



A U.S. PAYMENTS FORUM WHITE PAPER

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# Global Chip Supply Challenges: Considerations for Payment Industry Stakeholders

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**U.S. Payments Forum**

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# 1. Introduction

As most are likely aware, a global semiconductor supply challenge is affecting several industry sectors. Notably for the U.S. payments industry, the challenge is impacting the availability of the security chips used in payment cards, point-of-sale (POS) terminals, and other devices.

The objective of this white paper is to provide readers with an understanding of the chip supply challenges, the potential impacts to the payments ecosystem, and considerations for payments industry stakeholders to help manage through the coming months. Each section discusses relevant background, key challenges and considerations for specific payments industry stakeholders (i.e., chip supplier, card manufacturer, issuer, payment terminal manufacturer/merchant, processor/personalizer).

This paper will not cover potential lobbying efforts or any topics related to the commercial aspects of chip supply (e.g., allocation of capacity).

## 1.1 How Industry Got Here

While it is easy to look at COVID-19 as the primary inflection point for the current chip supply challenge, many other influencing factors converged in the same timeframe as the pandemic. Factors that may have contributed to the global chip supply challenge include the following:

- **COVID-19 – Q1/2020**

Early in 2020, COVID-19 caused an initial shock and disruption of the supply chain, leading to a market downturn. Orders and forecasts were reduced at foundries and stock levels were depleted. It should be noted that as the market rebounded, only a certain amount of capacity was available as it takes time for the foundries and supply chain to ramp up.

- **Push for Digitalization – Q2/2020**

The move to work from home and study from home pushed digitalization and demand for electronic products. As a result, electronic sales were affected less than expected and, in some instances, increased. Orders recovered and forecasts increased into 2021, causing chip capacity to start to tighten.

- **U.S./China Trade War Part 1 – Huawei Ban – Q3/2020**

Prior to the ban, Huawei built up significant inventory, and competitors prepared to grab market share. Foundries allocated capacity to Huawei before the ban and competitors were pushed to Q4/2020. Competitors then **booked additional capacity for 2021**.

- **U.S./China Trade War Part 2 – Blacklisting of the SMIC Foundry – Q3/2020**

Semiconductor Manufacturing International Corporation (SMIC) customers developed strategies for risk mitigation, enabling alternative foundries for supply. SMIC customers **booked capacity at alternative foundries in 2021**.

