April 30, 2014

Strategic Plan to Implement an

Advanced Manufacturing Innovation Alliance (AMIA)

for the South Kansas region

prepared for the

Investing in Manufacturing Communities Partnership (IMCP) Taskforce
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In fulfillment of:
WSU #CL4658/Grant Ref.#R51077

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Draft Report v. 2
Subject to Client Approval

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Executive Summary

Recommendations

1. **Form an Advanced Manufacturing Innovation Alliance (AMIA):** The Alliance would secure membership from all the innovation ecosystem stakeholders and be based at Wichita State University. The Alliance would be organized as a hybrid industry consortium and public/private partnership. The Alliance would align resources based on strategic programs and private sector defined projects.
2. **Recruit and Facilitate Major Regional Manufacturing Leaders to Common a Vision and Goals**: The leaders would be guided through a group process that emphasizes mapping alternative paths to meet future needs. The leaders would be guided to create only those goals to which their organizations would commit resources.
3. **Leverage the Innovation Center Launch to Form the AMIA and Recruit Regional Leaders**: The regional leadership would be secured in alignment with the University's launch of the Innovation Center.

Strategic Plan Summary

Vision: A world-leading region for high-value manufacturing

Mission: To generate and transfer innovations to regional manufacturers permitting them to constantly improve capabilities in advanced manufacturing

Goals: Create capabilities within regional manufacturing stakeholders to:

- Apply advanced materials, design and flexible manufacturing
- Reduce cycle time for development and implementation of innovations in products and processes
- Continuously improve the price/performance features of regionally manufactured goods
- Develop and deploy improved collaborative innovation mechanisms to advance manufacturing

Strategic Programs:

- **Advanced materials** (composites, metals, polymers)
- **Advanced analysis, design and qualification (ADQ)** that draws on advanced materials
- **Flexible manufacturing** that draws on ADQ permitting design-to-order, facility automation, and lean production.

Recruit Founding Membership: A founding membership group must be recruited among the leading end-users, OEM's and major suppliers. The founding members form the "launch team" working with management from the IMCP initiative to build the alliance.

Offer Membership: A common membership structure offers one, two and three year membership options. Organizations join at different membership levels and commit to participate in specific programs and their respective projects. A basic membership design includes four levels, with the lowest designed to be priced to permit easy entry for individuals, SME's and historically disadvantaged businesses.

Table 1: Membership Categories

Membership Category	Rights & Obligations	Resource Contributions
Principal	Eligible for six voting Board seats, Alliance leadership positions and technical team leadership; receives all Outputs	Dues, project funding and participation on working teams
Associate	Eligible for two voting Board seats, Alliance leadership or technical team leadership; receives systems outputs only as approved by the Board	Dues, project funding and participation in working teams
Supporting	Eligible for one voting Board seat; Eligible for one non-voting Board seat; receives systems outputs unless restricted by Board	Dues, in-kind contributions and participation on working teams
Observing	Not eligible for Board or leadership, eligible for project team participation only upon request of majority of team members; receives Guidelines Reports	Dues per annum

Create Governance: Members of the Alliance elect a Board of seven members to serve for a three-year terms. The Board is normally composed of up to four Principal members, up to two Associate members, and one Supporting member. Each Board member has one vote regarding Board decisions.

Establish Leadership: The membership of the Board elects from among its members a Chair and a Vice Chair that constitute the Alliance Leadership Team.

Create Legal Structure-WSU Affiliated Non-Profit: The Alliance would be created as a separate 501-c-3 non-stock corporation affiliated with Wichita State University (WSU).

Create Organizational Structure: The Alliance would create a four level, hybrid top-down command-and-control structure with representatives elected at the Board and Systems Teams levels.

- Board- Sets strategy and legally responsible for organization
- Management- Implements strategy and responsible for day-to-day operation
- Systems Teams- Integration teams elected from project teams and responsible to formulate “solutions” to meet strategic goals
- Working Teams- Project teams formed around different program topics

Create Programs/Projects: The Alliance is organized around strategic programs that of advanced manufacturing disciplines. Within these programs are individual projects funded by the membership. The systems teams integrate results from projects and across strategic programs. (See Priority Investments pg. 4 and pg. 5)

Define and Allocate Outputs: The Alliance will undertake activities that generate outputs, such as reports and prototypes. An intellectual property policy and set of guidelines will be developed to specify ownership and usage rights.

Secure Management: This plan proposes that WSU personnel form the Alliance management team. The management is responsible for oversight of the day-to-day research and development activities of the Alliance. The management team will work with the Board to develop strategic program plans and solicit project proposals from individual work teams.

Administration/Operating Functions: The Alliance operates like a common interest, membership business. It requires a full set of administrative and operations functions including but not limited to membership administration, financial management and intellectual property control.

Create Public Positioning: The Alliance is positioned as a neutral organization that is building advanced manufacturing capabilities in the South Kansas region. The Alliance is presented as private sector guided and generating both public benefits (economic growth, job formation, community stability, shared manufacturing advancements) and private benefits (valuable technical reports, guidelines and prototypes).

Timing Phased Launch: The Alliance will startup and operate in three phases. The phased approach is designed create clear progress points for the Alliance formation.

- Phase 1 Startup over a period of one year
- Phase 2 Development of strategic programs and project in sufficient detail to secure resources
- Phase 3 Launch of projects

Resources Source: The Alliance's research and project management functions will be supported by a combination of member contributions and solicitation for government program funding. The Alliance's business management will be supported by member dues and cost recovery on project overhead.

Pricing Structure: Member Dues and Seats: An alliance's pricing structure varies according to the level of membership. The AMIA's pricing structure will be a mix between the projected operating budgets and estimated revenue generation from members. An example pricing structure is:

Level	Dues
Principal	$ 10,000 per annum
Associate	$ 5,000 per annum
Supporting	$ 1,500 per annum
Observer	$ 500 per annum

Priority Investments: The formation of the Alliance's leadership group to develop their own strategic purpose and plan would be guided by the priority investments developed from the CIEE/IMCP initiative. The mapping of stakeholder roles across all the investments forms the foundation for the Alliance's leadership further solicitation of additional membership commitment.

Table 2: Priority Investments
An Innovation Based Economic Development Strategic Plan

<table>
<tr><td colspan="2">Common Interest Group
• Stakeholder commitment to group formation: Innovation Alliance
• Group process to create common vision, mission, goals
• Organizational structure to launch programs and projects
• Operations structure to administer Alliance and implement projects</td></tr>
<tr><td colspan="2">OEM’s
Common: Site and facility build out to accommodate new functions
Common: Workforce development (internal and external)
Common: Supply chain innovation partners investment in advanced manufacturing
• AM- Product/materials specification tools, practices and training
• (ADQ)- Tools, personnel & practices to apply analysis, design and qualification
• FM- Plant layout reconfiguration, equipage, automation, networking and ingress/egress</td></tr>
<tr><td colspan="2">Suppliers
Common: Shared centers for startups, engineering, and prototyping
Common: Site and facility build out to accommodate new functions
• AM- On site materials formulation, test, certification and fabrication equipment & personnel
• (ADQ)- Personnel, tools and practices to support ADQ
• FM- Personnel and equipment supporting OEM flexible manufacturing</td></tr>
<tr><td colspan="2">R, D, T & E
Common: Laboratories for development, testing and certification
Common: Fabrication laboratories for rapid prototyping
Common: Test beds for integrated solutions: materials, ADQ and automation
Common: Skilled personnel for lab, fab and test bed
• AM- Materials formulations, development testing, certify and standard support
• (ADQ)- Develop reference databases, tools and application protocols
• FM- Develop, test and evaluate production configurations, equipment, maintenance</td></tr>
<tr><td colspan="2">Education
Common: New graduate, undergraduate, certificate and specialized training
Common: K-12 or K-20 core curricula adjustments to support
• AM- Programs for materials science and engineering
• (ADQ)- Integrated programs w/knowledge of materials, design and fabrication
• FM- Facility design, equipage and automation engineering</td></tr>
<tr><td>Industry Partnerships & Associations
Create a Regional Advanced Manufacturing Group</td><td>Finance & Risk Mgmt.
Site and equipment financing for OEM’s and Suppliers
Regional Government Financing Associated with Infrastructure and Sites</td></tr>
<tr><td>Regional Government
Coordinated Investments for Infrastructure, Transportation and Education/Training</td><td>Gov. Regulations-Operations
Coordinated qualifications and certification teams</td></tr>
</table>

