A combination of passion and perseverance for a singularly important goal:

# Attracting Women to Manufacturing

SCAROLE ENTERPRISES

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# Accelerating Women's Participation in Advanced Manufacturing Through Technology-Enabled Learning

## Introduction

The advanced manufacturing sector is undergoing a rapid transformation driven by the integration of Industry 4.0 technologies, including robotics, artificial intelligence (AI), and flexible hybrid electronics.

While these advancements are creating new opportunities for economic growth and innovation, they are also leading to a significant skills gap, particularly in Western Pennsylvania, where the demand for qualified technical talent far exceeds the current supply.

Women, who constitute approximately 47% of the overall workforce but only 30% of the manufacturing sector, represent a largely untapped talent pool that could help bridge this gap (Census.gov).

Scarole Enterprises, a leader in technology-enabled learning with a focus on esports in education and extended reality (XR), is uniquely positioned to address these challenges. By leveraging our expertise in creating innovative workforce development models, we can attract more young women to advanced manufacturing careers and prepare them more rapidly through immersive learning experiences.

This white paper outlines the current state of the talent pipeline for women in manufacturing, identifies the skills gaps and opportunities, and demonstrates how Scarole Enterprises' capabilities can be a critical enabler for agencies and corporations committed to advancing gender diversity in the industry.

## The Current State of the Talent Pipeline for Women in Advanced Manufacturing

Women have traditionally been underrepresented in the manufacturing sector, particularly in high-skill areas such as robotics, automation, and digital manufacturing. According to the U.S. Census Bureau, the percentage of women in manufacturing management positions is around 25%, while their representation in technical and production roles remains much lower (Census.gov).

In Western Pennsylvania, major manufacturers such as PPG Industries, Westinghouse Electric, and ATI are facing significant skill shortages, especially in roles that involve the integration of new technologies like AI and robotics.

Despite these challenges, there is a growing recognition of the value women bring to manufacturing. Research shows that increasing gender diversity in manufacturing not only boosts employee morale and retention but also leads to higher levels of creativity, problem-solving, and overall organizational performance (U.S. Department of Commerce).

However, for women to enter and thrive in these careers, it is essential to address the specific barriers they face, such as limited exposure to STEM fields, perceptions of manufacturing as a male-dominated industry, and a lack of flexible training opportunities.

## Barriers and Objections to Women Entering Manufacturing Careers:

### Several key barriers discourage women from pursuing careers in manufacturing:

1. Perception of the Industry: Manufacturing is often viewed as a physically demanding and low-tech environment, which can deter young women from considering these careers. Despite the industry's shift towards high-tech, clean, and safe environments, these outdated perceptions still persist (U.S. Department of Commerce).
2. Lack of Work-Life Balance: Manufacturing jobs often require shift work and have rigid schedules, which can be difficult for women with family responsibilities.
3. Limited Career Advancement Opportunities: Women often perceive fewer opportunities for growth and mentorship in manufacturing roles, which can result in high attrition rates.
4. Insufficient Exposure to STEM and Manufacturing: Many young women, particularly in high school, are not exposed to the variety of careers available in advanced manufacturing, which limits their understanding of the opportunities.

## Future Job Roles and Skill Gaps in Advanced Manufacturing

The evolving nature of manufacturing, particularly with the integration of Industry 4.0 technologies, is creating new job roles that require specialized skills in robotics, digital manufacturing, and AI-driven processes. Some of the key roles and their associated skill gaps include:

1. Robotics Technician and Automation Specialist:
    - Skills Needed: Programming, troubleshooting, and maintaining robotic systems.
    - Projected Demand: Growth of 10-15% over the next five years due to increased automation in manufacturing( The White House).
2. Semiconductor Manufacturing Technician:
    - Skills Needed: Operating precision fabrication equipment, adhering to cleanroom protocols, and troubleshooting wafer processing.
    - Projected Demand: High demand as companies like Intel and Samsung expand semiconductor production in the U.S.
3. Digital Manufacturing and AI Specialists:
    - Skills Needed: Proficiency in digital twins, AI integration, and machine learning.
    - Projected Demand: Rising by over 20% in the next five years as manufacturers seek to leverage AI for enhanced productivity and process optimization (The White House).

