managers, and engineers (Baum & Ingram 1998; Darr & Kurtzberg, 2000; Darr et al., 1995; Huber, 1991; Ingram & Baum, 1997).

The greater the level of prior industry experience, the more any firm within the industry stands to benefit from a deeper understanding of the underlying technologies and the conditions for their use (Argote et al., 1990; Nelson & Winter, 1982). This familiarity can facilitate knowledge implementation in new facilities by mitigating the coordination and troubleshooting difficulties inherent in such deployments (Bohn & Terwiesch, 1999; Terwiesch & Bohn, 2001). Although industry-level learning has been connected to increased survival (Baum & Ingram, 1998; Ingram & Baum, 1997), decreased costs (Darr & Kurtzberg, 2000; Darr et al., 1995), and profitability (Ingram & Simons, 2002), to our knowledge, no study has examined its influence on efficiency in establishing new facilities. We therefore expect that industry-level experience will benefit firms and manifest as decreased time-to-build.

Personnel needs during new plant startups. Lawler (1991) asserts that the creation of a new manufacturing location represents an excellent opportunity to apply a new management approach. In a new setting, all the systems in an organization can be designed from the beginning to be consistent with a particular management strategy. Whole new methods of organizing and managing work can be put into place virtually overnight. Due to pressures of globalization and increased performance standards related to quality, speed, and costs, Lawler advocates for a participative management approach wherein information, power, knowledge, and rewards are placed in the hands of individuals who are actually creating the products and services. The intention is to develop a high level of business involvement among all employees. The expectation is that doing so will lead to performance improvements in speed, quality, and costs because lower level employees will be able to act more quickly and in a more informed, more motivated manner. This type of organization, Lawler explains, utilizes a flat design and extensive use of self-managing teams. He explains that this approach,

> is particularly important for business involvement that teams have the responsibility for producing a whole product or completely serving an identifiable customer base. Without this, it is impossible for individuals to feel that they have a business that they control in a bottom-line sense. In a manufacturing setting, a team needs to be given responsibility for producing an entire product and for dealing as directly as possible with both customers and suppliers. The teams, in essence, need to be responsible for all the value-added activities that occur with respect to a particular product. (p. 7)

In creating teams, a clear bias needs to exist toward establishing a customer-supplier relationship for each work team (Lawler, 1991). These can be internal customer-supplier relationships; where possible, however, there is a definite advantage to creating external customer- supplier relationships. This provides the most "real" business experience for individuals and keeps them in contact with the competitive business environment that they are in and the kinds of demands that the organization face from its external markets and suppliers.

To facilitate team management of a business, Lawler (1991) asserts that often it is important to use multi-functional teams when making decisions. This includes inserting staff support members in the production teams. For example, engineers and accountants may need to be placed on the teams so that the teams can handle a full scope of business issues and, in effect, operate as mini-business enterprises.

Additionally, the physical layout of the facility should be designed to facilitate teams owning an entire product or customer (Lawler, 1991). Equipment needs to be positioned so that employees who are on the same teams are located together. Staff support individuals need to be located in the production areas they support. Blocks to communication, including walls, need to be minimized or eliminated, as do all symbols that indicate differences in power and status. Hierarchical symbols work against all individuals feeling responsible for organizational success, and they encourage decision making on the basis of hierarchy rather than expertise.

Lawler (1991) further adds that a critical element in any new plant - especially one that follows his approach by creating self-managing teams - is a strong organizational commitment to selection and training. This typically includes realistic job previews as well as team-based selection processes. But the Second Generation Approach, if anything, requires a greater commitment to selection and development. In the area of development, for example, it requires a commitment to individuals learning a great deal about quality technology. It also requires individuals to learn more about the business impact of their roles in the organization. This means they need to get extensive economic education, as well as being educated in the technical details of the manufacturing or service process.

In essence, individuals in the production area need to be treated more like managers as far as the training, information, and pay rates they receive (Lawler, 1991). In terms of skill-based pay, they need to be able to progress higher in total compensation in return for learning vertical or upward skills. This has implications for the kind of individuals that are selected, since much more is expected of them than just the ability to work in a team and control a production process. They need to develop an understanding of the business.

Lawler (1991) acknowledges that his approach demands a great deal of managers. They must be coaches, leaders, and expert resources. Getting the right kind of manager cannot be left to chance. The selection process needs to be able to identify them—and of course, training and support should be available to them. In the area of selection, assessment centers and simulations can help to identify the right individuals. The training and development process needs to include peer and staff assessment data and behavioral learning experiences.

Although Lawler's (1991) suggestions are thought provoking, they likely have varying relevance across plant types. For example, within the rigid plastics industry and the study organization, in particular, the systems and processes are standardized and the new plant does not have the opportunity to make changes.

Conclusion

Chapter 2 provided a discussion of the rigid plastics industry and new plant startups. Particular attention was dedicated to factors that influence the time to build new plants and the time it takes for the new plant to become operational. Four main factors were identified as having a large influence on these variables. One such factor is the support a new plant receives from its parent company in terms of leveraging project management expertise and experience. This includes assistance with the layout of the plant, work organization, recruiting and training, and performance incentives. Additionally, parent companies often support new plants by providing senior managers and skilled technical workers for the plant startup phase.

The second factor that influences time to build is the level of complexity of the technology used in the new plant. Solomon and Martin (2008) found that the level of difficulty and the level of complexity of the technology used in the new plant immensely affect the process and the time needed to get the plant operational. The third relevant factor that influences the time to become operational is knowledge transfer as deploying and extending productive knowledge is crucial to the success of a new plant startup. The forth factor is organizational learning, which is seen as a process of accumulating, encoding, and leveraging insights gleaned through experience (Argote, 1999; Fiol & Lyles, 1985; Levitt & March, 1988; Huber, 1991).

Chapter 3

Methods

The purpose of this study was to identify what personnel need to rapidly achieve steady and sustainable performance during the startup phase of a new manufacturing facility in the rigid plastics packaging industry. Four research questions were examined:

1. What were employees' impressions of the startup experience?
2. What recommendations do employees provide regarding the type of leadership needed for a new plant startup?
3. What recommendations do employees provide regarding training and knowledge sharing needed for a new plant startup?
4. What recommendations do employees provide regarding the organizational systems and support needed for a new plant startup?

This chapter describes the methods that were used in the present study. The research design is described first, followed by a discussion of the procedures related to participant selection, assuring confidentiality and consent, collecting data, and analyzing data.

Research Design

A qualitative approach was used for this study. This approach is mainly used for gathering and analyzing data with the goal to have a thorough and convincing way to approach this topic (Creswell, 2013). The qualitative method approach allows a deep dive in exploring the topic of study. Kvale (1996) mentioned in his research papers that the qualitative approach allows researchers to represent the true complexity and nuances of human experience in its most authentic form. In this study we used the method of research interviewing as the main method as it allows for probing questions of the participants' feeling, thoughts, and experiences in a way which offers an opportunity for going really deep. Data in this study was collected by structured one-on-one interviews and by using a short demographic questionnaire.

Participants

A sample of 13 employees who played a role in the new plant startup took part in the study. Of these, eight were supervisory, quality assurance, forklift, or technical personnel. The remaining five participants were US-based internal corporate plant consultants, trainers, and support personnel. The aim of participant selection was to recruit a diverse group of employees that spanned several functional areas.

Length of service information was used to identify employees who were working at the production facility at the time of the startup phase. The official start of production was in August 2013. Due to a high turnover, only 22 people were eligible to participate in the study. In collaboration with human resources, 10 individuals were identified as possible candidates to invite to participate in the study. One was out of town at the time of the interviews and one was needed on the production floor. Ultimately, eight plant employees were available and completed an interview.

Confidentiality and Consent Procedures

All human subjects protections were observed as part of this study. In keeping with these procedures, participants received complete information regarding the benefits and risks of their participation. They were advised that their participation was voluntary, confidential, and protected under the extent of the laws of California. Consent information provided to participants described the study purpose, the procedures involved in the study, and the time required for participation. Risks of participation and safeguards for mitigating the risks were outlined. Participants were informed they could withdraw from the study or refuse to answer a question at any time. No hard copies of the data were produced. Audio-recordings of the interviews were created and kept until transcripts were created and verified. Then, the audio-recordings were destroyed. Electronic forms of the data were de-identified and will be kept for 5 years and then deleted.