I. Purpose

This report provides a Strategic Plan to create a permanent, advanced manufacturing region of excellence in twenty-seven counties of South Kansas. The Plan is designed to be updated and encompass changes from stakeholders, market forces, external factors and available resources. The scope of the Plan covers the region's advanced manufacturing / high-technology sector. The content of the Plan:

- Prioritizes investments: Prioritizes key tactical manufacturing investment(s)
- Specific alignment recommendations: Provides specific recommendation to strategically align resources to more efficiently and effectively support the region's advanced manufacturing / high-technology sector and associated supply chain
- SME/Disadvantage Business: Intentionally focus on inclusion of small- and medium-sized enterprises and historically underrepresented populations.

II. Method and Approach

This strategic plan approach and content has been customized to the need for coordinated actions to prioritize investments that will develop advanced manufacturing capabilities in the South Kansas region. We have summarized this customization below to provide a background understanding of the recommended Strategic Plan.

Strategy and Plans: Coordinated Decisions by Stakeholders

Strategic plans are decisions that are coordinated to achieve a future objective. The decisions are made by stakeholders with the resources to implement their joint decisions. The "plan" takes the form of a list of actions that meet basic criteria: the actions are internally consistent, meet the stakeholder needs, and account for external conditions such as competition and macro forces.

The basic concept of strategy derives from the need for organizational leaders to make decisions that commit resources for a future outcome. Most of our current body of research and methods applies to commercial, non-profit and governmental organizations. However, these basic methods can be applied for cross-organizational strategy. Our basic terms for these cross-organizational grouping is "alliance".

Economic Region Strategic Plan: More Stakeholders, Issues and Resources

An economic region is a wise way to think about investments and policies to spur growth. Economic relationships exist between separate individuals, organizations and their "third-party advocates", such as professional trade groups. The connection(s) among these groups creates a value chain that can bring benefit to all the participants.

The reality of an economic ecosystem, however, faces regional policy leaders with a conundrum: how to secure coordinated action when there are a large number of stakeholders, each focused on their own momentum and with little time to co-create and coordinate?

The solution to this conundrum is to adjust basic strategic planning methodology (principles, processes, outcomes) to create an alliance. This hybrid will treat some stakeholders as "customers", some as active "participants", others as "support" for customers/participants, and many as observers. Only through the stakeholder's joint vision, goals and commitment to resources will the collective interest be achieved.

Three Strategic Planning Approaches: Data-Based, Model-Based or Group Wisdom

A large survey conducted by Stanford and SRI International evaluated the strategic planning methods of US corporations (for-profit and non-profit) between the mid-1950 and 1960's. The survey found that planning fell into three basic approaches. Each of these approaches has their own principles, processes and outcomes.

- Data-based: Developing goals and actions to achieve goals, then gathering performance data to reveal best practices to achieve goals through the actions. The performance data is both internal to an organization and external relative to a sample of comparable organizations. The relative performance data leads to the decisions.
- Model-Based: Creating models of long-term (strategic) cause-and-effect relationships that can be confirmed by historical observation and applied to future decision-making. Information is gathered according to the model's elements, which in turn, reveal to the observer decisions for future actions.
- Group Knowledge Based: Creating long-term decisions among a group's stakeholders that control resources to implement their decisions. The group follows a structured process that breaks down long-term decisions into sub-elements, guides them to make decisions on those elements, and builds the individual decisions back into a strategy. The group's collective knowledge and vesting to implement decisions is the basis for confidence that the correct decision and commitment has been made.[1]

Approach for IMCP Ph. II Proposal and Strategic Plan: Modified Group Knowledge

The group-knowledge based approach was chosen in response to the needs and tasks defined in the WSU proposal for assistance. The CIEE had formed a Task Force that collected "group-wisdom" for the regional stakeholders, and laid out a task approach that required analyzing existing plans and conditions.

Decision Analysis Method: Principles, Process and Outcomes

StarNet applied the principles and organizing structure (process and outcomes) of Decision Analysis (DA) strategic planning to guide the integration of the analysis and facilitated meeting decisions that had been planned in the WSU-IMCP preparation. StarNet did not apply the group meeting processes nor quantitative analytic methods within DA, as those require a group process structured differently than that offered to the IMCP Task Force. The principles within Decision Analysis that matched the conditions facing the South Kansas region include:

- Group Wisdom- The mix of Task Force members represent the stakeholders and have knowledge to make the optimum decision for their joint interest.
- Group Process- The stakeholder representatives met through a formalized process supported by analyses to make recommended prioritized investments.
- User Needs Driven- The Task Force included managers and individuals knowledgeable of end and intermediate user needs.
- Alternatives- The analysis of existing plans and Task Force process could be used to generate alternative strategies.

The DA process begins with stakeholders guided through a series of meetings leading to collective conclusions and decisions. The meetings are preceded by

[1] The Wisdom of Crowds, James Surowiecki, First Anchor Books, 2005

analyses that inform the stakeholders, including a) current strategies, b) current market/user needs, c) competitive analyses and d) macro-forces such as politics, policy, economic trends or technological breakthroughs.

- Stakeholder- Who are the stakeholders? What are their interests?
- User Needs- Who are the end and intermediate users and what are their needs?
- Outcomes- What are the stakeholder's common-interest outcomes?
- Current Position- What are the current strengths, weaknesses, opportunities, threats?
- Competition- Who are the competitors?
- Macroforces- What are the trends of external forces?
    - Politics/Policy
    - Economy
    - Technology
    - Social Values

The group decision outcomes will slowly coalesce around a set of "ideas" that represent alternative paths to meet their collective needs. These paths are the alternatives plans. The group is facilitated to generate a set of decisions for these outcomes:

- Alternative Strategies- What are the stakeholder's strategic alternatives?
- Prioritized Strategies- How are the strategies prioritized?
- Implementation Plan- What is the implementation plan?

Plan Preparation Tasks: Integrating Existing IMCP Analysis and New Research

The IMCP preparation, regional plan analyses and Task Force meetings provided most of the information necessary to prepare the strategic plan. StarNet supplemented the available information with secondary research and using our reference manuals for regional economic development. The information was reviewed sequentially through the following tasks to prepare the Strategic Plan.

Map stakeholders- Create a map of stakeholders by their interest from the existing regional plans and IMCP Task Force meetings.

Define User needs- Define the chain of end and intermediate users of advanced manufacturing capabilities. Generate this analysis from research about advanced manufacturing definitions, industry programs and comparable regional economic development initiatives.

Assess Current Position- Define the current strategic position for the region's advanced manufacturing using an alliance position template and drawing on information gathered for the analyses of regional plans.

Assess Competitor(s)- Undertake new research to identify regional competitors with advanced manufacturing initiatives that appear to meet the needs of end-users.

Assess Macro forces- Gather and organize existing trends forecasts in the categories of:

- Economic
- Social/Demographic
- Political/Policy
- Technological

Compile Notional Strategic Decisions- Use the results of the IMCP Task Force, regional plan analyses and State convened meetings to create draft strategic decisions about vision, mission and goals as context for strategic implementation.