## How Scarole Enterprises Can Bridge the Gap: Technology-Enabled Learning Solutions

Scarole Enterprises has pioneered the use of technology-enabled learning to make STEM education more engaging, accessible, and impactful. By integrating esports in education and extended reality (XR) technologies, we create immersive and gamified learning experiences that resonate with younger generations and provide a hands-on approach to skill development. This methodology has several key benefits for preparing women for careers in advanced manufacturing:

### 1. Attracting Young Women to STEM Through Esports and Gamification

Esports competitions and activities can serve as an entry point for building technical skills such as coding, digital problem-solving, and hardware assembly. By incorporating esports into STEM curricula, Scarole Enterprises can help young women develop a foundational interest in technology, which can be further channeled into advanced manufacturing roles.

### 2. Accelerating Skill Acquisition Through Extended Reality (XR)

Extended reality (XR), including virtual reality (VR) and augmented reality (AR), can simulate complex manufacturing environments, allowing participants to gain practical experience without the need for expensive equipment or physical presence. XR-based learning accelerates the development of technical skills such as robotics programming, digital manufacturing operations, and quality assurance.

- Virtual Job Shadowing: XR experiences allow young women to virtually “job shadow” professionals in manufacturing settings, providing them with insights into career paths and day-to-day operations.
- Rapid Upskilling: XR-based simulations enable women to practice scenarios repeatedly, enhancing proficiency and reducing training time, which is especially valuable for career transitioners.

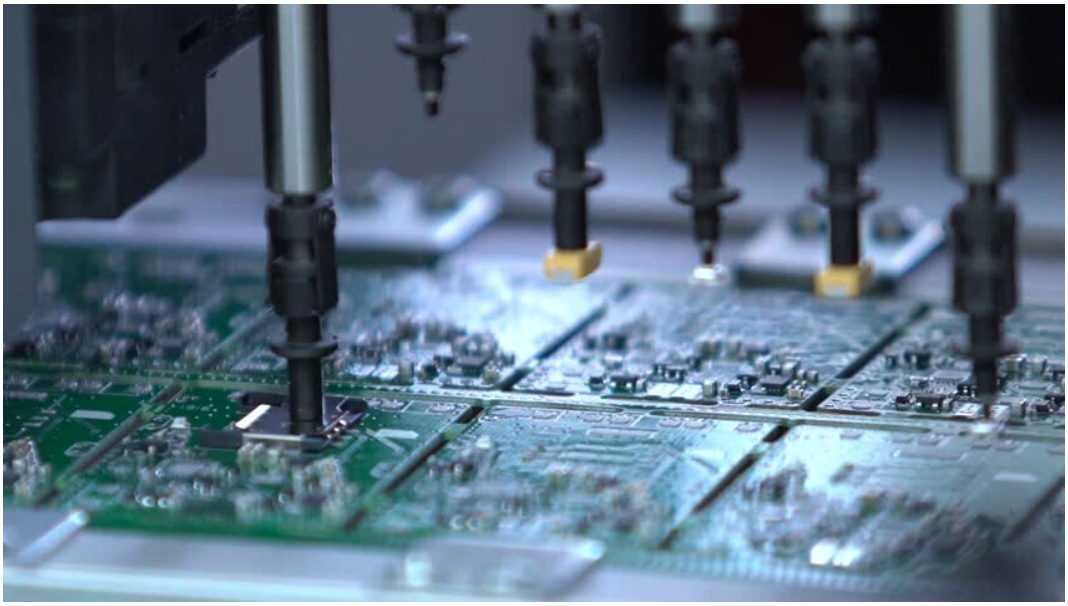
### 3. Creating Custom Learning Pathways for Advanced Manufacturing

Scarole Enterprises can design tailored learning pathways that combine esports principles (competition, teamwork, rapid problem-solving) with technical skill-building activities specific to manufacturing. This approach makes learning more interactive and less intimidating, addressing barriers such as lack of confidence and perceived difficulty of technical subjects.

