CASE STUDY: Problem Solving and Decision Making in a VUCA Environment

Undoubtedly, the COVID-19 virus has disrupted our personal lives and business practices as did the Great Recession of 2008. This pandemic and other similar events make our economic and business operating environments change in a chaotic and unstable manner beyond our control. Such environments share the following characteristics, the magnitude and duration of which varies with the severity of the event itself:

- **V**olatility of the rate and magnitude of change, and
- **U**ncertainty of the assumptions and information related to the direction of the change.
- **C**omplexity in the problem-solving and decision-making process as a result of the above, and
- **A**mbiguity of the process outcome as it is based on inadequate evolving information.

ABOUT VUCA

The concept of **VUCA** was introduced by the U.S. Army War College at the end of the Cold War. It has subsequently taken root in strategic leadership that applies in a wide range of organizations today.

Figure 1 illustrates the VUCA concept in a simplified manner, from the perspective of a typical manufacturing company.

In short, volatility and uncertainty impact the demand and supply dynamics of a company which has minimal control over its environment, and is therefore more exposed to business risk, including competitive changes.

Conversely, the company has more control over its future by focusing on how to improve its decision-making effectiveness by pursuing:

- More relevant information
- Increased collaboration across all stakeholders
- Rapid development and experimentation of actionable options under different scenarios.

FIG. 1: VUCA CONDITIONS AND IMPLICTIONS FOR MANUFACTURERS

PRESENT Environment Conditions **Less Control**	**V**OLATILITY (Rate of Change)	**Demand-Supply disruption** because of new product, manufacturing, or delivery related technologies.
	UNCERTAINTY (Unknown Direction)	Competition rules change along with **new norms of business processes and models**. Risk of respective extinction.
FUTURE Decision-Making Outcomes **More Control**	**C**OMPLEXITY (Decision Factors)	Need for more accurate, timely, and proactive **information, collaboration, and decision-making,** and rapid development **of alternative options.**
	AMBIGUITY (Intended Outcome)	Rapid experimentation and high-frequency review planning under Risk & Uncertainty.

BACKGROUND

When contemplating a COVID-19 response, our Wes-Tech Automation Solutions team chose to focus on the ventilator category where their skills and experience could make the utmost difference in saving lives. As always, problem-solving requires analysis of the constituent parts of the problem (left-brain thinking) and synthesis for the creative development of options that collectively comprise the composite solution to all the parts of the problem (right-brain thinking).

UNDERSTANDING AND DEFINING THE PROBLEM

Designing a ventilator for a market of volatile and unpredictable demand poses several challenges: The first is the current short supply of typical components, hence the need to begin the design with component parts from controllable and predictable supply sources. Under the worst-case scenario of a fast-upcoming spike in global demand, the product should also be designed for rapid and highly scalable mass-production. That, in turn, requires a product design suitable for reliable automated production assembly which could be easily and quickly replicated anywhere in the world. Therefore, the product, the supply chain, and the production process all require synchronization and cross functional collaboration throughout planning and execution.

That said, product availability is only one part of the problem. Another part is the speed and ease of deployment in the field that ultimately makes the product effective in its purpose. Global deployment encompasses commissioning, installation under any imaginable condition, sanitation and sterility control, product support, ease of use for a wide range of users and types of medical facilities, and provisioning with IoT features and capabilities that can be easily activated and updated in the field. In short, product design should address all aspects of the products' life cycle including the total product lifecycle cost (PLC) - a complimentary yet significant part of the solution. To improve the timeliness and effectiveness of the decision-making process the team separated the design requirements between necessary ones (i.e., safety, effectiveness, etc.) and sufficient ones derived from the following design objectives:

- Highly scalable solution (product, process, production, deployment, and support) designed for mass production up to 2,500 units/day.
- Simplified modular design with low total cost of ownership (i.e. acquisition cost target $1,000 versus $30,000 for conventional ventilators).
- Provisions for Innovative IoT value-added features (i.e. real-time information, over-the-air product upgrades, remote monitoring, etc.).

THE SOLUTION

The need for speed, flexibility, and ease of deployment led the Wes-Tech team to the realization that the optimal product design would have to be part of a larger solution. The tradeoff between product complexity and market needs led the team to developing an 80/20 (simplified outcome/time and effort) solution: An emergency-use ventilator with FDA approved critical components as well as available parts from suppliers with US and global manufacturing operations. Wes-Tech set an example of early collaboration and rapid experimentation with Delphian Systems - another JVA Partners holding – for the rapid development of a custom PCB controller (made in the US) with advanced IoT features that bring significant benefits to end customers and medical staff users.

Figure 2 shows a high-level example of how the problem was solved by decomposing it into key constituent parts which in turn were processed through VUCA conditions and prioritized into necessary as well as sufficient requirements – the latter shown as a high-level summary of the composite design solution.

Note, designing a VUCA solution capitalizes on the same creative thinking process that drives innovation with the caveat that the problem has been defined well enough for the solution to be relevant.

FIG. 2: DISTILLING THE PROBLEM TO SOLUTION REQUIREMENTS

DESIGN PROBLEM	CONDITIONS	DESIGN SOLUTION
• Unpredictable Demand • Supply Chain Risk • Effectiveness • Risk Tolerance • Safety • Manufacturing/Q.A. • Ramp-Up Speed • Production Scalability • Field Deployment • Ease of Use • Total Cost • Maintenance/Support • Other…	**V**OLATILITY (Rate of Change)	• Design for MFG/ASSY • Scalable Automation
	UNCERTAINTY (Unknown Direction)	• Minimal and readily available standard parts
	COMPLEXITY (Decision Factors)	• Simplified design • Ease of deployment/use
	AMBIGUITY (Intended Outcome)	• Flexible mass production • Modularity

THE OUTCOME

Because Time and Lives Matter

- Safe, Effective and Easy to Use
- Mass-Producible and Low Cost
- Easy to Transport and to Deploy
- Provisioned with IoT Features and Benefits

More about the ventilator