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The Spectrum of Risk Management in a Technology Company

## Maturation of Business Continuity Practice in the Intel Supply Chain

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## ABSTRACT

Natural disasters and other catastrophic events could interrupt Intel's global and interconnected supply chain at any time, any where. In order to reliably produce quality products, Intel needs to be able to quickly react to a crisis, ensure continuity of our business, and restore the supply chain. Business Continuity (BC) planning in Intel's worldwide Materials organization has matured over time, moving from crisis management and response, to a more mature BC approach. The BC methodology, infrastructure, and tools used within the Materials organization have improved Intel's ability to quickly recover from a supply chain outage and restore supply to manufacturing and other operations. The BC approach enables the Materials organization to determine the appropriate level of effort/investment to make in BC and focus on the business needs, risks, and available resources. Real-life events have demonstrated Intel's BC and crisis response capability and its improvement over time.

## INTRODUCTION

Business Continuity (BC) planning can be an overwhelming task. It can be an endless challenge because of the wide range of events that can cause business interruptions such as natural disasters, transportation interruptions, equipment malfunctions, pandemic disease, and acts of terrorism.

Intel has always planned for BC and crisis response in order to manage its business. As manufacturing and supply chain systems became more streamlined, with tighter and tighter timelines, BC became more critical to successful manufacturing, and to Intel's bottom line.

In this paper, we discuss how Intel's approach to BC planning in the supply chain has matured within the Materials organization. Intel needs to be ready to quickly restore the supply line and resume normal operations; yet, preparing a plan for every potential scenario is not

possible. We must be *prepared enough*: we must invest enough resources so that the organization can quickly respond to a supply chain outage, avoid over-investing in the planning efforts, and appropriately focus our resources based on the risks.

We describe the phases of supply chain BC planning and the evolution and maturation of our BC practice over time. We describe how the continuously improving BC practice in the Materials organization enabled Intel to quickly react to recent supply chain outages and improve our response.

## PROBLEM

Intel's manufacturing sites are located in many countries around the globe. These sites rely heavily on a dependable supply line of raw materials and parts and services that make up Intel's supply chain. In order for Intel to provide quality products to all its customers, this supply chain must be robust, flexible, and resistant to interruptions.

Intel's worldwide supply chain is complex and multi-tiered with dependencies for material and services across all levels of manufacturing processes and other operations. This supply chain encompasses hundreds of suppliers, located at multiple locations throughout the globe, supplying thousands of parts that support a variety of Intel CPU, server, and chipset product variations. In addition, Intel's products are constantly evolving and changing as the number of transistors on a chip doubles every two years (Moore's Law). These facts drive the need for a multitude of supply chain materials that includes both commonly sold materials and unique materials that contain intellectual property or have trade secret restrictions that limit the available supply. The Materials organization sources and buys the goods and services needed for Intel's manufacturing and operations.

Significant interruptions to the supply line can have a direct impact on Intel's revenue and end customers. As a result, Intel needs to understand and mitigate the key supply chain risks. These risks include, but are not limited to, natural disasters (earthquakes, cyclones, etc.), labor