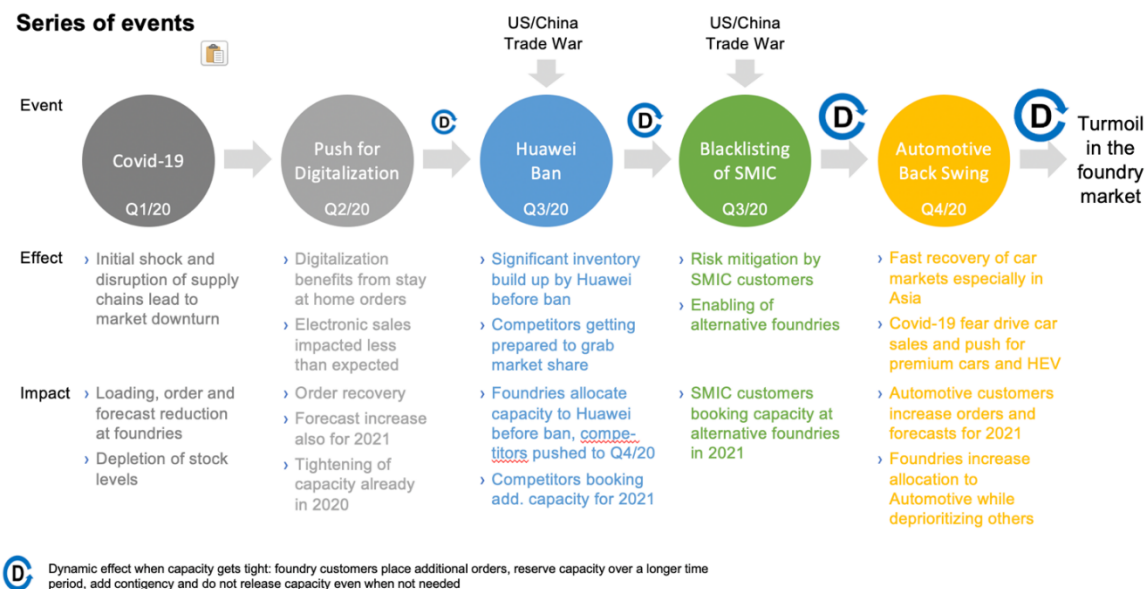
- **Automotive Recovery – Q4/2020**

The automotive market recovered quickly, with COVID-19 fears driving car sales and an increased demand for premium cars and electric vehicles (EVs), which use three times as many chips. As a result, automotive customers **increased foundry orders and forecasts for 2021**. Foundries then **increased chip allocations to automotive customers while deprioritizing other customer segments**.

## • Other Factors

A few unexpected events occurred that typically would only have resulted in a minor disruption. During shortages, however, they exacerbated the tight supply situation. These include, but are not limited to, the ice storm and resulting power outages in Texas during February 2021, and a power outage in Dresden, Germany (caused by a foil balloon at a substation).

Figure 1<sup>1</sup> illustrates the series of events in 2020 that impacted the global chip supply.



**Figure 1. Series of Events Impacting Global Chip Supply**

<sup>1</sup> Infineon Technologies

## **2. Chip Suppliers**

### **2.1 Background**

A confluence of factors has led to a very tight supply situation in the semiconductor industry. Many chip suppliers have their own foundries and also outsource some of their required capacity.

Most chip suppliers serve a number of industries, including payment, automotive, and consumer electronics. As the current supply situation affects all wafer production, decisions that ultimately impact the distribution of products occur at several points in the supply chain:

- Foundries to chip suppliers
- Chip suppliers internally (for various divisions)
- Chip suppliers to their customers (e.g., card suppliers)
- Card suppliers to issuing banks

### **2.2 Key Challenges**

Chip suppliers are facing numerous challenges today. Examples of the challenges specific to the payments industry include the following:

- Payment chips tend to be on older technology nodes – e.g., 40nm or 65nm – which is not where most foundries are currently investing.
- Moving to newer technology nodes (e.g., in the 20-30nm range) is a resource- and time-intensive exercise (including designing the chip, taking it to production, and getting various certifications – e.g., EMVCo, GlobalPlatform, payment networks).
- Certain industry sectors (e.g., automotive) have used strong lobbying efforts to help secure their supplies of chips relative to other industry sectors.
- Suppliers are trying to ensure chips are adequately allocated – e.g., meeting customers' basic requirements and trying to avoid instances of supply 'hoarding.'

### **2.3 Considerations for Chip Suppliers**

While there is no perfect solution to the current chip supply challenge, the following basic principles may be considered to lessen the impact:

- Urge customers (i.e., card suppliers) to place firm purchase orders as early as possible.
- Communicate regularly with customers and other partners to ensure future supply is well understood.
- Work with payment networks to ensure new approvals occur as quickly and efficiently as possible.
- Consider the measures noted in other parts of this document (e.g., consider limiting card rebranding efforts, and limiting reissuance to more active cards in portfolios).

### **3. Card Manufacturers**

There are different categories of card manufacturers. The larger ones typically procure wafers from chip manufacturers since they develop their own operating systems and have chip module manufacturing capabilities. They can also procure them directly from foundries if they design chips. Smaller card manufacturers typically procure chip modules from chip manufacturers and, in some cases, larger card manufacturers.

#### **3.1 Background**

If it is always important for card manufacturers to have good visibility of their customers' card forecast, it is even more crucial during silicon shortages to ensure that some customers do not deplete their stock of cards while others have too much inventory. The payment card industry is competing with other much larger industries to get chips. While the chips are different, chip providers' capacity is finite and shared among different products serving different industries.

#### **3.2 Key Challenges**

The chip shortage situation is very fluid. Confirmed shipping dates are suddenly decommitted while others are delayed. Volumes produced by foundries are sometimes less than anticipated.