Data Collection Procedures

The 21-question interview script (see Appendix) was created to gather information to help answer the research questions. The script gathered data related to five topics:

1. Participant demographics. The first nine questions of the interview gathered participants' demographic details, including their age, tenure, gender, educational attainment, first position at the company, current position at the company, supervisor for their first year of employment, number of startups they have experienced, and role they played during the ABC startup.

2. Impressions of the startup experience. Participants were asked about their experience with the plant startup in order to identify their general impressions, successful aspects of the startup, and challenging aspects of startup as they related to leadership, training, and organizational systems. For example, Question 11 asked, "Looking at the startup of the ABC plant from an overall perspective, what would you say went well?"

3. Recommendations for type of leadership needed for a new plant startup. Participants were asked to describe the type of leadership needed for the startup. For example, Question 13 asked, "Is there anything you would have liked the plant manager do differently? If yes, what is that?"

4. Recommendations for training and knowledge sharing needed in a new plant startup. Participants were asked to provide their recommendations related to training staff and promoting knowledge sharing. For example, Question 14 asked, "Looking at the training for new employees, what went really well?"

5. Recommendations for organizational systems and support needed at a new plant startup. Participants were asked to provide their recommendations related to organizational systems and support during a startup. For example, Question 16 asked, "Is there any support you didn't have that wish you did?"

Interviews were conducted one-on-one and in person onsite at ABC plant within a private conference room. The interviews were audio recorded and transcribed.

Data Analysis Procedures

Content analysis as described by Miles, Huberman, and Saldana (2013) was used to examine the qualitative data. The following steps were followed:

1. The transcript of each interviewee was reviewed several times in order to get familiar with the scope and nature of the data that emerged from the interviews.

2. Several rounds of coding were conducted. During the first round, each response was reviewed and discrete ideas were identified and assigned a theme.

3. After the first round of coding was complete, the themes and associated data were reviewed and reorganized to reflect a hierarchy of themes that aligned with the research questions. For example, themes related to leader selection and leader preparation were grouped under recommendations leadership, in answer to Research Question 2. This activity constituted the second round of coding.

4. When both rounds of coding were complete, the analysis was reviewed and revised as needed for accuracy.

5. When the analysis was verified, the number of participants reporting each theme was determined.

6. Finally, the analysis was submitted to a second rater who reviewed the analysis and pointed out any detected errors. The results captured in chapter 4 show the final analysis.

Summary

This chapter described the methods used in the study. This qualitative study gathered data through 13 interviews. Participants were asked to provide their impressions of the startup experience and recommendations for the type of leadership, training and knowledge sharing, and organizational systems and support needed for a new plant startup. The next chapter reports the study findings.

Chapter 4

Results

The purpose of this study was to identify what personnel need in order to rapidly achieve steady and sustainable performance during the startup phase of a new manufacturing facility in the rigid plastics packaging industry. Four research questions were examined:

1. What were employees' impressions of the startup experience?
2. What recommendations do employees provide regarding the type of leadership needed for a new plant startup?
3. What recommendations do employees provide regarding training and knowledge sharing needed for a new plant startup?
4. What recommendations do employees provide regarding the organizational systems and support needed for a new plant startup?

This chapter reports the results of the study. Participant demographics are provided first. Thereafter, the findings are reported by research question.

Participant Demographics

A total of 13 individuals were interviewed for this study. Of these, the majority were male (n = 11), aged 40-55 (n = 8), employed with the company 4 years or less (n = 8), and had completed some college (n = 7). Participant demographics are presented in Table 1.

Table 1

Participant Demographics

Gender	Age	Tenure	Educational Attainment
Female: 2 Male: 11	18 – 25: 0 26 – 39: 5 40 – 55: 8 56+: 0	0 – 4 years: 8 5 – 9 years: 1 10 – 14 years: 2 15+ years: 2	High school: 4 Some college: 7 Bachelor Degree: 2 Master's Degree or above: 0

N = 13

Employees' Impressions of the Startup Experience

Participants were asked to describe the successful and challenging aspects of the plant startup and to compare the ABC startup to other plant startups at the company. The findings are reported in the sections below.

Successful aspects. Participants were asked to identify and describe the aspects of the plant startup they believed to be successful. Participants identified several successes relating to the plant manager, training and support, and organizational systems during the early stage of the startup (see Table 2). Six participants stated that the plant manager was initially present and supportive on the plant floor. One participant shared,

> [Plant manager name] stayed on the floor when I was there. He tried to help out as much as he could, even though it was new to him too, even though he came from the other company. But he tried to help out and everybody tried.

Table 2

Early Startup Phase Successes

Successful Aspect	n
Plant manager was initially present and supportive on floor	6
Training and Support	
Technical training from corporate academy in Iowa was effective	12
Onsite training and support was effective	10
Support and training from corporate in Austria	7
High employee morale and effective teamwork	3
Organizational Systems	
Employee recognition was provided Provided recognition and appreciation through bringing food or taking them out (4) Provided verbal recognition (3) Recognition boosted morale (1)	7
Communication initially was effective	3
Installation of blow molding machines went very well	2

N = 13

Another participant expressed,

> He was involved in pretty much everything. I don't know about the stuff in the office, but he was always on the floor trying to make sure that we had everything

> that we [needed], and he was also good with the people and made sure that with the customer, he tried to make sure that we understood everything. He would try to learn also. He was very involved. He was on the floor all the time.

Note that no successes were reported for the later phase.

Related to training and support, participants identified four early phase successes. Twelve of the 13 participants expressed that technical training from the corporate academy in Iowa was effective. One participant stated the following,

> When I went to training in Iowa, the thing I liked about it is they take you on the floor and show you how the machines work. Basically they give you a machine and start up and stop the machine. And they show you how to put the head on. . . . It was a lot of hands on training. That's the best, for me. I don't know for other people. That worked pretty well—the hands on. The color change. The head change.

Another participant commented,

> We were at an operating plant, so we didn't always get a machine when we wanted one, but I thought they did a really good job of accommodating us and working around our schedule and making changeovers happen, getting us involved as much as possible. I have nothing but positive to say, really. . . . Iowa City was great. They treated us fantastic. There's not a negative thing I can say. I still talk to [employee name] to this day. I appreciate everything they did for us. They were fantastic. Couldn't have treated us better. . . . The training was effective.

A second commonly cited success (n = 10) was that the onsite training and support was effective. A participant noted the following,

> I found it to be very helpful to me personally because they would come in with a different set of eyes to see something that you didn't see, or they would bring their way in to doing something that perhaps it was easier. I found it helpful. I really did. I think it was a major reason why our plant eventually turned around

A second participant explained,

> We had good tech support. [Employee name] came and spent a couple of months with us after the training. He was reinforcing his training. He was having to re-learn our bottles as well. [Employee name] was with us for almost the first year we were starting up. He basically lived here. Without him, I don't know if we would have survived, to be quite honest. I owe a great debt to [employee name], seriously. . . .

Additionally, seven participants stated that support and training from experts from corporate in Austria has been helpful. One participant expressed the following,

> We had two guys in, they came from [corporate location name], [employee names], I learned a lot from them. Troubleshooting. That's what I learned from them. . . . When I had a question I'd go to them. They knew most of it. You go to them with a question and they show you. That kind of support was good, and the training itself.

Another participant stated,

> They played an important role on all the training, and plus the set up and everything. The bottle was developed in Europe. They stayed 7 or 8 months to train, to make sure everybody knew what was going on, with training. So they did a good job. . . . It was crucial that they were there, because we never ran this bottle in the United States. It was a new bottle. Dual neck chamber bottle. A complex bottle.

Regarding successes related to organizational systems, seven participants pointed out that employee recognition in the early startup phase was provided in various ways, such as bringing food or taking them out or providing verbal recognition. One participant mentioned the following,

> Yes, I felt recognized. Just being told that you did a good job or "Thanks for your input." Stuff like that means a lot to people. They still do the recognition here. When we first started doing even the recognition out on the floor it made people feel so good. "They took notice of what I did." Just telling people they did a good job and that. I got that a lot here.

It is notable that participants did not cite any successes related to the later stages of the startup.

