CASE STUDY

Textron Systems

*Fostering Continuous Improvement in a
Changing Business Context*

Summary

Who: Textron Systems

Where: Wilmington, Massachusetts

When: Site Visits: December 11-12, 1998; February 12, 1999;
                  May 8, 2000

What: Large non-union facility implementing systems change
                  initiatives in a rapidly changing business context

Introduction

For over five decades, Textron Systems has been an important contributor to the U.S. defense aerospace business. Its breakthroughs in thermal protection materials enabled NASA Apollo command modules and Air Force intercontinental missiles to successfully re-enter the earth's atmosphere. High strength, lightweight boron composites from Textron Systems help carry the primary structural load in the Space Shuttle orbiter and today's aircraft carriers rely on Textron's automated landing systems. Textron highlights smart systems, including smart air and ground munitions, as its unique value add in the 21st Century global marketplace -- products that can rapidly acquire, analyze and act on real-time data inputs.

For most of its products, such as the smart munitions, Textron Systems is a prime contractor with the U.S. government, while it also serves as a first-tier supplier for other technologies, such as boron composite components. The uncertainties associated with each role -- contractor and supplier -- are different and both are part of the Textron story. The constant adaptation of its product line and business strategy is a defining feature of Textron Systems as a business. This is a significant accomplishment for the business, but a constant challenge when it comes to work organization and skill development.

Beginning with quality principles in the 1980s and extending into lean principles in the 1990s, workplace change initiatives have been seen by Textron Systems as key to business success. The current initiative, which is entitled "10X" targets not just incremental gains, but performance gains of an order of magnitude or gains that are ten times current performance. Concurrently, Textron has long invested in employee training and development, another significant part of this case.

Textron Systems is part of the larger Textron Corporation, which includes the Textron Automotive Corporation, Cessna, Bell Helicopters and other businesses -- all of which have a high degree of autonomy. Textron Systems is based in Wilmington, Massachusetts, with additional facilities in three other locations. This case study is focused on the Wilmington operations, which are non-union. As a 1,400-person facility, the spirit of the operation is reflected in an internal presentation slide that features a picture of a huge gorilla and the statement, "We're competing with mega mergers."

Key Challenges and Key Lessons Learned

The core business and employment challenge facing Textron is to ensure a lean, flexible and agile organization to match a constantly evolving business strategy. This has required innovation in the areas of training, organizational development, and work organization.

Training has been a long-term priority for Textron Systems. When the company was focused on products to support re-entry to the earth's atmosphere, it needed large cadres of engineers with this unique skill set and a production workforce skilled with ceramics and other specialized materials. Today, the business depends on engineers and production workers with skills centered on smart munitions and other related products. In-between, there have been significant shifts in the business in each of the past five decades. The scale and scope of the challenge became apparent in two sets of interviews that we conducted. The first was a series of group interviews with five different teams spanning production workers, engineers and supervisors. The second was a series of individual interviews with senior managers.

In each of the team interviews, the employees expressed a deep commitment to acquiring new skills and abilities. They indicated that new skills and training make it possible to periodically move from one team to another and that being on the right team is critical when the business shifts direction. As one team member noted, "People must upgrade their skills to stay state of the art." Another pointed out, "Change does exist – needing new skills doesn't mean that you aren't a good employee." They also indicated, however, that it was hard to get timely and definitive information about just what the future directions of the business were. Just because managers said a given type of training was important was not, according to these employees, sufficient information upon which to base their own career prospects.

"People must upgrade their skills to stay state of the art."

-Textron team member

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Interestingly, in the interviews with senior managers they expressed frustration at not fully knowing what the available skill set of the workforce was. They said that it was hard to get timely and definitive information on what were the future career aspirations or even the current capabilities of the workforce. Just because employees said that a particular topic was interesting or important to them was not, according to these managers, sufficient information upon which to base the future prospects of the business.

The challenge here is that there are multiple stakeholders to the training process -- each with key information that others need, but each with legitimate concerns around how to ensure that the information is credible. This challenge becomes particularly salient in the aerospace context, where technology and markets constantly change.