Create and Prioritize Alternatives- Organize information from the prior tasks to specific stakeholder roles and investments for the three alternatives generated from the regional analyses and IMCP Task Force. Use the Task Force outcomes to prioritize the alternatives for priority investments
Implementation Action Plan- Apply an implementation plan template for an innovation based alliance to list the actions necessary to align the strategic investments.

Applied to Report Purpose

The strategic planning analysis is applied to the report's objectives in the following manner:

- Prioritized investments- The need for prioritized investments is addressed by creating a hierarchical map of stakeholders and their related investments. The investments are further detailed by the strategic alternatives.
- Strategic Alignment- The strategic alignment is addressed by creating an alliance among stakeholders to support a common strategy. The alliance is formalized through membership, governance, management, program/project teams and operations.
- SME - The inclusion of SME's[2] and is addressed through the "membership" criteria of the strategic plan implementation.
- Historically Disadvantaged Businesses- The inclusion of historically disadvantaged businesses by creating low membership fees and providing options for in-kind contribution of resources for potential projects. (See Observer Member description). There was no data provided to StarNet to map "historically disadvantaged businesses" [3] to the regional advanced manufacturing organizations.

II. Strategic Analysis

II.A. Stakeholders

Deep Network of Manufacturing Stakeholders Without Regional Coordination

Stakeholders are organizations and individuals that are affected by the actions and outcomes of the collaborative innovation. The definition of technology-based innovation provides us with the scope of nine potential stakeholder groups.

[2] Small/Medium Sized Enterprises- The US Small Business Administration sets small business criteria based on industry, ownership structure, revenue and number of employees (which in some circumstances may be as high as 1500, although the cap is typically 500); United States Small Business Administration. "Size Standards". Retrieved 2014-09-04

[3] Historically Disadvantaged Businesses- The State of Kansas defines "Disadvantaged Business Enterprise" as entities owned and/ or controlled by socially and economically disadvantaged individuals (as described in 42 USC 7601 and 42 USC 4370d- which includes Women's Business Enterprises (WBE), Minority Business Enterprise s (MBE) and a Small Business Enterprise (SBE); a Small Business in Rural Area (SBRA); a Labor Surplus Area Firm (LSAF); or a Historically Underutilized Business (HUB) Zone Small Business Concern.

Table 3: Hierarchy of Stakeholders

<table>
<tr><td colspan="2">End Users
Transportation, Farming, Building Architects & Construction</td></tr>
<tr><td colspan="2">OEM’s
Aircraft Assemblers, Truck Assemblers, Farm Equipment Manufacturers, HVAC Assemblers</td></tr>
<tr><td colspan="2">First and Second Tier Suppliers
Machinery, Metal Fabricators, Composite Fabricators, Polymer(s) Fabricators, Materials Suppliers, Specialized Equipment, Analysis and Qualification Tools, Design Tools, Production Equipment, Plant and Site Developer/Contractors, Component Fabricators, Tool and Die</td></tr>
<tr><td colspan="2">R, D, T & E
Research and Development Labs, Testing and Evaluation Labs, Fabrication Facilities, Rapid Prototyping Facilities, Qualification/Certification Facilities</td></tr>
<tr><td colspan="2">Education
Universities, Colleges, Community Colleges, Specialized Training Centers, Certification Programs, Labor Union Training Centers, Workforce Development Centers, K-20 Programs, K-12 Linked Curricula</td></tr>
<tr><td>Industry Partnerships & Associations
Manufacturing Associations, Local Chapters of Advanced Manufacturing Professional Groups</td><td>Finance & Risk Mgmt.
Construction and Commercial Real Estate Financiers, Equipment Financiers, Small Business Finance Programs</td></tr>
<tr><td>Regional Government

Economic Development: Sites, Infrastructure, Workforce</td><td>Government Regulation-Operation

Standards and Certification Programs</td></tr>
</table>

II.B. User needs

Pattern of Common Needs Among Customers of Regional Manufacturing OEM’s

There are strikingly similar needs between the OEM’s and tier one suppliers of the region’s major manufacturing firms. These needs reflect not only the broader patterns in the macro-economic forces that operate within the global economy, but also the common “input factors” that generate the core value for end users.

The South Kansas region manufacturing firms exports value to well defined set of end users: transportation companies, primarily aviation, farming equipment suppliers, building contractors using HVAC systems[4]. All of these end users configure systems that combine fabricated materials (metals, metal-alloys, composites, polymers), sensors and controls into moving parts that provide value. They are all “manufactured” items, exhibiting a common set of end-user needs for continuous innovation. The major OEM’s and their first tier suppliers meet these needs both with internal capabilities but also by drawing on the extended manufacturing support network in the region: lower tier suppliers, universities, startups, workforce trainers.

[4] Strengths of Community’s Advanced Manufacturing Industries, Top Three Employment Location Quotients, 27 County South Kansas Region, IMCP Task Force Information Packet, Jan. 24, 2014

The collective pattern of needs at the upper "stakeholder tiers" define the user needs to be satisfied by advance manufacturing investments. The needs are summarized by stakeholders in Table 4.

Table 4: Hierarchy of Advanced Manufacturing Stakeholder Needs

End Users Continuous innovation for price/performance (e.g. unit durability), improved product features, supplier ability to apply product/performance requirements in short periods of time and still provide reliability of supply
Intermediate Users- OEM's Continuous production price/performance improvements, concurrent higher throughput and quality control, rapid product design/redesign provided by improved materials linked analysis/design/qualification, flexible manufacturing through integrated sensors/controls, automation and plant reconfiguration
First Tier Suppliers Continuous component production price/performance improvements, capacity to respond to OEM changes to volume/timing and quality, capacity to co-participate with OEM in product development, on-site capacity for advanced materials formulation, testing and certification

Implications for Advanced Manufacturing Ecosystem

A set of common needs doesn't define how to other stakeholders in an economic ecosystem must respond, but it does provide implications about their future role in meeting those needs:

- R&D&T&E- Investments in laboratories, fabrication facilities and staffing configured to meet the OEM's and first tier supplier's evolving list of "advanced manufacturing needs"
- Education- Investments in courses, curricula, training programs and professional staffing that provide the skills necessary to apply advanced manufacturing
- Finance & Risk Mgt.- Personnel and risk evaluation systems that can understand the specific financing needs associated just with "advanced manufacturing": site development, facility configuration, specialized equipage
- Regional Government- Programs with knowledgeable managers
- Government Regulators- Creation and staffing of coordinating groups that can effectively work with government regulators for relevant standards and certification

II.C. Current Position

Strategic Direction: No Explicit Strategic Direction, Indications of Strategic Momentum

There is currently no explicit strategic coordination for advanced manufacturing between South Kansas regional stakeholders. This lack of a common strategic direction is partially due to the absence of a coordinating group (government, industry association, university) but also the lack of a "reason" to create such a shared vision. The following is a summary analysis of the current position. A detailed item-by-item analysis is included in Appendix A.

There are elements of a shared strategic purpose distributed throughout the multiple ideas generated at the State and local level. The core of the shared purpose is around the current momentum of continuous innovation to add value and lower costs for complex products. The common regional culture around this shared purpose derives from the manufacturing of aircraft, which requires a tightly integrated economic-ecosystem. The very nature of the expertise, inputs and service delivery required to manufacture aircraft effectively creates a shared dialogue around "high-value" (e.g. high precision) added manufacturing. This generates dialogue about both the region's over-dependence on aircraft, but also it's highly trained workforce and extensive supply chain.

This dialogue can be translated into a shared vision of "high value, high volume" manufacturing, rather than "aviation manufacturing". This vision of "high value, high volume" encompasses everything that touches not only aviation (e.g. high precision for certification), but also farm equipment and HVAC for buildings. It also applies to extending that capability into other sectors such as ground transportation, buildings materials, energy systems and even food production. Equally important is that such a strategic direction is grounded on meeting needs for continuous innovation, which is a step beyond a vision guided by comparison to regional competitors. An emphasis on continuous innovation as a strategic direction sets a focus, and culture, on meeting needs. This, in turn, creates a culture around continuous innovation that is always moving forward because the leaders are constantly focused on continuous learning of both needs and capabilities. This culture, known as being "mission driven" is a subtle, but important, difference from being competitor driven. It means that new missions can be introduced to motive the collective stakeholders.