Challenging aspects. Participants were asked to express their thoughts about the challenging aspects in regards to plant leadership during the early stage of the startup (see Table 3). They identified two areas of concern, which relate to the plant manager and the maintenance manager. Five participants out of 13 felt that the plant manager did not adjust well to the company culture and to the common company practices. One participant shared,

> I think leadership was there but you can't make somebody do right if they're going to do right. It's a mindset. Not everybody is a team player. There are going to be some people, regardless of how many people you've got, they're going to do it their way no matter what.

Table 3

Early Startup Phase Leadership Challenges

Leadership Challenge	n
Plant manager did not adjust to company culture and agenda	5
Maintenance manager was not a good fit	3

N = 13

Another participant stated the following,

> There were a couple of comments from the plant floor that all [plant manager name] did was look out his window with his arms folded looking down at everybody. That kind of bugged me. It creates a hierarchy. Big brother's watching you. That got me. . . . I didn't see [plant manager name] interacting with the managers and trying to help them out or give them guidance. He wanted to just let them go and that was it. He didn't have good interaction with them at all. He didn't lead the managers

In regards to the second person, the maintenance manager at that time, three participants were concerned about the right fit for the company. One participant stated the following,

> A maintenance manager should gather information on how the equipment works and then share it with his people. I think that's leadership. You've got to know what you know and share what you know. Share and train the maintenance people. . . . I think where we had a little bit of situation was in maintenance, with the maintenance manager, that's the only thing . . . he didn't know what he was doing.

Another challenging aspect the participants were questioned about were personnel challenges in the early startup phase (see Table 4). Two main challenges were found, one was in the area of staffing and the other one in the area of training. Related to staffing, participants mentioned three early startup phase staffing challenges. Eight out of 13 participants were mentioning the two main challenges of not filling the open positions in a timely manner and the high turnover. One participant cited the following,

> Maintenance had people there helping to train, and they went through some training, but they were lacking more on people. They only had 3 maintenance guys at the beginning. . . . We lost one of those guys in about a month after coming back from the external training site. Down to two maintenance guys. All that time spent working with that guy was wasted, or dropped off. There wasn't enough people to begin with to then train.

Table 4

Early Startup Phase Personnel Challenges

Personnel Challenge	n
Staffing	
Did not fill open positions in a timely manner	4
High turnover was a challenge	4
Setup challenges in warehouse due to lack of knowledgeable personnel	1
Training	
Lack of standardized training across locations and trainers	6
Lack of training processes to ensure adequate documentation, evaluation, and knowledge transfer	5
Insufficient supplementary support for maintenance and secondary packaging	5
Training and documentation from suppliers for secondary packaging equipment were insufficient	3
Later hires did not receive the same in-depth training as received by initial new hires	2
Insufficient training for toolmaker	1
Training received at training location in Iowa partly did not apply to new bottle	1
Insufficient ongoing training for maintenance	1

N = 13

Another participant stated,

> We simply couldn't fill the positions with competent people. Therefore we went through a phase of kind of having to rely upon the temp agencies. Which was a challenge. And the few people we actually had hired on, that started from the beginning that was really all we had. We had a couple of people on each shift. Full-timers. Everybody else were temps. It was just a revolving door.

Participants cited a number of challenges related to training; however, several of these were mentioned by only one or a few individuals.

The main challenges were identified as lack of standardization of training across the locations and between trainers, lack of training processes to ensure adequate documentation, evaluation and knowledge transfer. Six out of 13 participants believe that there has been a challenge with the level of training standardization. One participant described the following,

> In regards to training we had a lot of back and forth of people saying, “Touch this and don’t touch that” or one person saying, “You can touch this. Do this this way” and the other person saying, “Don’t touch that.” . . . If you’re going to be an operator, you should be allowed to operate. We had a lot of opposite messages. Some are still going on a little bit. It makes them not sure on what they’re doing because this guy is telling them to do it this way and this guy is telling them to do it the opposite way. It’s confusing.

A second participant mentioned,

> There was also an issue with the support people of not everyone being on the same page as far as telling people different things. I was in [plant name], I did things one way. [Employee name] was in [plant name], they do something different. [Employee name] was in [plant name] they do something different. So I had talked to operators and they said, “[Employee name] told me to do it this way. You’re telling me to do it this way.” I think this is on the processing and mold change side . . . not so much on the maintenance side.

In regards to the challenge of lack of training processes to ensure adequate documentation, evaluation and knowledge transfer, we had five out of the 13 participants mentioning this challenge. One participant described the following,

> The hand over from the plant where the initial training was done to the Startup plant wasn’t as good. Lack of training evaluation / training progress and documentation. Knowing what level the technical trainees were at when they first got to [plant name]. I didn’t know whether they were a level 1 operator or a 2, what skill level they were. No training matrix or training evaluation document was transferred with them. I didn’t know what skill level they were at. I could have been over training the person. They were brand new, and I didn’t have any paperwork to let me know.

Another participant mentioned,

> But one thing that hurt us was that we didn’t have any troubleshooting training at training plant. So when we got back here, and we got flash on a bottle, we didn’t have a clue on how to get rid of it. We’d look at each other. [Employee name]

> would say, “Cut the air back?” “How do you know? Don’t tell me what to do. Why do you know what to do?!” That was the biggest thing, the troubleshooting.

The last training challenge to mention relates to insufficient supplementary support for maintenance and secondary packaging, which was mentioned by five out of 13 participants. One participant noted the following,

> Again, 95% of our frustration was from any kind of lack of understanding of our downstream equipment. That was 95% of our frustration. It just seemed like nobody really knew what to do, and who to send, so we were left to struggle with it. People did come, but nobody really knew what to do. Nobody really knew what to do about our downstream because nobody else was familiar with it. It was so different.

A second participant pointed out,

> The support of the downstream was missing. We had plenty upstream as far as blow molding operators and stuff. . . . It had to be the vendors because you can’t have somebody from another plant come in and show our guys what to do. On the blow molding machines and stuff we had plenty of support up front but the back end didn’t have that support. If it had been a regular set up where they ran down into a box, I’d say we’d been run 90% within the first year, but it’s not. We’ve got all this different equipment, and a lot of turnover, and it seems like once somebody gets trained and knows what they’re doing they move on.

The participants also identified several challenges in the area of organizational systems in the early stage of the startup phase (see Table 5). The two main challenges are seen in the area of secondary packaging equipment and with the infrastructure, setup and processing of the blow molding machines.

Focusing on the secondary packaging equipment first, there are three areas of concern. Seven participants out of 13 identified a challenge with the design, set-up, support level and the insufficient reliability from the supplier. One participant explained the following,

> I recall that the packaging just wasn’t set up. That was the biggest thing. At this time we were sampling Machine Number One. So we went straight into sampling mode. We had the guys working with that, so I started setting up boards for 5S. Areas where we were going to store stuff, and started laying out the floor and the mold shop with the expert from corporate in Austria. We started laying out what

was going to be. Number Two was a shell. They were making that up. Number Three was coming in. It was still one machine moving to the second to the third. . . . There was just no coordination. The Dyco wasn't ready, the labelers weren't performing, the spouters weren't performing. Just complete chaos.

Table 5

Early Startup Phase Organizational Systems Challenges

Organization Systems Challenge	n
Secondary packaging equipment challenges	
Design, set up, support level, and supplier reliability was insufficient	7
Was overly complex, leading to scheduling pressure	6
Was not operating effectively	4
Infrastructure, setup, and processing challenges related to blow molding machines	8
Lacked organizational policies and procedures	3
Physical plant lacked needed infrastructure for the first two months	3
Employee recognition was lacking	2
Lacked production manager due to financial constraints	1

N = 13

Another participant noted,

> There was a lot of confusion for the downstream. Trying to figure out how to set things up, where everything was supposed to go, because there wasn't a clear picture of the schematics as far as the conveyors, how the machines were supposed to sit. We would spend sometimes a day or two. We would get a machine set into the position we thought it was supposed to be in and then we would have to move it over this way or we would have to move it a little bit more. So it was just a little bit of confusion because like you said ABC was unique as far as downstream and nobody really knew exactly what was going on. It was not a clear set up. There were a few people that knew.