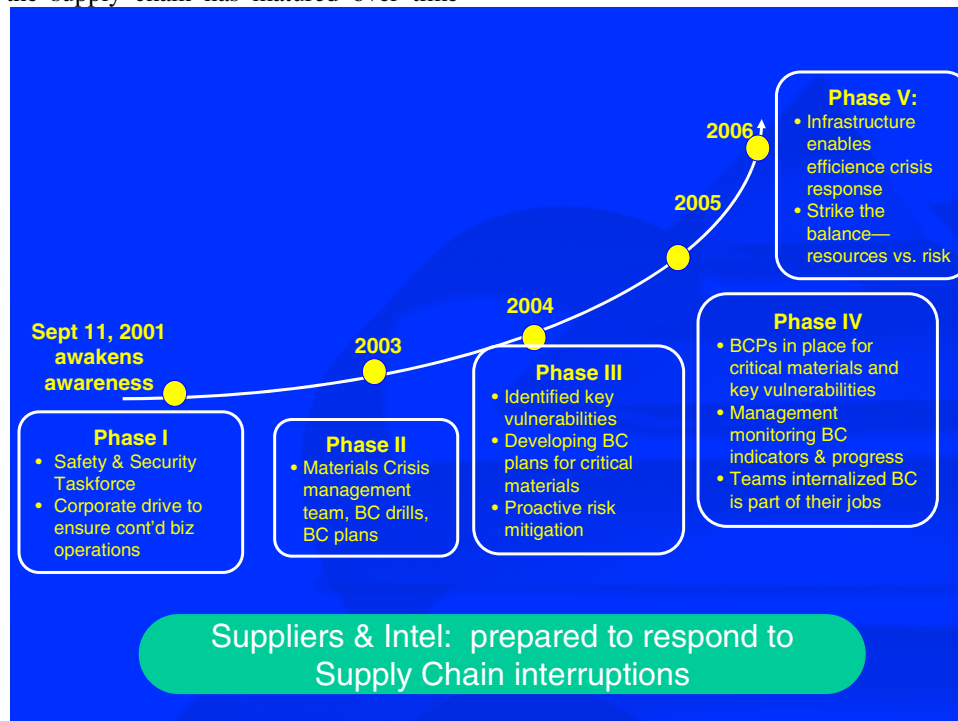
outages, transportation interruptions, terrorism, governmental restrictions/interruptions, fire, and global raw material shortages. The severity and frequency of these risks vary from one world geography to the next, further complicating the overall picture of supply chain risk. Therefore, the core problem for Intel is to develop and implement the right BC approach to mitigate these risks in order to meet the business needs.

## MATURATION OF BC PRACTICE

Intel’s approach to managing the risk of business interruption to the supply chain has matured over time

(see Figure 1). Intel’s Materials organization has always applied knowledge of the supply line, the raw materials, the business, etc., to restore supply as quickly as possible. However, now that our global manufacturing and supply chain are more streamlined and interconnected, robust BC planning has become an imperative for successful manufacturing.

As the BC practice has matured over time, we have put in place tools and methodologies that help Intel to more effectively use resources to prepare for and respond to crises.



**Figure 1: Materials Business Continuity program**

### Phase I: “Corporate Said”

The events of September 11<sup>th</sup> awakened Intel’s awareness of BC and the need for proactive planning to prepare for crises. Intel CEOs took the lessons of that day to heart. As Craig Barrett and Paul Otellini noted in a message to the Intel Board of Directors in April 2002:

“The events of 9/11 were a wake-up call to expect the unexpected. Employees, customers, stockholders, and the investment community are all raising the bar on what is expected of corporations. Every Intel organization must make BC a core business practice.”

Intel launched a corporate Safety and Security taskforce, taking a multidisciplinary approach to identifying threats and Intel’s exposures, and to preparing our employees and corporation to respond. The taskforce established a BC program management function, coordinating BC planning across the corporation. The corporate BC program provided basic tools and methodological guidance to help ramp up the business units on their crisis management and BC plans (see Figure 2). With these tools, and under the direction of the corporate BC program, Materials and other business units across the corporation formalized BC programs and put organizational plans in place under this corporate umbrella.