An interpretation of the momentum from the IMCP Phase II proposal combined with the State's summit meetings, Project 17, the WSU Innovation Campus (IC) and the Greater Wichita Economic Development Coalification (GWEDC) has these elements of a strategic direction.

- **Vision:** A world-leading region for high-value manufacturing
- **Mission**: To generate and transfer innovations to regional manufacturers permitting them to constantly improve capabilities in advanced manufacturing
- **Goals**: Create capabilities within regional manufacturing stakeholders to:
    - Apply advanced materials, design and flexible manufacturing
    - Reduce cycle time for development and implementation of innovations in products and processes
    - Continuously improve the price/performance features of regionally manufactured goods
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II.D. Competitors

Multiple Regional Advanced Manufacturing Materials Competitors

There are five American advanced manufacturing regional economic development strategies that tie heavily into advanced materials linked to improvements in ADQ and automation. The States of Connecticut, Ohio, Pennsylvania, Illinois and Utah have formulated advanced manufacturing strategies based on materials improvements to support legacy transportation industries. While none of these states have an MSA with the concentration of manufacturing similar to South Kansas, all of these states have intentional strategies that are being implemented through coordination at their respective state and regional levels. All of these states, except Illinois, have advanced manufacturing initiatives being coordinated through partnering practices institutionalized in the 1980's and 1990's. Strong competitors for the South Kansas strategy include the State of Connecticut's aerospace components manufacturing initiative to support their aerospace industry; the State of Utah's advanced composites initiative to support their commercial space and aviation Tier 1 suppliers; the State of Pennsylvania's Doyle Advanced Manufacturing Center in Pittsburgh that closely coordinates with regional manufacturing and robotics programs at Carnegie Mellon; the State of Ohio's investment in design, qualification and testing of materials linked to product design and flexible manufacturing; and the State of Illinois' recent securing of the Materials Genome Initiative to develop common materials qualification databases and fabrication systems. The Connecticut, Ohio and Pennsylvania initiatives are all partially funded by the US Air Force National Aerospace Leadership Initiative (NALI).

II.E. Macro Forces

Major Forces Favor South Kansas Advanced Manufacturing, but Require Coordinated Response

The region's decline in aviation manufacturing jobs and shift of manufacturing jobs offshore, such as with Coleman, are due to forces beyond the influence of existing OEM's and operators in the region. Equally so, there are current forces that support the rationale for regional coordination advanced manufacturing investments.

The following macro forces analyses are based on limited secondary research by the report author. They have been compiled from readily available global trends forecasting groups (World Economic Forum, Foreign Policy) that can be accessed online. The list has been compiled to describe trends that will impact advanced manufacturing in the United States. Additional macro forces detail is contained in Appendix C.

Economic Trends: This list was compiled from a review of trends analyses from the World Economic Forum, JP Morgan Chase and the US Congressional Budget Office

Lower cost energy- US energy costs will decline as those of it's manufacturing competitors rise. Manufacturers in Germany, Japan and China will face higher input costs and a disadvantage of transportation costs.

Increased cost of labor in developing countries- The US is becoming a relatively more attractive labor market. Over the last year, labor costs have risen 20% in China, 5% in Mexico and 3% in the United States.

Automation technology- It takes an average of fourteen years for innovation to substantially diffuse throughout a society, and this has been the case in manufacturing

automation. The advent of robots in the 1980's gave way to networked sensors, computing and decision support in the 1990's. The cost of these have dropped, leading way to new user-friendly factory automation that shifts the focus from ensuring low labor costs to finding skilled workers.

Reliability of global supply chains- The geographically diverse supply chains of major manufacturers have created a multitude of increased risk for each link in the supply chain rather than reduced risk through diversification. The solution has been a movement toward moving manufacturing back to the United States, Mexico or Canada.

Persistent structural unemployment- The US employment and average compensation levels will not recover to pre-2008 levels. This recent conclusion from the US Congressional Budget Office is based on their review of data from the period 2009 through 2013 and concluding there are not the underlying factors for solving structural unemployment

Politics/Policy: This list was compiled from a review of surveys by PewResearch and the World Economic Forum (WEF)

Widening income disparities- A majority of citizens polled in 31 of 39 countries said inequality is a *very* big problem in their country.

Persistent structural unemployment- The WEF spring 2013 survey found that two-thirds or more in most countries say a lack of employment opportunities *is a very* big problem.

Intensifying cyber threats- U.S. policy experts were very concerned about the threat of cyber-attacks from China, according to 2013 WEB survey. While the survey identified cyber threats as a top concern, 47% of experts admitted they have limited knowledge of the problem.

Climate change- A median of 54% or more of people surveyed in Canada, Europe, the Asia Pacific, Latin America and Africa saw global warming as a major threat to their countries. This compares to 40% of Americans and a median of 42% in the Middle East region that regarded global climate change as a major concern.

Social: This list of trends was compiled by a review of IBM forecasts and GlobalTrends Newsletter, which compiles trends summaries from multiple sources

Momentum Innovation Becomes Mission Innovation- There is a movement away from innovation for its own purpose to "mission driven" innovation to meet a collective need.

Information security- Commercial and public users of online systems have realized our data is not secure and we must develop solutions from multiple sources or reduce our virtual presence.

Direct purchasing- The future of shops will be increasingly defined by experiential spaces offering personalized service, integrated online and offline value propositions, and pop-up stores to satisfy demands for immediacy and surprise.[5]

Redistributing the industrial revolution- Complex, global value chains are being redistributed by new technologies, labor market shifts and connectivity. Small-scale manufacturing, including 3D and soon 4D printing, and shifting production economics are moving production closer to markets and enabling mass customization.

[5] Global Trends, December 2013

Regional hubs: A different aspect of globalization- As production and consumption become more distributed, hubs will characterize the next wave of "globalization." Underpinning these hubs will be global knowledge networks and new business and governance models based on regional economic networks (innovation hubs) that leverage global assets and hub strengths to deliver local value.[6]

Technological: This trends list was compiled from a review of forecasts from Gartner, Accenture, Forbes, Deloitte, IEEE and Frog Design

Internet Extension and Cloud Computing- There will be a continuing deployment of sensors and information collection through Internet enabled systems to support production, transportation, and supply organizations into shared customer-supplier-producer networks. These networks will be supported by a mix of secured networks and cloud computing.

Large Data Analysis- The integration of customer to producer systems will generate large volumes of data which, if sufficiently structured, will yield insights that can be applied to materials formulation, qualification, design and production processes.

Materials Formulation- There will be continuing scientific level progress at formulating materials at the molecular level to generate attributes desired for products and production.

3D Production and Manufacturing- Production will be reconfigured to adopt computer guided design-to-production (3D printing). The trend will continue to streamline prototyping and short run manufacturing.

IV. Strategic Decisions: Setting the Purpose

The region's collective current momentum can be integrated into a common advanced manufacturing strategy that responds to user needs, takes account of competition, and recognizes external forces. The notional strategic purpose statement includes:

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[6] Global Trends, December 2013

IV. Strategic Alternatives: Paths to Success

The stakeholder meetings held to prepare the IMCP Phase II proposal, State summits and regional plans provide a foundation for agreement among organizations to implement coordinated actions to achieve advanced manufacturing capabilities. However, there are more stakeholders to engage and there will be future changes in market conditions and broader forces.

The strongest strategic approach for the region's collaboration is to organize around alternative paths to success. The analyses and IMCP Task Force meetings have identified three alternative paths. These can be pursued independently, but are optimized when sequences to build upon one another. This sequencing is called "cascade" and is expressed as a prioritization of alternative strategies.