Six out of 13 participants described the overly complex secondary packaging equipment and the challenges we had to face. One participant mentioned the following,

> I think with that also they didn't take into account how complex the downstream was. We focused on the blow molding machines. That was fine, but truthfully they are 25% of that plant's downstream. We loaded up 80-90 per cent of our people on the front, and 10% taking over 70% of the plant. They underestimated. I don't think anyone realized how complex it was going to be. A lot of new equipment. Spouters we hadn't used in other plants. Labelers, not only was it a model we don't really use, it was a technology we don't really use. That's the only in-line downstream labeling that I know of in North America. We underestimated the technology on the downstream a lot.

Another participant stated the following,

> The downstream. The sheer timing and the complexity of the downstream was the problem. I'm not one to know when the project was launched but we were miles behind with the Dyco. I think that went on for many months after the start. About a year after the startup we maximized that.

The third challenge in regards to the secondary packaging equipment describes the ongoing challenge of the equipment not being operational. This has been stated by four out of 13 participants. One participant cited,

> I think we let the employees down with the downstream. It was awful. To go in there every day that was bad. When we got there at the beginning they were puffing their chests out and they were really enthusiastic and I think it just fell apart. I really do. . . . But the downstream was just such a disaster.

Another participant mentioned,

> At the beginning, even when the downstream put us in such a position, for a couple of months everybody was upbeat. We knew things were going to get better. We thought after two or three months we were finally going to get there. Turned into four months, five months, and six months. It really wore us out. Every day you came back to work, it was like a whole new day because we had a fresh set of temps. Nobody wanted to be here for 12 hours hand stacking boxes.

Another main challenge in regards to organizational systems has been the infrastructure, the setup, and the processing of the blow molding machines. Eight out of 13 participants mentioned this challenge. One participants noted,

> Initially there were major problems with the infrastructure. . . . The machines kept going down. . . . Consequence of infrastructure being down: There were ongoing problems with the temperature in the compressor room that they were working on. I remember when we came back we were still fixing that.

A second employee mentioned,

> We had a lot of headaches starting up, just getting the bottle right. That surprised me more than anything. The bottle size and just the environment had a lot to do with it. Our water was different. Humidity is different. On the floor we're running about 75% humidity right now. That's going to give you orange peel and everything else.

Until now the focus has been on the early stage of the startup. The next section is going to mention the challenges during the late stage of the startup (Table 6). This includes leadership challenges and organizational system challenges. Two out of 13 participants mentioned that the plant manager got disengaged during the late phase of the startup. One participant described the following,

> As the months wore on you could tell [plant manager name] was getting more frustrated and the recognition part was slowly kind of fading away. . . . He was frustrated but at the same time he was being upbeat to the group. It was things out of his control, things we are still challenged by now. He thought it would be easier to recruit people to work here, to start off.

Table 6

Later Startup Phase Challenges

Challenge	n
Leadership challenges	
Plant manager disengagement	2
Introduction of new performance targets during leadership change	1
Organizational systems challenges	
Struggle with communication as shifts were added	10
Employees did not receive recognition	5
Rumors about plant closure decreased employee morale	1

N = 13

In regards to the plant communication, 10 out of 13 participants noted that with added complexity in terms of moving from a one shift model to a two shift model and eventually to a four shift model had an effect on the effectiveness of the plant communication. One participant commented the following,

> Even when we were on day shift, the communication wasn't that great. I was at home one day. [Employee name] called me. "Oh by the way, we split up the schedule. We're doing twelve hour shifts." [Employee name], I think, was working Monday, Tuesday, Wednesday, and they had me and somebody else working Thursday, Friday, Saturday. We was going to be down on Sunday. I was off that week and he just found out about it. I was planning on coming in the next day and just, bam. I guess that goes with the startup of [customer name] Sun, what they expected us to be running. They just didn't know.

Another participant commented on the following:

> The night shift didn't get a lot of information. . . . Night shift would be here, and sometimes things would happen on my shift that wouldn't happen on the other, and I would send out a general email, of the daily meetings, what all happened. He [plant manager name] didn't like that. I don't know why. But nothing was really being communicated. It wasn't until current plant manager got on . . . . He sends out a detailed list every day, so that people are hearing the same information. Which is something I tried to do from the start but it was just frowned upon for some reason. But now we do it. That was a big frustration for the first 2.5 years. It was a struggle for night shift or even opposing day shifts, to have consistent information. Things they would be talking about today, then may not be talking about in a couple of days. Those shifts wouldn't hear it.

Comparison of ABC plant to other plants at the company. Participants were also asked to compare the ABC startup with other company startup situations (see Table 7). Not all participants have had a chance to be part of several company startups therefore there are only few responses. Three out of 13 participants mentioned that they could observe a cultural difference between the ABC startup and other company startups. One participant mentioned the following,

> Communication from management down to the employees was different from other plants. Majority of other plants we have usually a senior person from the company spending more time with whomever is being trained. So he communicates while he is with them. He [plant manager name] was trying to do it by himself. When we have someone like [employee name] or somebody in that position that we're familiar with, that helps out and communicates back and forth to us on the floor.

Table 7

Comparison of ABC Startup to Other Plant Startups at Company

Comparison	n
Culture and processes were inconsistent with other plants at the company	3
Higher level of complexity in terms of new bottle and secondary packaging equipment	2
Had more difficulty filling positions at needed times	1
Leadership and key positions not staffed appropriately to deal with typical technical challenges of startup	1

N = 13

Another participant expressed the following,

> [Plant manager name] was a new person, not a [company name] person. Communication the way [plant manager name] does things and the way we did them is totally different. The [company name] way wasn't there until they came later on and tried to implement it. [Plant manager name] had already had them molded the way he wanted them, so we had to remold them, which made it a whole lot difficult.

Two participants out of 13 stated that the level of complexity of the secondary packaging equipment is considerably higher than in most of the other company plants. One participant explained the following,

> It was different, because it was a new bottle for [company name], overall. . . . The downstream was different compared to most of our other startups. It was an outside labeler. We're not used to doing IML heat labelling. That was different. We had four or five different equipment that was new to the [company name] that we all had to learn. You had the dual neck bottle, the capper which we had in the [different plant location] but it was different in [plant location], we had an outside labeler that was different, and also the palletizer.

Recommendations Regarding Leadership

Four recommendations were identified by participants related to leader selection and preparation (see Table 8): competencies needed, qualification and leadership style, onboarding training, and startup support for startup plant manager during the early and the late phase of the startup.

Six out of 13 participants felt strongly about certain people skills such as hands-on management style, treat employees with respect, have a vision and a clear direction, be able to motivate employees, possess strong problem solving skills, show appreciation and recognize employees, communicate effectively, set and communicate clear expectations, and display a positive attitude. One participant stated the following: "A leader has to show that he knows and show what he knows and lead them in the right direction". Another participant mentioned

> I think if a team on the floor doesn't respect their leader, and there's not a mutual respect, I don't think it goes as well as it does when there's respect for your leader, and when there's respect from your leader to the shop floor. You can say leadership training, management training, but what do you mean by that in a startup situation? It's very different to running a plant than running an established plant.

Table 8

Leader Selection and Preparation Recommendations

Theme	n
Screen for needed competencies	
People skills	6
Ability to troubleshoot equipment problems	2
Ability to manage customers and contractors	1
Screen for qualifications and style	
Embraces company culture and practices	7
Has adequate technical background	4
Leads by example	1
Adjust onboarding training	
Include exposure to well-running and poorly running plants	3
Include visits to equipment suppliers	2
Provide support for startup plant manager during early and later startup phases	
Communicate clear expectations, goals, and performance evaluation procedures	9
Assign a mentor	5
Support relationship building between plant manager and customers	2

N = 13

Seven participants out of 13 stated the importance for the startup plant manager to embrace the company culture and company practices. One participant described it as follows:

> The new startup plant manager needs to have someone at his side who is be able to show him how to do things the [company name] way. . . . Preparation-wise, be more with the people. . . . [Plant manager name] may have been affected by his training, but he still did it his way. Personality thing.

Another topic in regards to the qualifications for a startup plant manager talked about the necessity of the startup plant manager of having a technical background. Four out of 13 participants answered this question. One participant expressed the following thought:

Participants also answered the question on how to improve the onboarding training for a startup plant manager. Three out of 13 participants felt quite strongly that a startup plant manager should have spent some time in a well-running plant as and in a poorly-running plant. One participant mentioned the following,

> Yes, send him to a well-running plant like [plant name]. This is how a plant should run. But send him to a plant that's struggling, or one that's been struggling and is coming out of it a bit. It's all fresh in those people's minds. "Hey, this is where we were, and this is what we had to do and this is what we had to put in place." Even send him to newer plant startups. . . . Just talk to the people who have been through plant startups and the frustration they see of a struggling plant.