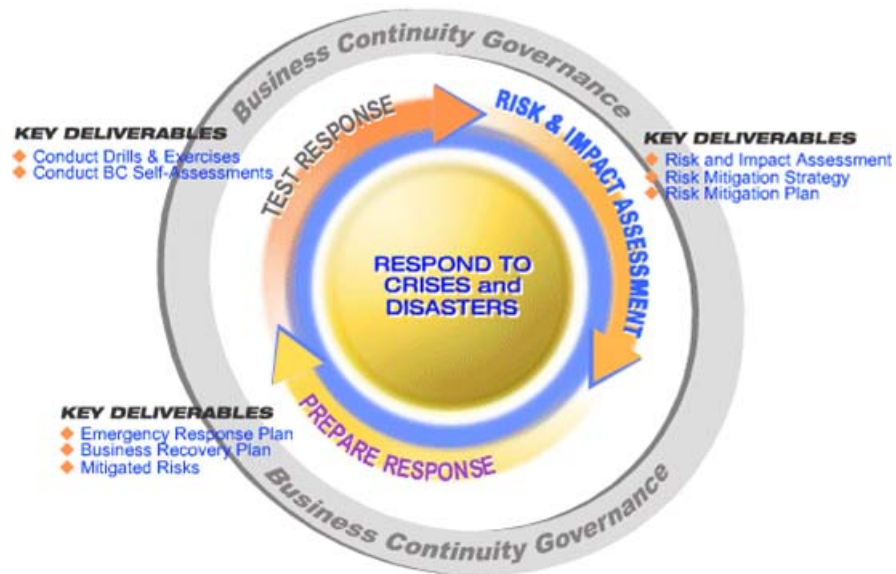


Figure 2: Business continuity cycle

### Phase II: “Materials Internalizes”

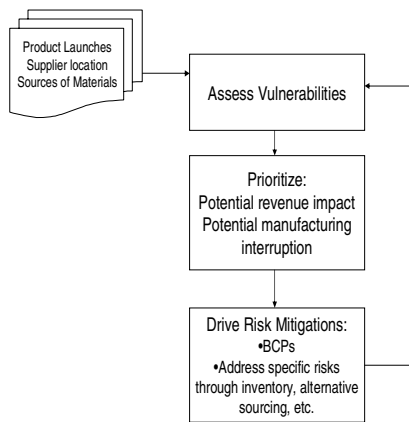
The Intel Materials organization named a BC manager to drive the organizational BC planning and engage with the corporate BC program. Materials established the BC infrastructure within the organization and gained management support for the importance of BC planning to the success of Intel’s business.

- *Materials crisis management team*: This team formalized how the organization would manage crises. We named representatives from the various departments within Materials as well as from key support organizations (e.g., Finance, Legal, and HR). We set up emergency contact procedures to assemble the team in the event of a crisis, in order for the organization to quickly respond to the situation and recover the business. We established a crisis escalation flow, providing guidance on when this team needed to be activated, and the steps to follow in assessing the state of the crisis.
- *Scenario-based BC plans*: Each organization identified the three to five key functions that it performs. Then for each key function, the organization assessed the risk to that function under several scenarios, such as loss of a building, loss of access to data/systems/Internet, etc.

- *Plan testing*: Materials began running BC drills to test the ability to activate the crisis management team, and to test BC plans. We drove improvements to the plans based on gaps identified, or additional needs uncovered.
- *BC embedding*: Materials incorporated BC considerations into several of the core business processes such as supplier selection, strategic sourcing, our annual supplier performance award process, etc. This helps to ensure that BC is built into Intel’s engagement with a supplier from the very beginning.

### Phase III: “Move to Proactive”

In the next phase of development, the Materials organization moved beyond crisis management and response planning, and into proactive risk mitigation. Intel’s worldwide supply chain is highly complex. It includes both highly specialized/unique parts as well as commonly sold parts, and relies not only on our suppliers, but also on their suppliers. As a result, we face a long list of business interruption risks. The task of planning responses or mitigating these risks could easily overwhelm the organization if we let it.



**Figure 3: Proactive risk mitigation**

The Materials organization assessed the BC risks and identified the key vulnerabilities (see Figure 3). We discussed the potential impacts of these vulnerabilities, and we decided to prioritize our BC planning work based on the potential impact on revenue posed by vulnerabilities. Once we gained management ratification on the key vulnerabilities, the prioritization criteria, and the approach, we began the proactive risk mitigation work.

- *Determining risk mitigation targets.* The procurement teams assessed the materials they manage, reviewed each against the key vulnerability list and the prioritization criteria, and determined which materials would require risk mitigation.
- *Setting the infrastructure.* The Materials BC manager installed a management review and progress tracking infrastructure. This included indicators tracking completion rate of the Business Continuity Plans (BCPs) and some basic formats/coaching on writing BC plans, so the teams didn't have to start from nothing.