Based on the stakeholder meetings to date, there are three strategies that meet the basic criteria for a successful plan. (See Criteria below) Those three strategies encompass investments and actions for:

- **Advanced materials** (composites, metals, polymers)
- **Advanced analysis, design and qualification (ADQ) that draws on advanced materials** permitting flexible manufacturing, new product features, cost savings, new qualification capabilities
- **Flexible manufacturing that draws on ADQ** permitting design-to-order, facility automation, and lean production.

Criteria for Prioritizing Strategic Alternatives

Each stakeholder group develops it's own criteria for success. However, there are some fundamentals that can be used to assess the effectiveness of any strategy. The following were the criteria used to assess and prioritize the recommended strategies for the South Kansas advanced manufacturing initiative:

- Purpose- Does the strategy meet stakeholders vision and mission?
- Goals- Does the strategy achieve the goals?
- User needs- Does it meet the user needs of key stakeholders?
- Strengths & weaknesses- Does it build off strengths and avoid weaknesses?
- External forces- Does it take into account trends in external forces?
- Competition- Does it account for competitor strengths and weaknesses?
- Present fit- Does it build off the current momentum and compatible with the current position?

V. Implementation Plan

V.A. Priority Investments

The core of the region's common interests is a set of investments that match each stakeholder's role and interests, yet integrate into a strategy. The priority investments derived from the IMCP planning process are detailed in the following table.

Table 5: Priority Investments
An Innovation Based Economic Development Strategic Plan

<table>
<tr><td colspan="2">Common Interest Group
• Stakeholder commitment to group formation: Innovation Alliance
• Group process to create common vision, mission, goals
• Organizational structure to launch programs and projects
• Operations structure to administer Alliance and implement projects</td></tr>
<tr><td colspan="2">OEM’s
Common: Site and facility build out to accommodate new functions
Common: Workforce development (internal and external)
Common: Supply chain innovation partners investment in advanced manufacturing
• AM- Product/materials specification tools, practices and training
• (ADQ)- Tools, personnel & practices to apply analysis, design and qualification
• FM- Plant layout reconfiguration, equipage, automation, networking and ingress/egress</td></tr>
<tr><td colspan="2">Suppliers
Common: Shared centers for startups, engineering, and prototyping
Common: Site and facility build out to accommodate new functions
• AM- On site materials formulation, test, certification and fabrication equipment & personnel
• (ADQ)- Personnel, tools and practices to support ADQ
• FM- Personnel and equipment supporting OEM flexible manufacturing</td></tr>
<tr><td colspan="2">R, D, T & E
Common: Laboratories for development, testing and certification
Common: Fabrication laboratories for rapid prototyping
Common: Test beds for integrated solutions: materials, ADQ and automation
Common: Skilled personnel for lab, fab and test bed
• AM- Materials formulations, development testing, certify and standard support
• (ADQ)- Develop reference databases, tools and application protocols
• FM- Develop, test and evaluate production configurations, equipment, maintenance</td></tr>
<tr><td colspan="2">Education
Common: New graduate, undergraduate, certificate and specialized training
Common: K-12 or K-20 core curricula adjustments to support
• AM- Programs for materials science and engineering
• (ADQ)- Integrated programs w/knowledge of materials, design and fabrication
• FM- Instruction for automation engineering, flexible manufacturing facility design and certification for automated machinery operations</td></tr>
<tr><td>Industry Partnerships & Associations
Create a Regional Advanced Manufacturing Group</td><td>Finance & Risk Mgmt.
Site and equipment financing for OEM’s and Suppliers
Regional Government Financing Associated with Infrastructure and Sites</td></tr>
<tr><td>Regional Government
Coordinated Investments for Infrastructure, Transportation and Education/Training</td><td>Gov. Regulations-Operations
Coordinated qualifications and certification teams</td></tr>
</table>

V.B. Forming an Innovation Alliance

An alliance is like a membership business, with it's own strategy, operating plans organization structure, budget and performance metrics. The correct decision-making and coordination requires decisions to guide the proposed Alliance formation.

StarNet uses a modified membership business approach to identify the decisions and actions that must be taken to launch an innovation alliance. The organizing elements are described below, based on a draft description of the vision, mission, goals and proposed priority investments.

Recruit Founding Membership: A founding membership group must be recruited from among the leading end-users, OEM's and Tier 1 suppliers. The founding members form the "launch team" working with the management from the IMCP initiative to build the Alliance.

Table 6: Founding Membership

Founding Member	Description	Startup Dues/Rights
Founding Principal	Leading for-profit business organizations	Pay $10,000 in dues; approve startup plan; position on Board for first year; develop draft strategic plans and program plans
Founding Associate	Supplier for-profit organizations; public and non-profit organizations	Pay $5,000 in dues; provide input to Founding Board

Offer Membership: A common membership structure offers one, two and three year membership options. Organizations join at different membership levels and commit to participate in specific programs and their respective projects. Membership shall be confirmed by completing a membership application that confirms the organization's commitment to the purpose, and agreement to provide resources. A basic membership design includes four levels, with the lowest designed to be priced to permit easy entry for individuals, SME's and historically disadvantaged businesses.

Table 7: Membership Categories

Membership Category	Rights & Obligations	Resource Contributions
Principal	Eligible for six voting Board seats, Alliance leadership positions and technical team leadership; receives all Outputs	Dues, project funding and participation on working teams
Associate	Eligible for two voting Board seats, Alliance leadership or technical team leadership; receives systems outputs only as approved by the Board	Dues, project funding and participation in working teams
Supporting	Eligible for one voting Board seat; Eligible for one non-voting Board seat; receives systems outputs unless restricted by Board	Dues, in-kind contributions and participation on working teams
Observing	Not eligible for Board or leadership, eligible for project team participation only upon request of majority of team members; receives Guidelines Reports	Dues per annum

Create Governance: Members of the Alliance elect a Board of seven members to serve for three-year terms. Each organization has one vote. The Board is normally composed of up to four Principal members, up to two Associate members, and one Supporting member. Each Board member has one vote regarding Board decisions. The elected Board has the option to appoint up to two, additional non-voting "observing members" from the academic and government sectors. Election to the Board is by nomination and election procedures created by the Alliance manager and approved by the Leadership.

Establish Leadership: The membership of the Board elects from its members a Chair and a Vice Chair that constitute the Alliance Leadership Team. The Chair and Vice Chair operate under common practices of authority to set agendas, review program performance and call Board meetings.

Created Legal Structure-WSU Affiliated Non-Profit: The Alliance would be created as a separate 501-c-3 non-stock corporation affiliated with Wichita State University (WSU). This allows the organization to operate with a Board dominated by commercial firms from among the membership while concurrently coordinating with the University to secure R&D funding and align education programs.

Create Organizational Structure: The Alliance would create hybrid, top-down command and control structure balanced with elected representatives at the Board and Systems Teams levels:

- Board- Sets strategy and legally responsible for organization
- Management- Implements strategy and responsible for day-to-day operation
- Systems Teams- Integration teams elected from project teams and responsible to integrate systems solutions across the programs
- Working Teams- Project teams formed around different program topics

Create Programs/Projects: The Alliance is organized around programs and projects. The Board, which is represented primarily by users, defines the specific elements of the programs and topics for projects. A sample of those for advanced manufacturing could include:

- Programs
    - Materials- Types, basic research, applied solutions
    - Analysis, Design and Qualification (ADQ)- Tools, expertise, application
    - Flexible Manufacturing- Layout, networking, prototyping linkage
- Projects
    - Crashworthy composites for automobiles
    - Materials qualification tools for graphene
    - IP-network enabled manufacturing configuration
    - Rapid prototyping methods and practice protocols

Define and Allocate Outputs: The Alliance will undertake activities that generate outputs for members. The specific outputs will be generated from respective and projects. A common set of outputs would include reports that are copyrighted or patented prototypes that generate test results for guidelines for standards or building full-scale systems. An intellectual property policy and set of guidelines will be developed to specify ownership and usage rights.