These unplanned changes have a tremendous impact on card manufacturer planning and can, as a result, impact the issuer's ability to have cards delivered to their cardholders.

#### **3.3 Considerations for Card Manufacturers**

Regular and open communication with both suppliers and customers is critical.

Depending on the size of the card manufacturer, it may be appropriate to establish a dedicated team to work with supply chain, product teams, sales and management to understand both global demand and global supply and to help address situations when there is not enough product to meet customer demand.

The following should be considered in navigating a chip shortage:

- With the supply chain (e.g., chip manufacturers/foundries):
  - Get clear visibility from suppliers on chip availability and delivery dates.
  - Hold regular meetings to make sure that the committed volumes are not at risk.
  - Review agreements as needed to secure supply.
  - Look at newer chips in the supplier roadmap and see if development can be accelerated to offer alternatives (e.g., on newer platforms).
- With card customers (e.g., issuers/aggregators):
  - Review forecasts on a regular basis (e.g., monthly).
  - Educate customers about the chip shortage and related impacts on business concerns, such as price increases, reduction in volume, and delays.
  - Work with customers to understand and address chip supply needs.
  - Consider whether customer onboarding of alternate chips may help address supply chain issues, including by enabling customer portfolios to be on multiple chip types. If a chip supplier decommits volume, having second and third sources may help mitigate the risk of not getting cards.

- Consider working with customers to avoid high levels of card stock in some vaults (standard average is six months) and depletion in others.
- Consult with issuers regarding planned product launches and rebranding efforts.



## 4. Issuers

### 4.1 Background

A recent study from ABI Research<sup>2</sup> suggests that one billion payment cards are at risk of not being issued due to the chip shortage. This shortage could have detrimental impacts on consumers' ability to make purchases, interchange revenue for issuing banks, and the U.S. Gross Domestic Product (GDP) more broadly.

### 4.2 Key Risks/Challenges

Some amount of chip shortage can be absorbed via effective supply chain and roadmap management. However, significant shortages may impact issuing bank customers' ability to make required purchases, particularly those relying on credit or debit at the point of sale.

Beyond a continuation of existing supply challenges, other possible risks to payment card chip supply for issuers include: data breaches (i.e., it would be difficult to absorb the supply impact if there were a breach with multiple major merchants/issuers); industry de-prioritization (e.g., if the government mandated priorities for automotive and consumer electronics); and hoarding of supply by large industry players that could exert influence on suppliers. Issuers should also be prepared for price volatility in the coming years until supply normalizes.

In the event shortages result in the inability for issuers to reissue cards for basic use cases (such as card expiration or lost/stolen cards), significant customer service, confusion, and purchasing challenges may occur across issuers and their customers.

### 4.3 Considerations for Issuers

To ensure that issuers are best positioned to meet continued supply challenges and manage associated risks for their own supplies and customers' purchasing needs, the following actions should be considered:

- Education/awareness: Ensure internal employees, key stakeholders, and customers are aware of the ongoing challenges and what they can do, if anything, to support related efforts.
- Supply chain diversification: To the extent possible, ensure that the chip supply is not coming from a single supplier.
- Supplier communication/roadmap management: Ensure frequent and effective communication with suppliers related to where issuing capacity is strained (and where it is not), and coordinate internal roadmap efforts, as appropriate. For example, supply will likely vary across dual-interface and legacy chip sets, so plan accordingly. Consider deferring projects (e.g., rebranding efforts) that are likely to result in unnecessary mass reissuance.
- Forecasting/ordering: Update inventory forecasts on an ongoing basis, and continually communicate these forecasts to suppliers; the historical target of maintaining six months' worth of supply may not be realistic throughout the shortage, though continue to be mindful of this benchmark. Place orders sooner than usual to allow for increased lead time and delays.