Also two participants out of 13 emphasized the importance of paying a visit to the equipment suppliers, for the blow molding machines as well as for the secondary packaging equipment. One participant answered the following, "Visiting the supplier for the blow molding machines might be helpful - depending on machines. . . . We even went to [supplier name] and looked at the heads and some of the other stuff there." Another participant stated,

> When I'd mentioned that we should have visited the plant of the vendors, he [plant manager name] to wished that he'd gone and seen the exact machinery in operation. Talk to the people on the lines. See what kind of machinery they have. Ease of operations. They give us a kind of estimated expectation of what it takes to run it but seeing people actually do it.

Participants also answered the questions on how to best support a startup plant manager during the early and late start up phases. Nine participants pointed out the importance of providing clear expectations, goals and performance evaluation procedures. One participant mentioned the following,

> A plant manager needs to know the expectations, and the reality. Sometimes the learning curve is getting from the reality to what the expectation is. Certainly some opportunities for training, development, setting expectations on future trainee operations managers or plant managers.

Five out of 13 participants suggested to support the startup plant manager during the early and later startup phase with an individual program, such as a buddy system, a mentoring program or a professional coach. One participant stated the following,

> I think a buddy support system for new startup plant managers is critical. As much just to listen to frustrations. . . . It's got to be a buddy not a critic. . . . I think we have to have the person be a shoulder to cry on and somebody to say, "No you don't want to do that. Let's go this way."

Recommendations Regarding Training and Knowledge Sharing

Participants were asked to provide recommendations regarding training and knowledge sharing (see Table 9). They focused on three topics: Assure that each functional area has sufficient training resources, ensure training schedule do not cut into weekends, and optimize training resources and materials.

Table 9

Training and Knowledge Sharing Recommendations

Recommendation	n
Assure each functional area has sufficient training resources	6
Ensure training schedules do not cut into weekends	2
Optimize training resources and materials	
Assure an adequate blend of hands-on, classroom, and online learning	4
Assure that training location, mix of attendees, and topics support later performance	3
Improve training documentation to support transfer of training	2
Improve trainer selection and preparation	2

N = 13

Six out of 13 participants said it was important to ensure that each functional area had sufficient training resources available. One participant mentioned,

> We definitely need more training. The training for machine operators is very well. I'll agree with that, but on the packaging end, there's really nobody to train the packers and that. It's up to the supervisors who are just learning too to train the new people, so I think that was our biggest problem, figuring out how to train a team lead to be a team lead on what's expected from them. Role clarity played a big part. All the positions.

Another participant commented on the following,

> Downstream training could have been better. It didn't go that well. I think the problem with that some of the equipment that came on site wasn't ready to go into production. So how can you train someone on a piece of equipment that's not ready to run? They're still making program changes, they're still making hardware changes. Priorities changed very quickly. So it is confusing to people.

Participants had a variety of ideas in regards to optimization of training resources and some saw a need to improve training material. Four out of 13 participants recommended to assure an adequate blend of hands-on, classroom ad online learning. One participant explained the following,

> Use E-Learning, there's so much that can happen on those machines that you can never learn it. I always tell everybody, "The only day you'll stop learning is when you're dead." And you have to be susceptible to understand that you're never going to know everything. E-learning would be nice. The last place I worked we had online training, to where you could log onto a computer.

Another participant believed,

> I've noticed a lot of employees here complain about their training. . . . Maybe we could create problems and train them on how to fix it may be a good issue to look at. Disc brakes, or whatever, and then have them fix it hands on. People here are more hands on than looking at a paper. And you learn faster hands-on. As far as training goes I think that would help, if we had some kind of procedure on working on the equipment and creating the issues instead of just saying it or telling them or showing them on paper. I think they would learn better like that.

Three out of 13 participants recommended to assure that the training location, the mix of attendees, and topics support later performance. One participant described the following,

> Should have the technical machine training in a plant which runs similar bottles. So the trainees had the training on the machines but when they came to [plant name] they had the bigger bottles, so they had to be retrained again because we were doing a different kind of process. It is about the bottle size. . . . Suggestion is to choose a plant with similar bottles.

Another participant identified a need for the following,

> The problem was we were trained the machine operators and maintenance in different locations. That might be something we can look at in the future. . . . The

> idea is to train machine operators and maintenance technicians in the same plant and maybe have a second group of machine operators and maintenance at another plant. Yes, at another plant, where we can have a happy spread. It helps to build the rapport. Most of these guys don't know each other so it helps build up that team spirit.

Participants had several suggestions around the topic of the support people coming into the plant (see Table 10). The first topic is about the coordination and communication of the support people.

Table 10

Support System Recommendations

Support Recommendation	n
Coordinate and communicate schedule for visiting support staff	
Ensure clear communication about visiting support staff at all plant levels	6
Provide support staff with clear directions and expectations for their visit	4
Create and maintain detailed schedule of visiting support staff to ensure seamless coverage	4
Encourage US corporate leaders to be more present on floor when visiting plant	1
Ensure support staff receives ongoing training and development	5

N = 13

Six out of 13 participants suggested that there needs to be a better communication about the support people visiting the plant. One participant believed the following,

> It needs to be communicated: Who they are, what they are, how long they are going to be there. . . . People need to know who they are and they should get introduced to them and all the stuff like that. How to do it? We're always in a group in a shift meeting. Here at [plant name] we always have the assistant production manager and the production manager in the meetings every morning, so any new stuff gets mentioned then. The supervisor in the shift handover meeting would be the best person to do it.

Another participant noted,

> [Employee name] made a point every morning at 7:00 am, all the support people met. "OK, what are you doing today? What are you focusing on? What are you focusing on?" I don't know if that was done before. . . . Nightshift was covered in another meeting at the beginning of the night shift. . . . It was effective. When [employee name] wasn't there, he had had the format of the meeting typed up and sent to the plant manager and said, "This is in your hands. If I'm not there that

> week, you need to talk with your people." . . . The meeting [employee name] had was good. We knew what people were doing, we knew what was going on, and it was a lot more structure. That would be a best practice.

The second topic around plant support and the people coming into the plant was about making sure that the support staff receives ongoing training and development which was mentioned by five out of 13 participants. One participant described the following,

> Especially when you bring them in from different plants. We had an operator in from [plant name]. He had a way of working in his home plant and it wasn't the way that we were doing to do it. We had to speak with him and how he was going to do his checks and all that. That can be a frustrating factor for people in the plants. I've seen it on multiple occasions.

Another participant commented on the following,

> It can be a lot. They have attitudes. I've seen that. I didn't have it so much in my area as I saw it on the floor. . . . They need to be reminded that they're here for support, and not to belittle anybody. Not to run the plant. They're here to support the plant.

Recommendations Regarding Organizational Systems and Support

Participants provided recommendations in regards to general organizational topics (see Table 11). Three out of 13 participants recommended that we need to make sure that we actively manage our customer expectations. One participant stated,

> Things are good now, but back then [customer name] were that demanding. It got to the stage where the frustration level went up and they were throwing everything back at us. [Employee name] was there at weekends! The frustrating part for me was that people from the customer on the fill lines would call her over and say, "We've got a bottle problem. We've got leakers." She'd stop whatever she was doing on a Saturday. . . [and] spend all day Saturday and sometimes part of Sunday. And it would turn out it wasn't our problem at all it was a [customer name] issue on the fill lines. Some of that happens in a new situation. Our QA managers, our planners, they get pulled into this. It's all chaos. It's all frustration. They get phone calls at night, they get phone calls at the weekend, and they get burnt out and we lose them. The plant manager needs to be part of this and set boundaries. The solution was to develop an escalation procedure.

Table 11

General Organizational System Recommendations

Recommendation	n
Actively manage customer expectations	3
Institute procedures for enhancing cross-shift communication	2
Accommodate workers' physical needs during extreme heat	2
Institute policies and procedures to measure plant performance	2

N = 13

Another recommendation from the participants, two out of 13, was to institute clear procedures about enhancing the cross-shift communication. One participant mentioned the following,

> All these shifts need to be doing the same thing. It wasn't more structured. More structure would help a lot. We went from one shift to two shifts, and then to four shifts. From a procedure perspective how the supervisors lead the shift. More explaining the procedures better. Even team leads explaining what needs to be done better.