- Research & Development Report- Research topic
- Technical Report- Technology configuration
- Testing and Evaluation Reports- Results of prototype tests
- Guidelines Reports- Guidelines for standards and certification
- Scaled Prototypes- Design, test and evaluation of scaled prototypes
- Databases- Reference databases for materials
- Formulation Guidelines- Guidelines for the formulation of materials, analysis tools and fabrication of manufacturing automation equipment

Secure Management: The Alliance will need a management team to translate the Board's strategic direction into programs with funded projects. The management will work with the Board to develop strategic program plans and solicit project proposals from among the membership. This plan proposes that WSU personnel form the Alliance management team.

Administration/Operating Functions: The Alliance operates like a common interest membership business. It requires a full set of administrative and operations functions including but not limited to:

- Membership Administration
- Governance and Management Support
- Program and Project Teams Support
- Financial Management
- Deliverables Monitoring
- Intellectual Property Management
- Reporting
- Dispute Resolution
- Defaults Notice and Resolution

Create Public Positioning: The Alliance requires set of messages to establish a public position. It should be positioned as a neutral organization guided by the private sector and generating both public benefits (economic growth, job formation, community stability, shared manufacturing advances) and private benefits (valuable technical reports, guidelines and prototypes).

Table 8: Example Public Positioning Messages

Themes and Messages	• The region is currently one of the most concentrated and sophisticated manufacturing centers in the world • This is reflected in the region's ability to manufacture the most complex products (aircraft) • The region has a unique combination of expertise and supply chain capabilities that can be leveraged for advanced manufacturing • The AMIA is focused on innovation, education and professional/workforce development as keys to maintaining the region's manufacturing prowess

Timing Phased Launch: The Alliance will startup and operate in three phases. The phased approach is designed to create clear progress points for the Alliance formation.

- Phase 1 Startup over a period of one year
- Phase 2 Definition of programs content and sample projects in sufficient detail to collect resources
- Phase 3 Launch of projects

Resources Source: The Alliance's research and project management functions will be supported by a combination of member contributions and solicitation for government program funding. The Alliance's business management will be supported by member dues and cost recovery on project overhead.

Pricing Structure: Member Dues and Seats: An Alliance's pricing structure varies according to the level of membership. The preliminary pricing structure proposed in Table 9 is designed to meet operating budget needs while permitting maximum participation of SME's and historically disadvantaged businesses.

Table 9: Annual Dues Levels

Level	Dues
Principal	$ 10,000 per annum
Associate	$ 5,000 per annum
Supporting	$ 1,500 per annum
Observer	$ 500 per annum

APPENDICES

Appendix A Strategic Analysis: Current Position

Current Situation Has Most, But Not All, Of the Elements in Place for a Strategy

The South Kansas region has most of the current elements needed for coordination into a regional strategy. In assessing the region's current position in advanced manufacturing, there are a number of existing organizations, investments and programs in place. There are, however, also gaps in capabilities to provide innovation, advanced education in areas of continuous manufacturing improvement, financing for small- and medium- sized suppliers and coordinating organizations.

- Stakeholder/Users: There is a regional manufacturing association and three chapters of national engineering associations[7] that can act as sources to gather end-user needs to guide stakeholders. The southeast region has also intentionally created an advanced manufacturing strategy.
- Services & Programs: There are programs for site location, training and financing as needed, but there are no degree programs or R&D groups for advanced materials, ADQ and flexible manufacturing nor are there small-business startup and support programs to build a supply chain for these capabilities. There are programs for applied development and testing for composites and agro-based polymers, but not for the full range of materials, design and flexible manufacturing.
- Delivery: There are meetings, training centers and businesses with service delivery, but there are no facilities with associated programs and services that "target" delivery for convenience to the OEM's, large suppliers and their associated SME supply chain. There is also an absence of working group meetings that have focused on the issue of how "capabilities" are to be delivered, and whether they require, for example, co-location at major production sites (e.g. Spirit) or alignment with specific transport corridors to draw from the extended 27 county industrial-supply-chain ecosystem.
- Organization: There are industry associations and university programs (i.e. CIEE and upcoming IC) that can be the organizational coordinator for an advanced manufacturing initiative. However, there is no organization or coordinating body that has established a charter with associated structures that are designed to integrated innovations (advanced materials, ADQ and flexible manufacturing) into existing OEM's and suppliers. At core to this issue is the fact that integrated manufacturing advances requires an organization that can support systems solutions teams (systems integration and systems assurance).
- Operations: There are sufficient professional and technical services within large organizations and from independent vendors to provide operational support for coordination of advanced manufacturing programs and services. The majority of these capabilities are within regional universities (WSU and Pittsburg State) and supply chain programs organized by the largest aviation OEM's (Spirit and Cessna).
- Legal: There are a few entities with the legal structure that would optimize the coordinated investment of resources to achieve a regional advanced manufacturing

[7] Society of Manufacturing Engineers (SME), Society of Advanced Materials and Process Engineering (SAMPE), Society of Automotive Engineers (SAE)

initiative. These entities are at universities (Wichita State University and Pittsburg State) and regional colleges (four year and two year) that house non-profit organizations supporting fabrication facilities. There is no longer an independent non-profit (KTEC) with an arms-length relationship from the State Government that can fulfill this function, without an adjustment to it's current legal position within the non-profit sector. The shift to organizationally, but not legally, integrate KTEC into the State's Department of Commerce and appoint all KTEC directors by an elected official means that KTEC no longer passes the "arms-length" test from any parallel organization that controls it's purpose.

- Funding: There is existing funding for individual programs and services that support sites, building rehabilitation, infrastructure and education/training programs. The existing funding for the WSU IC and the Kansas Polymer Research Center (KPRC-Pittsburg State) fill a gap for applied research in materials, but there is still a gap in a full range of R&D, special equipage, and small business support. The there is a total absence of funding for the coordinating function organization necessary to implement a regional strategy. While there are examples of multi-membership, fee-based organizations in the region that pool resources to fund projects, there are none for advanced manufacturing.
- Human/Key: The human expertise exists in most but not all of the categories necessary to implement a regional strategy for advanced manufacturing. The key resources exist for many key inputs, including sites, building rehabilitation, infrastructure and education training. The resources also existing for research, development testing and evaluation of composites and agro-based polymers. However, there needs to be a "critical mass" of expertise in sectors that include all materials development, ADQ and flexible manufacturing. This critical mass of expertise needs to be increased at the university, non-aviation OEM and large supplier level. There are also an insufficient number of skilled personnel familiar with the organization, management and implementation of innovation based regional economic development strategies.
- Assumptions: There are several key assumptions generated by the IMCP dialogue that reflect the region's current position. Key among those assumptions are:
  - Aviation Heavy- The region is aviation heavy and must diversify to other manufacturing.
  - Aviation Contracting, Needs Automation- The region will not recover aviation jobs lost during the recession due to lack of automation and transfer of legacy production systems to to low-wage workers in Mexico.
  - Re-Shoring and Co-location are Key- The region should focus on the concept of re-shoring to increase manufacturing capability, and co-locating close to regional manufacturing facilities. Cessna's transfer of legacy production to Mexico will result in relative lack of quality and ability to coordinate with expertise in the South Kansas region.
  - Distance Not a Problem- The distances between the region's OEM's and their suppliers are not a major impediment to accessing personnel or new capabilities from suppliers
  - Sufficient Infrastructure, Financing, and Education- There is sufficient regional infrastructure, financing and education to meet existing needs.

- Innovation Available- There is sufficient innovation capacity from the region's universities, entrepreneurs and suppliers to meet existing needs.
- Energy Cost Advantage- The region has an inherent energy cost advantage that can be optimized with small changes in current State policy regarding energy sources.