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<sup>2</sup> "Up to 1 Billion Payment Cards at Risk of Not Being Issued as Chip Shortage Impact Looms Over the Payment Cards Industry," ABI Research, August 5, 2021, <https://www.abiresearch.com/press/1-billion-payment-cards-risk-not-being-issued-chip-shortage-impact-looms-over-payment-cards-industry/>

- Industry prioritization: Communicate with trade associations and government officials to ensure that payment/financial industry needs do not get lost when navigating industry prioritization if a more pronounced shortage occurs.
- Industry collaboration: Collaborate with issuers, suppliers, and industry groups, to help minimize supply issues for other stakeholders .
- Prioritization of renewals: Consider reviewing renewal/reissuance strategies to optimize inventory usage.
- Useful life optimization: While some actions may only provide longer term relief, partner with the payment networks and suppliers to optimize the useful life of chip stock.
- Flexibility/adaptability: Accelerate efforts on certification agility and place added focus on due diligence/testing processes. This will improve the ability to more quickly adopt new chip sets and mitigate risk associated with wasted supply.

Please contact the relevant payment network for their recommendations and rules.

In addition to these considerations, issuers should consider developing talking points for communicating the supply challenge with consumers (Section 4.4 and Section 4.5).

#### **4.4 Consumer Communication: Chip Shortage**

Issuers should be prepared to respond to customer inquiries about the chip shortage and its potential impact to payment cards. In doing so, issuers are encouraged to communicate with their customers in the manner that best meets the needs of their customer base. Components of response messaging to create high-level awareness may include the following:

- Sharing high-level information on how the semiconductor chip shortage is impacting payment cards.
- Creating awareness that issuers are taking steps (such as working with supply chain partners, diversifying the supply chain, and increasing order lead times, where appropriate) to mitigate risks of the shortage for their customers.
- Encouraging customers to take advantage of virtual cards and payment instruments, where appropriate and applicable.

#### **4.5 Consumer Communication: Potential Delays in Reissuance for Expiration and Lost/Stolen Use Cases**

Issuers are encouraged to communicate with their customers in the manner that best meets the needs of their customer base. Core objectives of tactical messaging for issuance delays may include the following:

- Reminding consumers of the shortage, which is impacting all industries that rely on semiconductor chips.
- Addressing concerns relating to reissuance delays.
- Providing current estimates for reissuance delivery times.
- Providing applicable messaging for other payment instruments and virtual payment options in the interim.

## **5. Payment Terminal Manufacturers/Merchants**

### **5.1 Background**

Prior to the COVID-19 pandemic, the semiconductor industry had fairly balanced supply and demand relationships. The key factor that maintained the relationship between chip foundries, chip vendors and the device/product manufacturers were forecasts that were based on understanding the time cycles in each supply chain step. With the advent of COVID-19, supply chain harmony ended abruptly. Orders based on forecasts began to disappear as pandemic precautions spread globally. The increase in work from home enhanced the ripple effect in the payments industry. With forecast declines of almost 70 percent in some cases, combined with closed locations, reduced staff and even natural disasters, chip foundries struggled with their production targets. With better control of the pandemic and the reopening of markets, chip foundries needed to begin or restart chip production, which has an inherently long cycle. In addition, once started, production priorities were set with newer chip designs taking precedence over existing legacy and older, near-end-of-life designs.

### **5.2 Risks/Challenges**

Many industries today have sought balance between orders, inventories and deliveries in order to achieve a fast time-to-market while minimizing inventory expense. With a loss of manufacturing capabilities, inventory replenishment was reduced which had an immediate effect across industries. As progress was made in pandemic control, a 'perfect storm' was created with new forecasts and orders submitted simultaneously and globally, disrupting the supply chain.

The supply chain disruption created a new challenge for terminal manufacturers and other industries that provide support for chip-based products: revised forecasts for legacy chips against a foundry production focus on newer chip designs and the resulting servicing impact. In other words, the shortage is challenging the servicing of legacy devices where any replacement depends on a chip design that may have a low production priority.

These constraints and others have now led to an almost 20 percent increase in costs, adding further challenges to any net revenue or cost savings initiatives for manufacturers. This issue becomes clear when looking at a secondary spot market for chips. It has been documented the premiums that chip suppliers in the spot and gray market channels are paid can be as high as 100% or higher over retail prices<sup>3</sup>. Another cost contributor is the impact of import tariffs.

Changing chip suppliers may affect the timeline for performing EMVCo Level 1 and Level 2 certification as well as PCI-PTS certification.

