Background: Before the industrial era, the United States followed the craftsmanship model where people learned a skilled trade while serving as an apprentice. They played the combined role of designers and manufacturers, supplying the local community, and had a personal stake in customer satisfaction. However, these goods were expensive and made only in small quantities. The industrial era allowed mass produced goods of high quality (e.g., metallic bolts made in China) in fully automated factories, but without the necessary customization, leading to a surplus of cheap goods and diminishing opportunities for workers. With shrinking product cycles, it is necessary to develop technologies to make a wide range of short run, custom or semi-custom products with very low set-up time. A sustainable manufacturing services sector requires the ability to anticipate and rapidly adapt to changes in needs without disruption of the supply chain.

Vision: With recent advancements in information technology (e.g. wireless sensing, communications and “big data”), manufacturing process (e.g. 3-D printing) as well as automation (e.g., robotics, supply chain) technologies, we envision a new kind of designer-manufacturer---one who can locally deliver customized products with high quality but with the cost structure of a mass manufactured product.

The new paradigm transforms manufacturing into a “cloud based service” to produce high value components requiring significant innovation. Central to this vision is a network of small and medium scale businesses spread across the state of Texas, to create a virtual manufacturing setup (cloud manufacturing as a counterpart to Cloud computing) with the capability (cyber-infrastructure and machine tools) to translate clients’ needs into a product or manufacturing process that can be immediately implemented.

Our Initiative: The main components of this vision are: (1) a new class of manufacturing workforce, trained at the manufacturing demonstration and training hub that will be located in San Antonio, Texas, that can combine engineering product design ability with information technology to convert ideas into components, and (2) a new class of cyber machine tools that combines the capability to add, remove or transform a wide range of precursor materials into products to meet advanced functionalities. A CyberManufacturing support cloud will be located in College Station (Texas A&M University and Texas A&M Engineering Experiment Station) and will provide product actualization ideas, manufacturing research, knowhow and coordination to support a cybermanufacturing ecosystem with a sustainable technological and competitive advantage.
Our Objective: Enabling Texas to establish a leadership position in cyber manufacturing with all the described competitive, economic, and workforce advantages.

Present: Expensive fixed plant facilities: capital intensive, high maintenance, high retooling cost, distant location, semi-skilled workforce

Future: Networked design and manufacturing functions, adapts to changing requirements, lower infrastructure costs, products developed regionally/on site, skilled workforce, fewer fixed plant facilities.