During the group interviews, formal brainstorming took place around current strengths and weaknesses. All of the groups mentioned training opportunities as a strength, along with the work ethic, flexibility, benefits and other matters. The weaknesses included multiple layers of management, communications (across levels and among teams), limited career opportunities (given the niche markets served by Textron Systems), politics, and differences between engineering and manufacturing cultures. In other words, many of the formal programs and human resource systems are in place, but the informal working of the organization prevents the full potential from being realized.

"We ask people to think about improving the performance of their part of the operation by a factor of ten over a two-year period."

-Noel Nightingale

Continuous improvement is a closely related business challenge. In response, the company has fashioned its "10X" initiative. Begun in October 1996, it is rooted in two thoughts that have a transformative potential when combined together. First, all employees and groups of employees are urged to make improvements in their operations -- but not just small incremental improvements. As Noel Nightingale put it, "We ask people to think about improving the performance of their part of the operation by a factor of ten over a two-year time period." This alone could be seen just as top-down management pressure for improvement, were it not for the key second part of the message. Again, Noel Nightingale comments, "At the same time that we ask people to make a "10X" improvement, we also ask them what resources and support would be required to do this." Framed this way, the "10X" sessions end up surfacing key systems barriers and major systems change opportunities.

The 10X aims are centered on what Textron terms the business basics: Reduce product cycle time; improve product quality; lower product cost; minimize waste. The methodology for 10X builds on quality principles and is as follows: Understand requirements; measure process capability; improve the process; control process variables; satisfy the customer. The aim with 10X is to avoid sub-optimal "stovepipe" improvement and instead align improvements in service of the end customer. As Michelle Johnson, a senior manager with lead responsibility for 10X noted, "we have linked 'lean' and '10X' together."

In support of the "10X" effort, the "red book" of company performance metrics was revised in January 1997 to include agreed upon 10X metrics (it is literally a red binder, hence the name). This was expanded a year later to feature an integrated productivity index. Monthly red book sessions are held by the Vice President of Operations to review work group, department and plant performance improvements, which are tracked in the red book. The tone at these sessions is constructive and non-blaming. If anticipated gains are achieved, there is enthusiastic appreciation given. If not, there is a problem-solving oriented discussion of what might be preventing such gains. One team member commented, "I like 10X because it's very structured."

Most of Textron's production and engineering operations are now organized around teams in order to best meet the ever-shifting business requirements. The shift to teams has proven a valuable foundation for the 10X improvement efforts and an appropriate framework to organize employee training and development. It has, however, had some unintended effects. As former Textron executive Ron Milauskas put it, "We wanted to convey the team concept, so we eliminated all the titles and made everyone a technician. Even though people were getting more new assignments than before, the absence of new titles to go with the new assignments made people feel like teams had made their careers stand still." Thus, the challenge is to foster cooperation and interdependency at the group or team level, while still ensuring that individual career progress can be tracked and recognized.

Restructuring has not been limited to front line operations. Not only are production workers organized into teams, but also engineering design primarily occurs through integrated product design teams. Even at the executive level there has been restructuring – with over a dozen senior executives in the early 1990s and a reduction to seven vice-presidents now reporting to the president of Textron Systems, primarily driven by the team structure.

Textron Systems is both a direct contractor and a supplier in the aerospace industry. As such, it must meet the increasingly stringent supplier certification requirements of the companies it supplies, as well as administer similar systems with its own supply base. Aerospace suppliers are also expected to contribute increasing levels of engineering and design, all of which makes the management of supplier relations a multi-dimensional challenge for Textron. As we will see below, there are a number of innovations emerging around long-term supplier agreements and opportunities for employees to set up entrepreneurial businesses and become suppliers.

Summary of Types of Instability

Organizational instability has been a factor at Textron throughout the 1990s, but in different ways. In the early 1990s there was an initial wave of cost-cutting initiatives that resulted in substantial layoffs. Then, between 1995 and 1999, there was a surge in the business, which included substantial new hiring. Then, in late 1999, there was another wave of restructuring that involved the use of attrition and some staffing reductions. The impact has been strongest on the most recently hired employees. It is both the growth and the layoffs that drive the focus on skills and capabilities -- either to move into areas that promise interesting work and some degree of business growth during good times or to limit vulnerability to layoffs during downturns.

One specific aspect of government policy that was noted with respect to training is that job specific training can be billed as part of the government contract, while more general development skills can't always be billed.