Once the procurement teams identified these most critical materials for which they needed BC plans, they engaged the supplier in BC discussions. They expected the supplier to put BC plans in place to enable the firm to quickly recover supply to Intel. They expected suppliers to have a crisis communication plan, enabling them to reach key employees in a crisis and to notify their Intel contact. With their understanding of the business need, the risks, and the material, the procurement team then set about risk

mitigation. They identified ways to mitigate the risk of losing a supply of a critical material, e.g., by stockpiling inventory, and switching to alternative sources of supply and alternative locations.

#### Phase IV: “Middle Management ‘Gets It’”

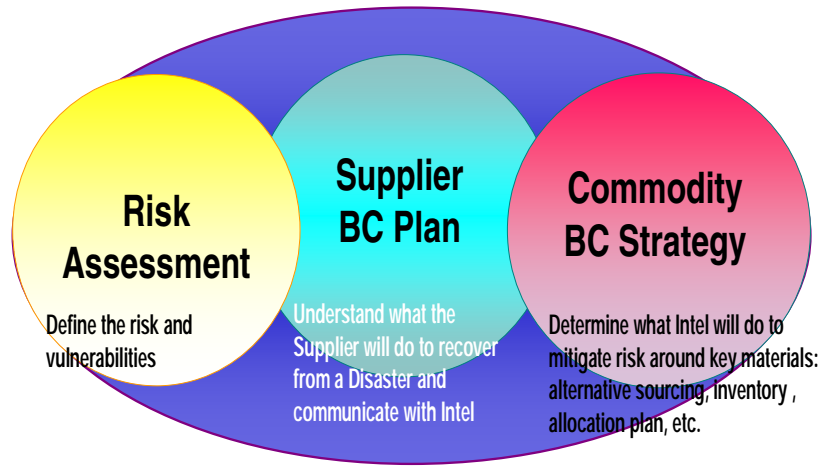
Through indicators, we monitored completion of the prioritized BCPs and the risk mitigation activities. Management supported the BC activities, but the organization as a whole viewed BC as a burden that got in the way of their “real work.”

Then we experienced a crisis: a fire broke out at a major supplier impacting several Intel product lines by creating immediate supply constraints. A crisis management taskforce was quickly formed to determine the damage and mitigate any risk to Intel's customers. The taskforce members comprised management, manufacturing, planning, commercial, engineering, operations, and development department representatives. Sub teams were also formed with core focus areas of supply chain, technical, supplier management, and development. The taskforce gathered data, assessed technical risks, and quickly defined an offload strategy. The taskforce's plan defined the other supply options, material compatibility, and the fungibility of specific qualified substitute parts. Because of the BC communication links and processes put in place, the team was able to respond and quickly define and implement their plan. They mitigated the potential loss of production output by 97%, avoiding a potential revenue impact of millions of dollars.

The fire highlighted an area of vulnerability already known to Intel and validated the need to further develop the BC program. After-event-analyses were conducted to identify key lessons from the event, find gaps, and further enhance existing BC systems. Working through this crisis helped drive the maturation shift into Phase IV.

Senior management now wanted to make sure the Materials organization was ready for a crisis. We instituted BC reviews for our key materials. The teams took senior management through their risk assessments, their plans to restore supply after a crisis, and the preparedness of the suppliers to respond to a crisis (see Figure 4). At the first of these reviews, senior management asked the teams a lot of questions and reinforced the expectations that they manage the supply line—and that responding to a crisis was not *extra*. Management made it clear that BC was part of their jobs and having BC plans was part of successful supply line management.

With senior management's strong support, the middle management and their teams finally realized: “BC is part of my real job.”



**Figure 4: Business continuity**

#### **Phase V: “Striking the Balance”**

As our BC program has matured, we have put tools and methodologies in place (below) that speed our response and make it easier for the teams to complete their BC planning.

- An “auto dialer” tool to contact members of the Crisis Management Team.
- A BCP spec, defining the basic steps/approach to BC planning that the Materials teams should apply.
- Reference information to speed evaluation of and response to a crisis.
- BC information for our suppliers at <http://supplier.intel.com/static/bc/>.

