

Survival of a Head-up Display Business in COVID-19 Post-Pandemic Microchip Shortage

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Abstract

The world of tightly-knit businesses has felt an unprecedented ripple effect since the outbreak of COVID-19. Contact restrictions, supply chain disruption, changes in consumer behavior, travel ban, and quarantine have shaken almost all businesses at their core. Unimaginable restrictions, drastic changes, and irreparable disruptions during the pandemic choked many businesses to death. The businesses that survived the pandemic face new challenges in a post-pandemic environment. The Pandemic imposes not only challenges but also opened opportunities for diversification, digitization, automation, and expansion. One of the main challenges many manufacturers faced was supply chain disruption. Manufacturers are forced to realign their production due to supply chain disruptions throughout the pandemic and still waiting for its restoration. Decisions taken regarding supply chain disruption during the pandemic are still tested during the post-pandemic era.

Introduction

The COVID-19 pandemic continues to hit the profitability and sustainability of small and medium enterprises (SMEs) in an unprecedented way (Zutshi et al., 2021). Many are trying to navigate through their unfolding business complexities related to people, supply chain, financial health, customer engagement, and risk management (Kumar, n. d.). The Congressional Research Service (2021) estimates that COVID-19 has affected the \$90 trillion global economy beyond anything experienced in nearly a century. According to the World Health Organization, by November 1, 2021, the COVID-19 virus had sickened over 246.6 million people globally, with over 5.0 million fatalities (Congressional Research Service, 2021). Further, the International Labor Organization (2020) data suggest that uncertainties created by COVID-19 could cause half of the labor force around the world to lose their jobs (Zahra, 2021).

People and organizations found themselves unprepared for the disruptive power of COVID-19. The unthinkable became a reality, and people realized that organizations and governments have no strategies to fight against such a pandemic. They discovered that the strategic knowledge gap is enormous, and the only way to navigate this crisis is to create emergent knowledge strategies (Bratianu & Bejinaru, 2020). The future is not an extrapolation of the continuous present time but an emergent complex of phenomena with implications in all aspects of our personal and community life. Deliberate strategies can no longer help, and we must react quickly to survive. Deliberate strategies are designed based on what is known, while emergent strategies focus on what is unknown. Thus, knowledge management must quickly switch from knowledge exploitation to exploration (Bratianu & Bejinaru, 2020). Firms that survived the COVID-19 crisis are older and more productive; they also tend to be innovators, use digital technology, and operate in less burdensome business environments (Jolevski et al., 2021).

Business Challenges and Thriving Skills

The shocking disruption of social nexus and turmoil in the business environment caused by COVID-19 is still going on. Businesses have been tackling challenges since the onset of COVID-19 to remain afloat and thrive. The disruption is on a global scale and shockingly new in nature; there is no established strategy to overcome it. Challenges faced by businesses during COVID-19 are summarized below in Table 1 (Looze & Desai, 2020). The categories are oversimplified, but it needs to be remembered that they are intricately dependent on one another.

TABLE 1 Challenges Among Owners of New, Young, and Mature Businesses During COVID-19				
	New Businesses	Young Businesses		Mature Businesses
	<1 year old	1–5 years old	5–10 years old	10 years or older
Finding new customers	80%	76%	70%	69%
Keeping existing customers	68%	59%	61%	54%
Funds to start the business	72%	56%	39%	39%
Funds to grow the business	64%	64%	45%	47%
Self-doubt and fear	58%	59%	47%	43%
Laws, policies, and regulations	52%	42%	46%	43%
Skilled employees	52%	34%	34%	35%
Networks and connections	51%	49%	43%	33%
Information, education, or knowledge	48%	43%	27%	21%
Social support	43%	34%	24%	18%
Time to devote to the business	41%	38%	32%	24%
Location, region, or geography	39%	39%	24%	24%
Technology	38%	33%	29%	32%
Mentors who can provide guidance	34%	38%	26%	21%
Inclusion	28%	21%	15%	14%