A second form of instability, which is common in many sectors, has been management turnover. In the Textron case, this is evident with respect to the "10X" initiative. The success of these efforts in Wilmington and other sister facilities led one of its key champions, Noel Nightingale, to be promoted in order to drive this approach at the corporate level. While this promises to extend the ideas more broadly, it has also revealed a gap in the Wilmington operation. The "10X" initiative depends on management's commitment to provide the resources and support associated with the "10X" proposals. As an on-site champion, Noel drove this support. While the current management team is still committed to "10X," there is the risk that the loss of a key champion may diminish the level of dedicated support. During a recent visit, we learned that the "red book" reviews are still taking place, but that there was also the fear of increased variability in the degree of passion driving the effort.

Compounding the current business pressures are additional forces created by the current job market, which is very tight. Some of the most talented engineers and managers are being offered positions by high technology firms that include stock options and other incentives. As one leading operations manager noted, "This is a brain drain affecting us and many others in the industry." One member of a software engineering team stated, "I am one of five people recently hired and four have left to take other jobs."

Technological instability is a fact of life at Textron. The computer hardware and software in its smart products, for example, is constantly evolving. While this is ever-present, it was seen as a given by most people we met -- not as something that needed to be tempered or addressed directly. By contrast, the instability and oversight costs associated with government contracts were highlighted in a number of individual and team interviews. One senior operations manager who had recently transferred into the Wilmington plant from Textron's automotive division commented that: "The government is really going to have to change. It seems the government wants to know everything that you do here -- it is not at all like autos. This adds waste to the system." Other senior leaders at Textron point out, however, that "there has been significant movement by government in the right direction in recent years" -- citing the increased use of performance specs and other lean practices.

One specific aspect of government policy that was noted with respect to training is that job specific training can be billed as part of the government contract, while more general development skills can't always be billed. In a traditional, mass production organization, this distinction can at least be supported. By contrast, many topics, such as team training or lean principles, involve general skills but are essential to business success. One of the team members commented on the paperwork that goes with government work, noting "the requirements of the DCAA – the Defense Contract Auditing Agency – make things very rigid." Again, even though front-line works may see this as rigidity, others in Textron point out that DCAA has made significant improvements in recent years.

A final source of instability derives from mergers and restructuring across the Textron Corporation. Three mergers have impacted this facility over the last nine years, which include restructurings with Bell Aerospace, Specialty Materials division and HR Textron. In each case, products and activities have shifted among Textron locations, impacting workforces and operations. Elements of Textron operations in Lowell, Massachusetts, and other locations have also been

periodically restructured, with some impact on the Wilmington workforce.

Perceptions of Instability

In order to better understand perceptions of instability, a survey was administered in this location and five others where similar research is under way. The results are listed in Table 1. A cross section of 93 professional, technical and production workers completed this survey. More than some of the other locations, the employees in this facility experience significantly more frequent instability due to changes in government budget allocations and significantly less due to changes in product demand (reflecting the relatively low level of commercial work in this facility). Interestingly, changes in equipment and technology were not seen as a common source of instability, which either means that such changes are not frequent or that they are effectively handled when they do occur. Like all of the employees surveyed, changing customer requirements is a commonly encountered source of instability.

Internally, the most common sources of instability concern changes in budgets, changes in leadership vision, and tension/stress around change. These forms of instability were also at relatively high levels across all of the organizations in which this survey was administered. Although the frequency of instability due to sub-contracting is low compared to these factors, the employees in this location did cite this more often than in other locations -- reflecting concerns about potential decline in business at the time that this research was under way.

Data suggest that there are potential sources of instability that are both external and internal facing this organization, all of which will require a broad mix of mitigation strategies. Responding to shifting budget allocations, for example, is a very different challenge as compared to the response to perceived shifts in leadership vision.

Table 1

Sources of Instability:
Textron and Other Aerospace Plants

At this site and others, we conducted an attitude survey to study people's views on instability and related topics. The following table features the results on some survey topics for this location and the average results for all others. The survey topics are a variety of instability types, all from three broad sources of stability; changes in

funding, changes in technology, and changes in organizational structure. For example, funding instability is reflected in changes in budget allocation for government contracts, internal company budgets, and product demand. These results represent a sample of the views of the entire workforce and must be interpreted from that perspective.