- Constraints: There are constraints to the region's ability to achieve advanced manufacturing capabilities as expressed in the IMCP initiative. Some of these constraints were generated during the IMCP Task Force meetings, others during the analysis generated by CIEE and some from the analysis of existing plans.
  - Absence of Dialogue and Leadership re Advanced Manufacturing- There is an absence of previous dialogue within the 10-county region regarding advanced manufacturing. This absence increases the cost, time and difficulty of securing a common vision and action plan for a regional strategy. The dialogue is absent the level of specificity that addresses advanced materials (beyond composites), ADQ and flexible manufacturing.
  - Absence of Coordinating Organization- There is an absence of a regional coordinating organization to create and implement a regional strategy.
  - Gaps in Innovation, Expertise and Selected SME Development- There are gaps in innovation capabilities across the full spectrum of advanced manufacturing; the expertise associated with that full spectrum; and the infrastructure (e.g. incubators) necessary to create and support SME's that make up a majority of the manufacturing supply chain.

Appendix B Strategic Analysis: Macro Forces

Economic Trends: Energy, Automation, Foreign Labor and Supply Chain Quality

There is a collection of economic trends that should increase overall US manufacturing competitiveness. These trends are taken from a review of the World Economic Forum, JP Morgan Chase and the US Congressional Budget Office summary of trends that will impact American manufacturing.

Lower cost energy- Chief among these trends is the increased cost of globally distributed manufacturing that brings the highest energy costs to manufacturing centers with few resources (Germany, Japan and China) and requires their products to be shipped to multiple international markets. The US cost of energy is declining not only for oil but also heavily for natural gas.

Increased cost of labor in developing countries- The US is becoming a relatively more attractive labor market. Over the last year, labor costs have risen 20% in China, 5% in Mexico and 3% in the United States.

Automation technology- it takes an average of fourteen years for innovation to substantially diffuse throughout a society, and this has been the case in manufacturing automation. The advent of robots in the 1980's gave way to networked sensors, computing and decision support in the 1990's. The cost of these have dropped, leading way to new user-friendly factory automation that shifts the focus from ensuring low labor costs to finding skilled workers.

Reliability of global supply chains- The theories of economic advantage by outsourcing and offshoring have been met with the practicality of geographic, intellectual property and currency risks. These risks have shown to outweigh many of the assumptions made a decade ago. The geographically diverse supply chains of major manufacturers have created a multitude of increased risk for each link in the supply chain rather than reduce risk through diversification. The solution for selection firms has been to reshore to the United States or Mexico.

Social: Mission Innovation, Decentralization, Knowledge Networks and Direct Purchase

Momentum Innovation Becomes Mission Innovation- A scientific historian by the name of James Burke produced a series in the late 1970's that explained our modern world as the accumulation of interconnected innovations that spanned centuries. The conclusion of Burke's historical explanation, however, was that the rate of innovation and change would accelerate, because we had built a system of specialists and "momentum innovation". At some point, he postulated, the rate would overwhelm individuals and there would be a rebellion. Well, we don't currently see a rebellion, but we do see increasingly the question about our contribution to climate change, and the desire to use our scientific and technological knowledge to sustain our planet. This shift represents something titanic in the evolution of innovation: a movement away from innovation as its own purpose to "mission driven" innovation to meet a collective need. This momentum will accelerate in the coming years, and have profound impact, especially for the design of our products and ability to manufacture them to custom orders.

Information security- The evolution of a "connected" society that is swimming in information is slowly giving way to realizing that our information may not be safe…much less private! The information security genie is out of the bottle as cyber-surveillance and data mining by public and private organizations increases much less criminal networks. This will create a searching process of how to share and secure information, including customer orders for manufactured goods.

Direct Purchasing- Retailers are facing a digitally driven perfect storm. Connectivity, rising consumer influence, time scarcity, mobile payments, and the Internet of Things, are changing where, when and how we shop – if smart machines have not already done the job. The optimal shopping experience is one defined by the Best Buy conundrum: the need for a large floor space to display products, but the reality that shoppers then depart for the Internet to find the best price. The future of shops will be increasingly defined by experiential spaces offering personalized service, integrated online and offline value propositions, and pop-up stores to satisfy demands for immediacy and surprise.[8]

Redistributing the industrial revolution- Complex, global value chains are being redistributed by new technologies, labor market shifts and connectivity. Small-scale manufacturing, including 3D and soon 4D printing, and shifting production economics are moving production closer to markets and enabling mass customization – not just by companies but by the tech-enabled maker movement which is going mainstream. Rising labor costs in developing markets, high unemployment in developed markets, global access to online talent and knowledge, plus advances in robotics mean reshoring of production to developed markets will increase. Mobility, flexibility and networks will define the future industrial landscape.[9]

Regional Hubs: A different aspect of globalization- As production and consumption become more distributed, hubs will characterize the next wave of "globalization." They will specialize to support the needs of growing regional trade, emerging city-states, on-line communities of choice, and the next generation of flexible workers and entrepreneurs. Underpinning these hubs will be global knowledge networks and new business and governance models based on regional economic networks (innovation hubs) that leverage global assets and hub strengths to deliver local value.[10]

[8] Global Trends, December 2013
[9] Global Trends, December 2013
[10] Global Trends, December 2013

Political/Policy: Income Disparity, Unemployment, Climate Change, Economic Policies and Leadership[11]

The following list of US focused trends was taken by matching the results of global policy issue surveys from the World Economic Forum (WEF) against the topic list of PewResearch social trends reports released only for the United States.

Widening income disparities- One of the most striking findings from WEF survey of general publics across the globe was the degree to which people see the gap between rich and poor as a major challenge. In 31 of 39 nations, half or more of those polled said inequality is a *very* big problem in their country.

Persistent structural unemployment- The WEF spring 2013 survey found that two-thirds or more in most countries say a lack of employment opportunities *is a very* big problem. When asked which of the four issues – inflation, unemployment, inequality or debt – the government should address first, 22 of the 39 publics surveyed said jobs.

Intensifying cyber threats- U.S. policy experts were very concerned about the threat of cyber-attacks from China, according to our survey last year. However, while the WEF survey identified cyber threats as a top concern, 47% of experts admitted they have limited knowledge of the problem.

Inaction on climate change- A median of 54% or more of people surveyed in Canada, Europe, the Asia Pacific, Latin America and Africa saw global warming as a major threat to their countries, according to our global survey. However, only 40% of Americans and a median of 42% in the Middle East region regarded global climate change as a major concern.

Diminishing confidence in economic policies- In our polls conducted across the globe, people voiced widespread concerns about economic conditions in their countries. Indeed, attitudes were particularly grim in European countries, such as France (only 9% said good), 4% said the same in Spain, 3% in Italy and just 1% in Greece. Nevertheless, in emerging markets such as China, 88% of the people said their economy was doing well.

A lack of values in leadership- In the U.S., public trust in government has fallen substantially since 1958 and is near an all-time low. Between 2007 and 2012, confidence in Organization for Economic Co-operation and Development (OECD) national governments declined from 45% to 40% on average. In both regions, this trend is making it difficult for national authorities to mobilize support for necessary reforms.

[11] Pew Research Center, World Economic Forum, Ranking of Top 10 Global Trends, Poll of 1,592 world leaders, pewresearch.org, accessed April 9, 2014

Technological: Materials Science Becoming Materials Mastery, Unknown Impacts on Design, Fabrication and Manufacturing

Trends summarized from review of Gartner, Accenture, Forbes, Deloitte, IEEE, and Frog Design.

Internet Extension and Cloud Computing- There will be a continuing deployment of sensors and information transmission via Internet of production systems, transportation, and supply organizations into shared customer-supplier-producer networks, all supported by cloud computing.