The combination of longer chip cycle time and new device certification for EMVCo and PCI may also delay the ability to upgrade solutions.

Delayed implementation combined with increased costs can put further burdens on manufacturers.

### **5.3 Considerations for Payment Terminal Manufacturers and Merchants**

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<sup>3</sup> "Out of the Chips" Digital Transactions, September 2021, <https://v6r2p5t5.rocketcdn.me/wp-content/uploads/2021/08/DTSept2021.pdf>

To help address chip supply issues, payment terminal manufacturers and merchants may wish to consider a variety of long-term and short-term measures. Long-term measures are likely to be more appropriate when a degree of 'normalization' within the chip supply chain occurs. Short-term measures may help in the interim, before the industry is stabilized. The following measures are, for the most part, relevant considerations in the longer-term, once the chip industry has a chance to catch up:

- Review end-of-life strategies and expiration dates.
- Reforecast and increase inventory for legacy products.
- If appropriate, establish new relationships and/or increase the number of relationships with chip suppliers.
- Develop/enhance bring-your-own-device strategies.
- Increase the use of virtual terminals.
- Discuss potential extensions to existing expiration dates with relevant EMVCo, PCI SSC and the payment networks.
- Where appropriate, regularly update customers on chip-related status.

## **6. Issuer Processors/Personalizers**

The current chip shortage is a global crisis affecting many industries, and the chip card processing and issuance industry is no exception. The current issue is clear, the demand for chips is greater than the current supply.

From a payment processor and issuer perspective, the global chip shortage is affecting how daily business is conducted and is impacting issuing to customers and cardholders. Business leaders have had to take steps to address the issue to promote business continuity and lessen the impact on the business and downstream customers.

This section reviews some of the measures currently being explored by processors and personalizers to address the challenge.

### **6.1 Advanced Forecasting**

Implementing advanced forecasting techniques allows issuers and processors to make better estimates of future demands for chip cards, especially where unique products are required. Techniques such as considering significant variances and seasonality and leveraging historic volumes may help improve the quality of forecasts, as well as help minimize waste and identify/leverage unused inventory. These measures in turn may help reduce the number of chips required for inventory, or at least give a clearer estimate on what chips and what volume to purchase.

### **6.2 House Cleaning**

The supply chain challenge also provides an opportunity to ‘clean house.’ As the chip shortage persists and the importance of crafting different possible solutions to address the issue grows, current inventory can be checked and re-evaluated. Consistently reviewing and updating inventory roadmaps may allow issuers to gain a better understanding of which chips are readily available in the market at the time and to replace the chips that are under stress or not available due to the shortage. Considering what chips currently in inventory can be reused or repurposed for other appropriate scenarios is an opportunity to address product shortages.

### **6.3 Educating Customers**

Providing guidance, best practices, and in-depth evaluation of customers’ needs allows issuer processors to advise and encourage issuers to re-evaluate their goals and plans for chip card issuance, particularly for re-issuing certain types of programs. For example, issuer customers may consider extending the expiration dates on some programs to allow for longer card use in the field and to help reduce the frequency of card reissuance. Issuer customers may also consider maintaining chip cards until they must be phased out or are close to the chip manufacturer’s expiration dates or end of life.

## 7. Conclusion

No ‘magic bullet’ will quickly alleviate the current chip supply challenges. As reviewed in this document, multiple factors have caused the situation, but ultimately supply will normalize and shortages will subside.

In the meantime, key focus areas to help address chip supply challenges include the following:

- Developing strong forecasting capabilities and communicating among all payments industry stakeholders.
- Placing firm orders early, without attempting to stockpile inventory, which will only serve to exacerbate the issue.
- Considering chip diversification to increase the potential for uninterrupted supply.
- Carefully considering product strategies, such as rebranding efforts, to take into account all aspects including current chip/card inventories

The chip supply challenge is expected to persist through 2023 and perhaps into 2024. Careful management throughout the supply chain can help the payments industry to minimize this current challenge and associated disruption to the payments ecosystem.

The U.S. Payments Forum remains engaged and is prepared to offer insights as the ecosystem navigates this challenge.

## 8. Legal Notice

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