Participants provided suggestions in the area of Human Resources practices such as employee recognition and recruiting policies to ensure appropriate staffing at startup (see Table 12). Six out of 13 participants commented on employee recognition. Suggestions were to provide various types of rewards to recognize employees across all shifts such as verbal recognition, encouragement, and feedback on performance; gift cards and other monetary incentives; training; building rapport; and providing food. One participant stated,

> At the end they started doing stuff like that, rewarding people for attendance, or job performance. Bringing food in. Yeah. If you do something for a long time. For a month. . . . You can have an efficiency goal or something like that then you do it for all four shifts. You can also recognize individually, it all depends on improvement. We could use it for training as well. You've proved that you're that good. Some kind of recognition. Some kind of award or badge. A sticker. Anything. Any kind of award to let them know they're doing well. They can build their confidence, their morale. It doesn't have to be money. It can be a pat on the back sometime. But it has to be from the right people.

Table 12

Human Resource Recommendations

Recommendation	n
Institute formal reward and recognition system	
Provide various types of rewards to recognize employees across all shifts Verbal recognition, encouragement, and feedback on performance (5) Gift cards and other monetary incentives (4) Training (2) Building rapport (1) Food (1)	6
Not all employees require recognition	2
Institute formal recruiting policies to ensure appropriate staffing at startup	3

N = 13

Please note that some of the participants felt no need for recognition. They just want to do their job and what is expected of them.

Three participants stated the importance of implementing formal recruiting policies to ensure appropriate staffing at startup. One participant described the following,

> I think a big part of it is having the people filled before you start, because you're getting so intensive training at the beginning, and it's going to taper off, and the people who show up two months later are losing part of that. Have the budgeted people ready and come in the training phase. Right. It's a big deal.

A second participant mentioned,

> Our plant's problem was finding the right management. Luckily I only went through two, but a lot of the departments went through so many managers. We went through three plant managers. . . . Finding the right people in the right places is what helped us get to this point. Having people that were here because they cared about the job not just because they wanted the job.

Participants shared some recommendations about the overall project planning which includes a suggestion for a new approach in regards to plant startups and also some suggestions in regards to the area of secondary packaging. Three out of 13 participants mentioned the idea of installing a specialized startup team for new plant startups (see Table 13). One participant cited the following: "Every new plant startup is a progression from the last one, as long as the same group continues to start them up. You need the continuation of the same people starting the plants and that same transfer of knowledge." Another participant stated,

> I think having a team that can come up here and work with people for a little while. I know every start up is going to be unique. . . . I think the team, the help that would come in and work with the people and know that they were here to work with the people and didn't have the big heads saying, "Oh we're the elite group from [company name]. . . . If you get people in there that do have that kind of attitude, weed them out. Don't leave them in there. . . . When you bring a group of people in to help, they need to be able to help, to educate the people, to encourage them to do the job that they want to do. . . . To me that would be the most beneficial part of the whole start up. The support of a complete group and tools to do the job that you need. It's hard enough to start a plant up. You don't need people coming in with attitudes right off the bat. . . . It's one thing for people to come that really know how to do things, but if they don't show you how to do it, it's useless.

For the area of secondary packaging the participants had two different suggestions. Two participants suggested to install a mock line either at the company itself or at the supplier site. One participant identified the following option,

> At [former company name], we knew everything for the most part that we were going to be having. . . . We went there, and they had actually set up what we were going to be getting, at a warehouse. We did some kind of "mock production" at the time. They worked in conjunction with us. They took the machinery we were going to be getting, took it to an empty warehouse to pre-train some of our people to understand some of the robotics. Not only did we get the hands on at the actual production facility, some of the things were going to be different, we still got hands on but at a different location. That helped us. As soon as we got it in our facility, there wasn't any question about how we had to run it. We already understood it. . . . If we do have a complex start up like here, we can have better communication with the suppliers, whatever downstream suppliers we have, maybe set up prototype lines to get some hands on experience and realistic experience, so if we get into all kinds of problems we can address it then. . . . The more things you can address in advance, to really know what you're getting into, the easier the startup will be.

Another suggestion around the area of secondary packaging was to manage secondary packaging equipment suppliers more effectively. One participant mentioned the following,

> We should be pushing our suppliers far harder. . . . The people we're supplying to want the bottles. They don't care about our palletizer. They don't care about our labeler. They just care that they get the bottles from us. . . . We should have said, "I don't care about the other people you're working for, [supplier name], I want you here and I want you here now and get it running." And that's where I would have taken a far more direct line.

Table 13

Project Management and Equipment Recommendations

Recommendation	n
Optimize project management	
Create specialized startup team for new plant startups	3
Assure project plan has realistic timelines	2
Improve procedures related to secondary packaging equipment	
Create mock line for secondary packaging equipment	2
Manage secondary packaging equipment suppliers more effectively	1

N = 13

Summary

A total of 13 participants were interviewed as part of this study and provided insights related to their impressions of the startup experience. They also made recommendations for the type of leadership, training and knowledge sharing, and organizational systems and support needed for a new plant startup. Regarding their impressions, participants noted several successes in the early startup phase having to do with the plant manager's availability, training and support delivered, and communication and employee recognition practiced. Several early challenges also were noted related to leadership, staffing and training, and secondary packaging equipment as well as other organizational systems issues. Later startup phase challenges primarily concerned leadership and organizational systems challenges. Participants additionally noted that the ABC plant was unlike other plants related to its culture and processes, complexity, staffing, and leadership.

Participants' recommendations regarding leadership focused on improving leader selection and preparation. Recommendations for training and knowledge sharing focused on optimizing training resources, schedules, and materials for each area so that personnel throughout the plant will be adequately prepared for their roles. Participants further recommended that the plant needs to better coordinate and communicate schedules for visiting support staff and ensure they receive ongoing training and development. Participants' recommendations regarding organizational systems and support included general suggestions, suggestions for human resources, project management, and equipment. The next chapter provides a discussion of these results.

Chapter 5

Discussion

The purpose of this study was to identify what personnel need in order to rapidly achieve steady and sustainable performance during the startup phase of a new manufacturing facility in the rigid plastics packaging industry. Four research questions were examined:

1. What were employees' impressions of the startup experience?
2. What recommendations do employees provide regarding the type of leadership needed for a new plant startup?
3. What recommendations do employees provide regarding training and knowledge sharing needed for a new plant startup?
4. What recommendations do employees provide regarding the organizational systems and support needed for a new plant startup?

This chapter provides a discussion of the study results. Conclusions related to each research question are provided first, followed by recommendations for the study organization and for the organization development consultant. Limitations of the study are then acknowledged and suggestions for continued research are outlined.

Conclusions

Employee impressions of the startup experience. Overall, the technical training for the blow molding machines has been successful, including the 6-weeks pre-training phase in the Midwest where the corporate academy training concept and materials had been used, as well as the onsite training at the ABC plant once production started. The implication of this is that the machine operators started out with a good basic understanding of how to run the machines, which gave them some confidence and a feeling that they were prepared for the basic tasks of their position. Further, it appears that this aspect of the overall plant startup process is working effectively. This finding echoes what can be found in the literature in terms of the importance of deploying and extending productive knowledge to new startup plants (Salomon & Martin, 2008).

Another key take away concerns the effective and helpful support two taskforce members from the corporate technical unit in Austria provided to the plant. Both individuals possess profound technical expertise and, therefore, were able to (a) make the modifications needed to process the new bottle and (b) train the US trainers and support people so they, in turn, were able to train the machine operators. Both individuals had respected capabilities and social skills as trainers. This finding underscores the critical role parent companies play in new plant startups, as prior experiences and organizational learning can be leveraged in new startups to promote a shorter time-to-build and time to become operational (Doeringer et al., 2002).

Additionally, study findings indicated that good team work and energy were evident at the beginning of the startup. People were excited about the project, they supported each other, and worked together as a big team. Participants explained that being part of a startup project creates a strong bond among those involved. From that perspective, things were going well at the beginning.