* Reproduced from Looze & Desai, 2020

Organizations that have typically survived crises were best able to recover if they:

- had a well-tested business continuity plan or prepared such a plan promptly
- had strong leadership to ensure decisive action in response to immediate uncertainties
- communicated swiftly and frankly with stakeholders and, where appropriate, the media
- demonstrated practical compassion for those impacted
- were prepared for the mundane and predictable problems of business continuity (e.g., alternative technological and communication systems, preservation of vital records, and other operational requirements, including remote access)
- had access to financial and other resources to absorb the effects of the crisis or conducted an early and aggressive review of cash flow and developed a cash management plan (CPA, 2022)

COVID-19 has created the most severe impact on supply chains in recent history and caused one of the biggest disruptions in the history of humankind (Ivanov & Dolgui, 2020). Its disruptions have propagated through entire systems of supply chains with devastating results (Lopes de Sousa Jabbour et al., 2020). The effects of the coronavirus outbreak on global supply chains have emerged on three different sides: supply side, demand side, and logistical side (Mishra et al., 2021). Before the COVID-19 era, supply chain managers generally focused on just-in-time inventory management, which helped to reduce costs and increase efficiency. However, following the COVID-19 outbreak, it has become clear that this approach fails to prepare global supply chains to combat extreme shocks, such as those from the COVID-19 pandemic (Govinda et al., 2020).

Example of Business Decision and its Implications

A fictitious company TeraTech has been producing and selling Head-up Displays (HUDs) since the pre-pandemic era. As per the definition of Statistics Canada (Government of Canada, S. C., 2022), this is a medium-sized company of 450 employees. The target market of the company is the automobile industry and drivers, with the possibility of extension for military and civilian aircraft.

Head-up display market size is valued at USD 2.4 billion in 2022 and is anticipated to be USD 6.4 billion by 2027, growing at a compound annual growth rate (CAGR) of 21.3% from 2022 to 2027. Factors such as increasing awareness about passenger and vehicle safety are driving the market's growth during the forecast period (MarketsandMarkets, n.d.). The head-up display market in North America is anticipated to register the highest CAGR of 26.5% between 2022 and 2027. The US, Canada, and Mexico are key contributors to North America's head-up display market growth (Research and Markets, 2022).

The head-up display is a technology that projects an image onto the vehicle's windshield or a panel just beneath the driver's line of sight. It provides assorted information but does not require drivers to take their eyes off the road (Heaps, 2022). A vehicle's HUD keeps drivers focused on the road, safely delivering speed, warning signals, and other vital vehicle and navigation information on the windshield directly in the driver's line of sight. BMW also includes entertainment functions in the HUD. It displays radio stations or song lists as one scrolls through them using a button on the steering wheel.

The safety of passengers and vehicles is of prime importance for vehicle buyers and Regulatory authorities. According to a global status report on road safety published in 2019, more than 1.35 million deaths caused by traffic on roads occur every year across the world. Studies suggest that road traffic injuries will become the fifth leading cause of death globally by 2030. Driver distraction is one of the key causes of these accidents. According to the National Center for Statistics and Analysis (NCSA), crashes killing ~9 people and injuring more than 1,000 a day in the US are reported to occur due to distracted drivers. Thus, accidents due to the distraction of drivers caused by monitoring in-vehicle displays can be reduced using head-up displays (MarketsandMarkets. n.d.).

The first HUD was developed during World War I to help pilots shoot down enemy planes, so it would no longer have to align the pilot's head precisely with mechanical sights to make an accurate shot. These devices have expanded to include basic flight information like altitude, airspeed, compass, and artificial horizon indicators. In 1988, General Motors was the first company to install a monochrome HUD in a civilian motor vehicle. A car HUD system is formed by three main parts: (1) the combiner, the surface on which the image is projected; (2) the projector, which

generates the image and directs it toward the combiner and (3) the computing unit which processes data from different sources and handles the projection (Cano-Marin, 2016).