Employees at Textron scored four instability topics as significant; changes in budgetary allocation for government contracts, changes in product demand, changes in technology, and changes in the subcontracting of work. It is clear that the impact of reduced defense spending is a critical issue for Textron employees. A shift in product demand and awareness of the need to continually shift to meet demand is increasingly a part of the environment among the Textron workforce. Employees try to position themselves to work in areas where there is greatest demand. In addition the significant scores reflect the company's drive to constantly improve their product and develop new technological advances. The concerns registered by employees about the subcontracting of work arise in part out of the experience of layoffs and reductions in the workforce both at this location and at a sister location nearby.

Table 1
Sources of Instability: Textron and Other Aerospace Plants

EXTERNAL SOURCES OF INSTABILITY	Textron n=93 (1=never, 2=sometimes, 3=frequently)	Average of other plants (5 plants, n=482)	Difference
Budget allocations	2.20	1.56	0.64**
Product demand	1.92	2.29	-0.37**
Customer requirements	2.14	2.29	-0.15
Equipment/technology	1.96	2.17	-0.21**
Supplier performance	1.82	1.97	-0.15
INTERNAL SOURCES OF INSTABILITY			
Internal budgets	2.12	2.09	0.03
Voluntary turnover	1.92	1.98	-0.06
Reengineering	2.05	1.97	0.08
Leadership vision	2.16	2.07	0.09
Tension/stress around change	2.17	2.03	0.13
Subcontract out work	1.79	1.51	0.29**
In sourcing of work	1.55	1.42	0.13

* .1 level of statistical significance; ** .05 level of statistical significance; *** .01 level of statistical significance

Summary of Mitigation Strategies

The dominant mitigation strategy at Textron Systems involves a constant search for business opportunities that build on the core competencies of the organization and that promise long-term revenue potential. In addition to the "smart" products, this has recently involved the exploration of a growing number of commercial applications of Textron's sensor technologies. The driving force is that the commercial sector is seen as more stable.

All of the focus groups were asked to brainstorm future opportunities and future threats (as well as the current strengths and weaknesses noted earlier). In each group, commercial business was seen as a key future opportunity. While this does have the potential for relief from budgetary instability, it would introduce increased market instability into the operation. Indeed, a commonly cited threat was the challenge of being able to effectively compete in the commercial world. Other opportunities highlighted included cross training and leveraging learning across other parts of the Textron Corporation, while other threats included the lack of funding for new technology, the fear of future layoffs, and the loss of government contracts.

> **"Learning is the key…it implies a transfer of knowledge, not just attending a training event."**
>
> **-Russ Gamache, Senior Operations Manager, Textron Systems**

Achieving more than incremental gains in business performance, driven by the 10X approach, is also a key mitigation strategy. As Noel Nightingale put it, "If we make ourselves the best, we can capture other business and jobs that we hadn't seen before." This stance is reinforced with symbolic gestures. For example, all employees were given copies of the book "Lean Thinking" by Noel as a holiday present in 1999.

Shifting to a team-based work system is both a vehicle for enabling business growth and a way of mitigating some internal organizational instability. As the Vice President of HR put it, "cross training gives us flexibility to grow the business." The cross training is not just within teams. Recently, for example, a group of associates from a smaller boron manufacturing plant in Lowell, Massachusetts, was rotated into the Wilmington facility for cross-training and they are now back in the Lowell facility applying what they learned.

While training is an important part of how Textron Systems seeks to mitigate the instability in the marketplace, there is the dilemma for

employees and managers alike around what skills to highlight and pursue. Towards this end, senior operations manager Russ Gamache reports a set of major new initiatives that are in early stages of development and implementation. The first is a system designed to formally indicate future business skill needs, highlight training and development opportunities, and track training accomplishments. This initiative has not been formally launched, so it will bear further study in the future. As Gamache noted, "Learning is the key. . . it implies a transfer of knowledge, not just attending a training event." He stated that the company doesn't know how to measure the full payback to training, but it is convinced that this investment is essential to future business success. At the time of this study, a learning center was developed, with specially designed classrooms and other facilities. Since this time, however, the learning activities have been decentralized across different parts of the operation in order to better integrate training into the business and to be responsive to pressures around the utilization of floor space.

A related initiative also still in early stages of exploration is focused on the loss of talented people to high technology start-ups. Textron is exploring ways to create incubator situations where associates will have the chance to make a business case to for funding to develop and launch their own businesses. In effect, this has the potential to build a growing network of suppliers who are uniquely capable to work with Textron.