However, to sustain this initial positivity and momentum, it is crucial to have people with the right experience and competence in key leadership roles in a startup plant. At ABC plant, finding the right person for the maintenance manager role has been a significant challenge that has tremendously and adversely affected the entire project. Participants additionally reported that staffing in general has been challenging, as ABC has had difficulty finding candidates with the right qualifications. This emphasizes the importance of establishing new processes and procedures for recruiting and selecting the talent necessary to run a plant with this level of complexity. The relevant key roles for each startup plant need to be defined early in the process when the organizational structure of the new plant can be influenced.

The area of secondary packaging equipment has been the most challenging aspect of the plant startup, due to multiple factors. With similar projects in the future, the company needs to put more effort in preparing a thorough and detailed design, layout, and planning of the secondary packaging lines. The goal should be to make equipment choices that result in a level of complexity that matches the organization's operational handling skills and competencies. Similarly, past research has indicated that the nature and complexity of the technology introduced to a startup plant plays a critical role and has a substantial impact on time-to-build (Galbraith, 1990; Kogut & Zander, 1992, 1993; Teece, 1977).

Given the challenges of the secondary packaging equipment at ABC plant, it is crucial to have an onsite employee with the capabilities and authority to manage the different suppliers in a way that they are hold accountable for their actions. Additionally, the company needs to establish a thorough process for selecting the right person for this position. In addition to having suitable technical and business experience and competencies, the candidate also should fit culturally with the company. Assuring this fit could be accomplished using cultural fit assessment tools.

Moreover, company leadership should define a process for collecting feedback on a regular basis, with the aim of intervening as necessary if the startup is not progressing as expected. Feedback processes may include assembling relevant project members and plant staff every 6 weeks to assess project progress. Leaders also should make sure that the company policies and procedures, best practices, and routines are implemented early in the startup phase to promote process standardization.

It is crucial for the startup plant manager and his or her leadership team to embrace the company culture. This goal is supported by having existing company employees relocate to the new location. In this scenario, the company culture is brought in and modeled by senior employees. Lawler (1991) explained how critical it is during a plant startup to have the right plant leadership in place. Lawler asserted that managers must be coaches, leaders, and expert resources.

Additionally, it will be important for future startups to make a thorough and honest assessment about the overall complexity of the plant. Executive leadership needs to decide whether it is necessary to engage external resources to effectively manage the startup project.

The organization's human resource department needs to make a thorough assessment of the local labor market in at the location of the startup plant. Based on the findings, a competitive compensation structure needs to be put in place and managed over time to capture market movements.

Recommendations regarding leadership. The leadership team at each plant needs to embrace the company culture and lead by example. The company could achieve this by educating the leadership team about the company culture. Regular feedback loops also are needed to learn more about the local plant culture and assess alignment with the overall company culture.

Startup plant managers should be hired 5 or 6 months before plant startup so they receive a thorough onboarding with the company. As part of the onboarding process, the startup plant manager needs to spend some time both at a well-running plant and a poorly running plant. The goal of these rotations is to learn the daily, weekly, monthly and annual routines of the plant and the main processes for each function—both when a plant is working well and when it is not. Several additional measures need to be taken to support the startup plant manager during the challenging onboarding phase. One such tactic is to assign a mentor to the startup manager who will provide support, empathic listening, and guidance as needed.

Recommendations regarding training and knowledge sharing. Efficient, effective, and consistent training is needed for all functional areas of a startup. Training should be planned and knowledgeable and skilled trainers should be allocated, in particular, for production planning, spare parts inventory, the tool room, and more.

E-learning training also is anticipated to play an increasing role in the future, as it offers a highly scalable and cost-effective training option and further allows learners to modules at their own pace.

Depending on the overall complexity of the startup plant, a wide range of support people may be needed. To guarantee successful visits by these support people, it is crucial to coordinate their activities. One recommendation is to hold daily shift meetings (e.g., one in the morning, one in the afternoon) so all the support activities can be coordinated and managed proactively.

It is also crucial that support visits and schedules are communicated at all levels of the plant so staff know who is visiting, where they are coming from, what their assignments are, and how long they will stay. A simple tool for providing this communication could be a white board in the production area where visitors' profile, picture, and plans are posted. Additionally, it would be helpful for one person onsite at the plant to keep track of all the visiting support people and to coordinate with the relevant parties to make sure the full coverage is guaranteed in areas where needed.

Recommendations regarding organizational systems and support. Startup plants rely upon established routines to support the development of a good working relationship with customers. The introduction of the new startup plant manager, therefore, needs to be a strong focus. It is also important to manage the customer so that unrealistic expectations are identified and adjusted. Root cause analyses also need to be thoroughly evaluated before rushing to blame suppliers.

Plant leadership should take into account employee wellbeing for startups that occur during periods of extreme weather. For example, employees need to have ample water, more breaks, and cooling bands during summer months.

Clear goals and key performance indicators need to defined for new startup projects. Once established, these need to be promptly communicated to establish a performance-based culture within the company. Targets should be adjusted as needed to promote realistic goal setting.

Having effective human resource practices in place from the beginning of the startup is very important. Employee recognition should be built into the leadership culture so that employees are acknowledged for their good work regularly as well as both formally and informally.

Recruiting is an important part of a startup project and, therefore, needs to be a focus so that the organization has enough resources in the form of available people, time, and competencies. Assuring that the organization has sufficient recruiting resources in place also needs to be assured so that staffing does not become a problem throughout the plant. It is crucial to follow the recruiting process and not to allow any shortcuts due to time constraints. Ultimately, US corporate leadership is responsible for ensuring that necessary competencies are available to plan and manage a highly technical complex startup project, either internally or externally through consulting companies.

A new way to approach startup situations would be to install a startup team. This team would consist of highly skilled and experienced team members who have already been part of at least two startups in the past with the company. These team members should know the company's policies, procedures, and processes well so that they embrace and help propagate the company culture.

One way to approach the challenge of high complexity in the area of secondary packaging would be to install a mock line that would allow testing of the whole line and to verify the interplay of all the equipment pieces. This would need to be done before the startup in a separate location occurs. A possible location for the mock line could be one of the supplier locations.

Recommendations

Recommendations for executive leadership. Three recommendations for executive leadership are offered based on the study findings. First, the study findings indicated that many of the challenges experienced emerged from the complex nature of the secondary packaging equipment and the need to incorporate multiple pieces of equipment that needed to be aligned and synced with each other. To address this challenge, US corporate leadership needs to either hire qualified staff or external consultants and experts. One interesting approach would be to install a mock/test line in a warehouse or at a supplier site to allow for problems to be identified and ameliorated before production begins. Although this approach is capital intensive, conducting a cost-benefit analysis of a mock line would be helpful.

The second recommendation is based on the finding that onsite support staff people are needed for startups characterized by high complexity and technical challenges. In particular, participants expressed the benefits of having company-specific knowledge and experience available onsite on an ongoing basis for a defined time frame in all the key functions. Installing a startup launch team that supports the overall goal of meeting defined due dates and fulfilling project schedules may help to this end.

The third recommendation is that startup outcomes could be improved by conducting a pre-mortem to identify the challenges that could undermine the startup. Potential challenges may include secondary packaging equipment (whether it is a single piece of equipment or multiple pieces that need to be aligned and coordinated), new product designs (e.g., bottles, caps, or closures) that require process or equipment modifications, labor and talent shortages, and market competition. Based on the challenges identified, key roles for the plant startup should be defined and the needed knowledge, skills, and abilities for each role should be defined. To begin the process of hiring, at least two to there qualified candidates per role should be identified. Once the roles are filled, the staff should be thoroughly trained to effectively carry out their roles. Emphasis should be given to cultivating both the soft and hard skills needed for their roles.

Given the challenges experienced by the plant concerning plant leadership, the fourth recommendation is to assure that a strong recruiting and selection process is established to guide hiring for the plant. In particular, the study organization is advised to either make the internal process more robust or to select a qualified external company to handle recruiting. Specific recommendations to improve the current hiring process are as follows:

- The human resources director, training manager or an external organization development practitioner should lead a facilitated meeting with diverse stakeholders to create job profiles for the key plant positions. Recommended stakeholders to include in the meeting are the general manager, vice president of manufacturing, hiring manager, program and project management manager, human resources director, and internal recruiter. Involving multiple stakeholders can promote alignment and clear understanding about the scope and demands of these roles. Based on the position profiles, key success criteria and qualifications (both required and preferred) also should be defined.