Materials now has a robust BC infrastructure in place. We assess risks, prioritize them, drive risk mitigation where appropriate, etc. Our procurement teams understand the role of BC in their jobs, and they consider it in their work with suppliers. We conduct drills and drive improvements on the lessons learned from drills as well as real-life events. In BC, we must continuously assess, evaluate, and improve.

#### **SUCCESS STORIES**

Recent experiences with cyclones further illustrate BC successes and maturation. In August, 2005, the category IV Hurricane Katrina hit the United States. In September, 2006, the Level 4 Typhoon Milengo (Xangsane) hit the Philippines. Both were severe storms, causing significant damage in impacted regions. However, for the purposes of

this paper, they serve to showcase the continued maturation of our Materials BC practice (see Table 1).

**Table 1: The continued maturation of our Materials BC practice**

	<b>Katrina</b>	<b>Milengo</b>
Year	August 2006	September 2006
Advance notice of storm.	Yes	Yes
Pre-event activation by Materials.	None	Materials site contact notified Materials management and key partners. Began contingency plans. Linked into site emergency plans.
“Trigger” for BC assessment.	Notice that a key supplier’s manufacturing facility was underwater.	Notice that the storm was approaching.
Impact to Intel facilities.	No facility in region.	Damage to Intel factory and buildings. No injuries to personnel.
Activation and response.	Materials Crisis Management Team responded. Chartered taskforce to work issue resolution.	Site emergency management team responded. Local Materials teams worked issue resolution.
Supply line issues.	Restore supply sourced from the underwater plant.	None

Our experience with Katrina highlighted a number of improvements to our BC infrastructure and practice. Between Katrina and Milengo, we put several capabilities in place in Materials:

- The ability to identify critical suppliers with manufacturing facilities in the path of a crisis.
- Proactive response to major storms and other events with advance notice, evaluating the potential impact and determining what mitigation strategies were appropriate.
- Improved crisis communications, enabling us to better inform Materials management and key stakeholders on status of the event, issues, gaps, help needed, and most effectively, focus our response.

Before Milengo hit the Philippines, the local Materials manager had already begun mitigating activities at the site and was part of the site preparations. The Materials BC program manager identified critical suppliers who may be impacted by the storm and notified the teams so they could assess the situation. Once the storm hit, the local Materials manager provided status updates to management and key stakeholders, so they could best focus resources and attention where they were needed. No Materials Crisis Management Team activation was needed, as the response was successfully driven by the local team. This event demonstrated the increased strength and capability of our BC infrastructure to effectively respond to crises.

## SUMMARY

Over the past five years, the BC program in the Intel Materials organization has progressed through four phases of maturation. We have a BC infrastructure, tools, and methodology to enable the teams to quickly implement BC plans and flex their BC planning to the appropriate level.

The program now faces the challenge of the next phase: reducing our overall BC investment but getting the Materials organization “prepared enough” within an efficiency-oriented and tightly constrained environment. In Phase III, we addressed our key vulnerabilities and the most critical risks. We then pushed beyond that, asking teams to do more (address the next layer of risk, do BC planning with all suppliers, consider additional scenarios, etc.). In striking the balance, we strive to reach “prepared enough.” We need to understand our vulnerabilities, to drive risk mitigation in critical areas, but also, we need to decide which risks to accept as part of doing business. Since we don’t have the resources to mitigate all risks, we must drive a decision-making process to select the risks we mitigate and the risks we are prepared to take.

The BC infrastructure, methodologies, and tools enable us to more easily drive BC planning and risk mitigation. Our experiences with BCP over the last couple of years helps guide our understanding of where we can accept the risk vs. mitigate it. We are confident that Materials will continue to successfully manage BC risk as we strike the

balance between prepared enough and being over invested.

The maturation of the BC practice in Materials has enabled our organization to be able to quickly restore our supply chain—and to do so efficiently.

## CONCLUSION

Maturation of BC planning in the supply chain requires the movement from a corporate-dictated approach to an internalized or embedded BC practice encompassing BC tools, methodologies, and infrastructure. Successful BC planning enables Intel to ensure supply to manufacturing operations and reliably produce quality product.

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