In working with its supply base, Textron has applied the 10X approach, along with lean principles in order to completely restructure supplier relations. For example, the purchasing department previously took 25 days to process a $100 million supply contract and it has targeted a turnaround time of 2.5 days. With its own top suppliers, the company has negotiated long-term contracts that outline a variety of contingency circumstances depending on whether a given line of business expands or contracts. Some are five-year agreements, which anticipate major performance gains as a result of 10X efforts and include mechanisms to share the gains between contractor and supplier.

The long-term agreements create complex challenges for team members at Textron Systems. On the one hand, they have little direct input into what work is kept in-house or contracted out. At the same time, the suppliers with whom Textron has long-term agreements often become integral to the way the work is completed. For example, interviews with a team of computer programmers indicated that the teams within Textron and the teams in the supplier organizations would interact directly with one-another, without having to go through

levels of management or the purchasing department. There is a challenge, however, in that senior executives must now take into account these deepening levels of interdependency in future make-buy decisions -- all in a business that is constantly shifting. Thus, the long-term agreements do help to mitigate instability, but create a complex web of relations and new constraints on the business.

Given the instability associated with military contracts, combined with the logic of continuous improvement under the 10X initiative, the company's policy around job security becomes an important, if complicated issue. As one senior executive noted, "the business is always unpredictable." He added, "We try to imply that using 10X will give us job security. . . we try to send the message without stating a policy." In fact, the lack of a layoff between 1995 and 1999, despite volatility in the business, reflects significant effort to move people and align activity with the available work. As another organizational leader noted on this issue, "our actions speak louder than our words."

The current downturn in the military business has created predictable tension with respect to the job security issue. Some of the responses are unique. For example, a manager and an entire team of 30 people in the Lowell boron plant took a summer furlough – preserving their jobs as a group but accommodating reduced demand. Although many layoffs were avoided through policies such as this, attrition and early retirements, the fact that some people were laid off becomes a strategic concern in a business that is depending on 10X gains to drive business success.

Conclusion

Textron Systems illustrates the ever-changing challenge of aligning employment systems with business strategy in the aerospace industry. As an autonomous division of a larger corporation, it has sufficient resources to sustain major change initiatives, but it is also small enough that is remains vulnerable to the swings that come with each new business contract. In response, a combination of training, organizational development and work restructuring activities are being implemented – all of which are critical, but which together still can't full mitigate the instability associated with the defense aerospace sector.

Teaching Notes

It is people who are at the heart of new work systems – establishing stability and then driving continuous improvement. The Labor Aerospace Research Agenda (LARA) at MIT is committed to furthering our understanding of the human and institutional aspects of these new work systems, especially as they relate to broader issues of employment and vitality in the aerospace industry. Toward this end, LARA is pleased to announce a new series of Case Studies. These Case Studies were written by a MIT-based research team and were developed in conjunction with representatives from each of the sites, with the help of representatives of the United Auto Workers and the International Association of Machinists.

These case studies are designed for use by union leaders, managers, trainers, college and university educators, and others interested in fostering constructive dialogue about the current dilemmas, challenges and innovations in around employment matters the aerospace industry. These cases can be used in a classroom setting, in small discussion groups, or by individuals as thought starters.

This case study was prepared as an example of the challenges of instability in the aerospace industry. It was written as a basis for dialogue and learning, not as an illustration of either effective or ineffective actions. There may be many possible answers to these questions. They are designed to foster constructive dialogue and action on these very challenging issues.

Potential Discussion Questions

- What are the implications of shifting business strategies for the workforce at Textron Systems? What are ways to effectively prepare a workforce to operating in a changing business context?

- What is required for people at all levels of the Textron Systems to engage in constructive, open dialogue around future skill requirements and current capabilities?

- In what ways does the 10X initiative help to mitigate the competitive pressures facing this organization? In what ways does it introduce additional internal dynamics and support requirements that need to be met?

- Given the changing nature of technology, what are the training and workforce development implications for an organization such as Textron Systems?

- How would an increase in commercial business impact the workforce in this facility? What sources of instability would be reduced and what new challenges would likely emerge?

- What are the implications of long-term contracts with key suppliers? How would this add stability to the operation? In what ways will this impact daily work operations