- The human resources director should facilitate an interview team meeting before the hiring process begins to brief all involved personnel about the job profiles, success criteria, intended behavioral interview questions, and interview schedule. The director also should provide needed tools at this time, including interview scripts and candidate evaluation sheets.

- At least two assessment instruments selected by the human resource director and the internal recruiter should be administered to candidates to gather additional information to inform the hiring process.

- An interview team meeting should be held before selecting the final candidate for each position. The focus of this meeting should be review each member's input and evaluation of the candidates.

- One day a week (e.g., Friday) should be reserved for several weeks to ensure availability of interview team members for needed meetings.

Recommendations for project management. Two recommendations are offered to project managers based on the study findings. First, one study finding indicated that some key responsible stakeholders for the startup from US corporate were not available onsite until issues reached a critical level. To avoid this situation, a regular feedback loop should be implemented. This could occur through a regular call convened by the project manager with the responsible onsite stakeholders. Meeting frequency depends on the project phase and progress. The meeting focus will be to assure the project is on schedule. A specified agenda should guide the meeting, minutes should be taken, and project status should be fed back to the project management structure (Project Delivery Review Board [PDRB]). To improve the value of the regular status report (PDRB) meetings, an escalation procedure should be instituted where projects showing “red” status three times in a row trigger the scheduling of a crisis team meeting. This meeting should be led by a neutral person who has strong facilitation skills, such as the human resource director, the training manager, or an external organization development practitioner.

Study findings indicated that the employees at all levels at the startup plant have experienced substantial frustration. Moreover, frustration escalated as technical challenges continued to go unresolved. Therefore, the second recommendation is for the project management group to gather regular firsthand feedback from individuals on the startup plant floor. Methods for doing so include brief all-employee surveys or focus groups (the preferred solution). Focus groups should be convened by a neutral external party (e.g., a US corporate human resource person, an external organization development practitioner) with a representative number of the shift’s employees. These could be conducted as lunch or dinner meetings, and the focus of the discussion should be simply to ask how things are going. Although a structured set of questions should be used, free-flowing and in-depth discussion should be encouraged through follow-up questions. Feedback procedures like this offer two benefits: company leaders gain valuable information and employees feel heard and taken seriously. Results of the discussions need to be reported back the US leadership team.

Recommendations for organization development consultants. Recommendations also are offered to organization development consultants who aim to assist a startup effort. There are multiple engagement opportunities for an organization development practitioner. In the study organization, findings indicated that the startup began in a promising manner, despite some known technical challenges and high complexity due to the bottle design and secondary packaging equipment. However, over time, employees' enthusiasm and excitement about the startup faded and became escalating frustration as the technical issues remained unresolved. Organization development practitioners may offer several benefits under such conditions.

First, the organization development consultant could work hand-in-hand with the project manager to assure that feedback is gathered and reported back to the organization. In particular, organization development practitioners could help design, implement, and operate a standardized feedback process (see recommendation above) and also could help facilitate regular project status meetings. Moreover, organization development practitioners could assure that people-related concerns are observed during these procedures.

Second, study findings suggested that employees' growing frustration was associated with eventual disengagement of the plant manager and other key personnel. This indicates that the US corporate stakeholders did not successfully manage these aspects of the project, for whatever reason. The organization development consultant could help the project manager create an escalation procedure that establishes clear processes for addressing critical issues. Part of this process should include proposing appropriate interventions for resolving emergent issues to relevant stakeholders.

Third, participants suggested implementing mentor program for startup plant managers to provide them with needed support during challenging phases of the project. It is the organization development practitioner's role to develop the mentor and assure that he or she is aware of the situation and issues at hand and congruent with the company culture.

Fourth, another study finding emphasized the importance of cultural fit during the hiring process for a new plant startup. Organization development practitioners can support this goal by facilitating cultural trainings and workshops with the leadership team and new plant employees early in the startup process. This will promote consistent understanding of the company culture across all plant leadership and employees. In particular, the organization development practitioner should introduce the company compass and share all activities provided at all the other plant locations with the startup plant manager and the local human resource manager.

Limitations

Two key limitations affected the present study and need to be acknowledged. First, the sample did not include all functions or people involved in the startup. For example, many people left through turnover and their perspectives were not included in this study. Additionally, most of study participants were from production. Thus, the findings largely represent the concerns and issues of participants and are not necessarily representative of all employees. For example, the use and need for temporary workers was significant for the startup but was not emphasized in the study findings.

Second, the researcher has extensive experience in the study organization in general and with regard to new plant startups. This background likely led to researcher bias, as she was already knowledgeable of the issues hampering the startup before the start of the research project. Her foreknowledge may have consciously or subconsciously led her to emphasize or de-emphasize findings based on own experience and perceptions.

Suggestions for Further Research

The primary suggestion for further research is to repeat the study, correcting for the limitations. Specific suggestions are to include co-researchers to help reduce the incidence of researcher bias. Additionally, the sample should be expanded to include all functions at the plant, as well as attempt to include personnel who were present at the beginning of the startup but who left at some point along the way. Additional methods of data gathering could be incorporated to further enhance the findings, such as including observation data and performance data.

Summary

The purpose of this qualitative study was to identify what personnel need in order to rapidly achieve steady and sustainable performance during the startup phase of a new manufacturing facility in the rigid plastics packaging industry. Data were gathered through 13 interviews with personnel who were present during plant startup. Participants were asked to provide their impressions of the startup experience and recommendations for the type of leadership, training and knowledge sharing, and organizational systems and support needed for a new plant startup. Participants noted both successes and challenges related to the plant manager, training and support delivered, and communication and other organizational systems in place. Participants additionally noted that the ABC plant was unlike other plants related to its culture and processes, complexity, staffing, and leadership. Participants' offered several recommendations, including improving leader selection and preparation; optimizing training resources, schedules, and materials for each area; improving coordination, communication, and training for visiting support staff; and adapting human resources, project management, and equipment. Based on these findings, several recommendations for executive leaders, project management, and organization development consultants were identified. The key suggestion for continued research is to repeat the study with an enhanced design.

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Appendix: Interview Script

Name: ____
Date: ____

The interview consists of two parts. The first part is around demographic questions. The second part is about your experiences during the startup phase of the [ABC] plant. The information provided in this interview will not be related back to you as an individual. The idea is to collect input from people who have been involved in the startup and who have relevant information to share so the company can improve future start up situations.

Demographic Questions

1. How old are you?

___ 18 – 25 ___ 26 – 39 ___ 40 – 55 ___ 56+

2. How long have you worked for [the company]?

___ 0 – 4 years ___ 5 – 9 years
___ 10 – 14 years ___ 15+ years

3. What is your gender?

___ Male ___ Female

4. What is your highest level of education?

___ High school ___ Some college ___ Bachelor Degree ___ Master's Degree
___ PhD ___ Other

5. What is your current position?

6. What was your position at the time you joined the company?

7. Who was your supervisor for your first year of employment at [the company] in [ABC]?

8. How many manufacturing startups have you been involved in besides [ABC] (whether at [this company] or at another employer)?

9. What role(s) did you play during the startup?

10. When you think about the startup of the [ABC] plant, what stands out most to you about your experience?

11. Looking at the startup of the [ABC] plant from an overall perspective, what would you say went well? → Ask probing questions such as – Tell me more about that? – Why do you think that happened?

12. What did not go that well? And what are the reasons for that?

13. Is there anything you would have liked the plant manager do differently? If yes, what is that?

14. Looking at the training for new employees, what went really well?

15. And what did not go that well in regards to that training?

16. Have there been any additional support people available during the startup, either from the SVC (US corporate) or from other plants? If yes, has this been helpful? What has been especially helpful about them? Is there any support you didn't have that wish you did?

17. How would you describe the overall communication? What went well and what did not go that well? What would have been helpful, especially during the startup phase?

18. Did the employees feel recognized during the startup phase? If yes, what kind of recognition did they get? If not, what kind of recognition would have been helpful?

19. Was [ABC] a typical plant startup here? If no, what was different compared to other plant startups?

20. What kind of preparation is provided to the plant manager before the actual startup? What kind of guidance is provided to the plant manager during the startup phase? Is the guidance helpful? If no, what is missing?

21. Is there anything else about your experience with the startup that you would like to share, such as recommendations or best practices?