## Impact on Organizations and Regional Workforce Development

### Organizations Benefiting from Scarole's Expertise

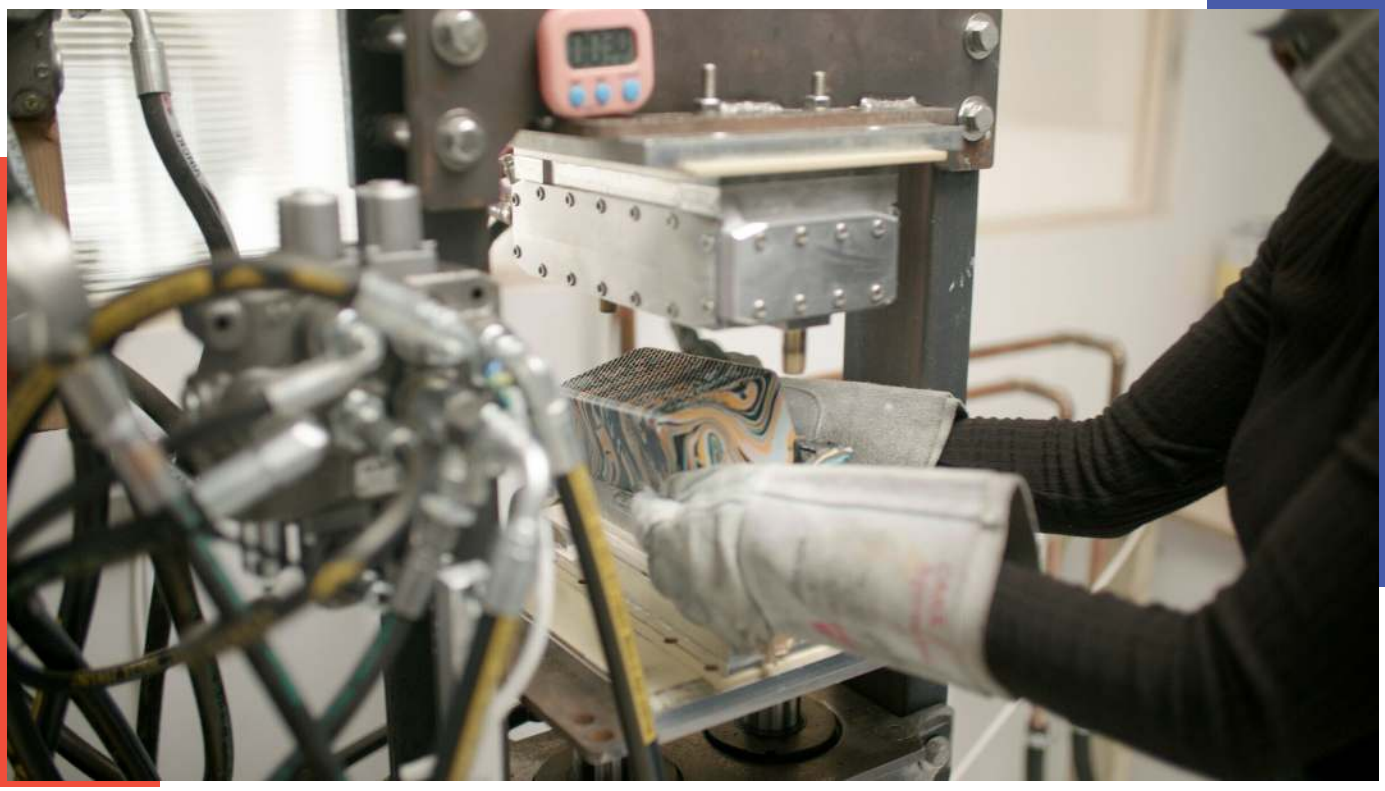
1. **Manufacturing Companie**s: PPG Industries, Westinghouse Electric, and ATI can reduce recruitment costs and time-to-productivity by sourcing job-ready women trained through Scarole's innovative programs.
2. **Educational Institutions**: Community colleges and technical schools in Western Pennsylvania can partner with Scarole to enhance their existing STEM and manufacturing programs, increasing enrollment and retention rates for women.
3. **Regional Economic Development Agencies:** Agencies such as the Pittsburgh Regional Alliance and Allegheny Conference on Community Development can leverage Scarole's programs to meet regional employment goals, reduce skill shortages, and attract more companies to invest in the area.



# It's time for a fresh approach.

Scarole Enterprises' deep expertise in technology-enabled learning, combined on esports and XR technologies, positions us as a critical partner in driving w participation in advanced manufacturing. By leveraging our innovative training methods, organizations can tap into a previously underrepresented talent pool, fill critical skill gaps, and achieve a more diverse, inclusive, and highly skilled workforce. We invite agencies and corporations committed to gender diversity and workforce development to partner with us in building a brighter future for women in manufacturing in Western Pennsylvania and beyond.

For more information, please contact us at info@scaroleenterprises.com or visit our website at **www.scaroleworks.com.** Together, we can redefine the future of manufacturing.



**Scarole Enterprises, LLC. [WNY I Chicago I Miami I Toronto I Pittsburgh**