There are three types of conventional HUD, excluding augmented reality, 1. In-Car Head-Up Display, 2. Head-up Display Apps, 3. Third-Party Aftermarket Head-up Display. All three types of HUD have pros and cons in price, display size, visibility, installation, ease of use, and dependency. The In-Car and Third-Party Aftermarket Head-up displays are complete HUD system that includes all parts of a HUD system or at least integrate all parts of the HUD system through a hardware interface. Our company, in the example, is manufacturing and selling these two types of HUDs. Some Head-up Display Apps can be used with users' mobile to project information from mobile to automobile windshields without additional hardware e. g. Navier HUD, HUDWAY, and Sygic (Cano-Marin, 2016). We can categorize the HUD market as 1. HUD Market By Component: Video generators, Projectors/Projection Units, Display units, Software, Other Components (Relay optics, Magnifying glass, and Control Panels), 2. HUD Market By Type: Conventional, Augmented Reality (AR) 3. HUD Market By Application: Aviation, Automotive 4. HUD Market By Region: North America, Europe, APAC, RoW (MarketsandMarkets. n.d.)

The car industry was hit hard by the Pandemic. Automobile manufacturing has gone down by 20-50% globally, which would directly impact the HUD market (Mordor Intelligence, n.d.). In the post-pandemic revival environment, car industries halted again due to an acute shortage of semiconductors or microchips. In 2021, hamstrung by the global microchip shortage, the automotive industry lost more than \$200 billion (Walsh, 2022). The world will have lost 11.3 million units of production in 2021 because of the chip shortage, according to AutoForecast Solutions (Priddle, 2021). The problem encompasses more than just a reduction in the number of new vehicles. When the chip supply tightened, some companies paused entire production lines for

some vehicles and kept building others while removing some of the less-vital high-tech features that require chips (Blanco, 2021). BMW, for instance, has been forced to drop its head-up display option for a number of its models due to the semiconductor shortage. (Anderson, 2021). Every car brand has to a greater or lesser degree been struggling with supply issues due to the ongoing global semiconductor shortage (Quick, 2022). TeraTech is no exception and struggling to meet demands for HUD due to the shortage of semiconductors.

At the onset of the COVID-19 pandemic, TeraTech set out its strategy for survival and revival. One of the strategies was to reduce production and maintain minimum inventory as cost-cut measures since the demand for HUD dropped significantly with the drop in car sales and travel restrictions. They canceled their microchip orders and did not place any acquisitions for future requirements. TeraTech strategy was planned with the assumption that they could acquire microchips ad-hoc basis. Unprecedented disruption of the supply chain and acute shortage of microchips are now paralyzing them in a post-pandemic revival environment where every electronic, appliance and car industry is vying for microchips (Priddle, 2021). They are not only unable to meet the demand of existing customers, but they also fail to tap the opportunity created in a car company that is forced to drop HUD from their car due to a shortage of microchips.

In search of a way out of the current crisis, they found a solution in new HUD technology. Instead of manufacturing In-car HUD and Aftermarket HUD that require microchips, they can tweak their applications easily and quickly to be used with mobile. Suppose they can integrate and adapt their applications for mobile. In that case, they can bypass the current crisis of microchip and generate cash flow from the market segment that use HUD applications only. They can also integrate their applications with other navigation devices or automobile info sources. They should also be resilient about future market trends, challenges, and opportunities.

Conclusion

There was no unique and fit-for-all recipe for surviving through the chaotic business environment created by COVID-19. In a post-pandemic environment, businesses are facing new challenges and need to plan according to the uniqueness of each business and amend the strategy in light of the new normal. Prompt, adaptive, digitized, automated, and diversified businesses coped with the pandemic and revived well in a post-pandemic environment in general.

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