Large Data Analysis- The integration of customer to producer systems will generate large volumes of data which, if sufficiently structured, will yield insights that can be applied to materials formulation, qualification, design and production processes.

Materials Formulation- There will be continuing scientific level progress at formulating materials at the molecular level to generate attributes desired for products and production. The scientific progress will feed “commercial formulation” solutions that will be tested for their financial viability.

3D Production and Manufacturing- Production will be reconfigured to adopt computer guided design-to-production (3D printing). The trend will continue to streamline prototyping and short production runs.

Appendix C Glossary of Terminology and Phrases

- Advanced manufacturing-Innovation Based: A concise definition of advanced manufacturing offered by some is manufacturing that entails rapid transfer of science & technology (S&T) into manufacturing products and processes." (PCAST, Apr. 2010)
    - Computer technologies (e.g., CAD, CAE, CAM) (Paul Fowler, NACFAM; UK Manufacturing Advisory Service Southeast; C.B. Adams, St. Louis, OECD)
    - High Performance Computing (HPC) for modeling, simulation and analysis (Council on Competitiveness)
    - High Precision technologies (Paul Fowler, NACFAM)
    - Information technologies (Paul Fowler, NACFAM)
    - Advanced robotics and other intelligent production systems (US Department of Labor, ETA; C.B. Adams, St. Louis)
    - Automation (UK Manufacturing Advisory Service Southeast; C.B. Adams, St. Louis)
    - Control systems to monitor processes (UK Manufacturing Advisory Service Southeast)
    - Sustainable and green processes and technologies (US Department of Labor)
    - New industrial platform technologies (e.g., composite materials) (UK Manufacturing Advisory Service Southeast)
    - Ability to custom manufacture (PCAST; Paul Fowler, NACFAM; Grow Oklahoma Campaign)
    - Ability to manufacture high or low volume (scalability) (PCAST; Paul Fowler, NACFAM; Grow Oklahoma Campaign)
    - High rate of manufacturing
- Advanced Manufacturing-Use of Business/Management Methodologies:
  A number of organizations also included business or management methodologies in their definition of advanced manufacturing. For example, one organization defines "advanced manufacturing as the insertion of new technology, improved processes, and management methods to improve the manufacturing of products." (National Defense University, 2002, as reported in PCAST) Another organization lists advanced manufacturing as "encompassing lean production techniques, enhanced supply chain integration, and technology assimilation."[2] In fact, the Wikipedia definition of "advanced manufacturing" is "advanced planning and scheduling" described as "a manufacturing management process by which raw materials and production capacity are optimally allocated to meet demand." Overall, the following business or management methodologies were listed as being a part of advanced manufacturing:
    - Quality controls (US Department of Labor)
    - Lean production technologies
    - Supply chain integration
    - Advanced Planning and Scheduling (Wikipedia, online, accessed June 2010)
    - Lean design coupled with lean production (StarNet)
- Assist to strategically align resources: Recommend and facilitate how tactical investments can be grouped into "alternative" strategies
- Associated supply chain: All organizations within the ten county area that directly provide goods and services to the "competitive" advanced manufacturing and high technology organizations
- Business expansion: Reported increases in sales volume and new business formation

- Economic region: The counties within Kansas beyond the ten county SCKEDD
- Focusing on inclusion of small and medium sized enterprises: Recommend the optimal of SME's based on their natural strengths.
- Global competitiveness: Capability of regional linkages to generate and export value at a price/performance tradeoff equal to or superior than other global competitors (domestic and international)
- High technology: The capture and configuration of knowledge into any one of four states that generate value:
    - Physically engineered item
    - Process (software, protocols, etc.)
    - Unique competency of people
- Historically underrepresented populations: Requires WSU definition
- Identify/define market trends: Patterns of demand for manufactured products, those patterns group into distinct markets defined by common customer needs (not common products)
- Identify key technology industry sectors with competitive advantage:
    - Technology: Any physically engineered or process engineered item that captures within the engineering advanced knowledge
    - Industry sectors: A grouping of organizations whose commonality is defined by a NAICS listing
    - Competitive advantage: A comparative set of strengths, global positioning or advantage generated by one of the seven key economic cluster inputs that provides all the companies in a given regional NAICS code a clear price/performance capacity superior to the supermajority (75%) of their global competitors.
- Key tactical advanced manufacturing/high technology: Individual investments of cash, in-kind resources or coordination of existing resources that meets specific needs (tactical) rather than being coordinated into an integrated approach (strategy). Those investments are made in industries that meet the WSU/CIEE definition of "advanced manufacturing".
- Map key strategic investment, elements/initiatives: A state, county or municipal program, center, education support or facility investment directly contributing to advanced manufacturing and associated clusters
- Materials Innovation: "Employs physical theory, materials combinations at the molecular level and higher, advanced computer models, materials properties databases and complex computations to accelerate the design of a new material with specific properties for a particular application—perhaps an extremely tough, lightweight composite for auto bodies or a biocompatible cell scaffold for medicine." US Department of Commerce, National Institute of Standards and Technology, Materials Measurement Lab, Announcement of Materials Genome Initiative, December 3, 2013 modified by Paul Masson of StarNet, LLC
- Short and long term goals: short 1 year, long term 3 years
- Job growth: New job formation at a rate higher than the rate of population growth
- Promote entrepreneurs: Reported new business formation; success rate of new businesses after five years; success rate of new businesses after two years; rate of sales growth for new businesses
- Position a region for growth: coordination of existing investments supplemented by additional IMCP investments leverages other a) market demand and b) Federal and commercial investments to

- Positive impact on region: Implementation of recommendations will result in positioning the region for growth per definition above
- Preliminary recommendations to achieve identified goals
- Southern Kansas: Butler, Cowley, Harper, Harvey, Kingman, Marion, McPherson, Reno, Sedgwick, and Sumner counties.
- Strategy: A series of decisions to act in a coordinated manner that will achieve a targeted future goal. The actions coordinate use of scarce resources (financial, leadership, operational) with a consistent logic to create cause-and-effect outcomes that achieve stated goals.
- Unique regional organization: A coordinating body similar to a fixed organization that includes regional and corporate collaboration structures that combine "competency" into unique capabilities
- Wichita Metropolitan Statistical Area (MSA)
    - Four counties- Sedgwick, Sumner, Butler and Cowley County

Appendix D Project SOW

This SOW is a combination of the Task and Deliverable definition from the WSU's RFP and the methods and approach section from the StarNet proposal.

Background

National Initiative: Investing in Manufacturing Communities Partnership (IMPC)

The Federal government will award $20 million over a five-year period to twelve (12) regional groups to invest in "advanced manufacturing" capabilities intended to generate job formation, increase exports and reduce imports. The awards will be made to regional partnership groups that present strategic plans coordinating existing regional resources to be leveraged by Federal funds. The awards will be made under a US Department of Commerce Program designated the "Investing in Manufacturing Partnership (IMCP) initiative.

The Investing in Manufacturing Communities Partnership (IMCP) is a new government-wide initiative designed to reward communities that demonstrate best practices in attracting and expanding manufacturing by bringing together key local stakeholders and using long-term planning that integrates targeted investments across a community's industrial ecosystem to create broad-based prosperity. Research has shown that vibrant ecosystems may create a virtuous cycle of development for a key technology or supply chain through integrated investments and relationships among the following elements:

- Workforce and training;
- Supplier networks
- Research and innovation;
- Infrastructure/site development;
- Trade and international investment;
- Operational improvement and capital access

The IMCP program issued twenty-two (22) Phase I planning awards. The recipient groups must submit a Phase II strategic plan to potentially receive one of the twelve (12) $20,000,000 grants.

WSU: CIEE

Wichita State University (WSU) Center for Innovation and Enterprise Engagement (CIEE) was established in 2011 to strengthen and develop the local manufacturing industries' innovation competencies in manufacturing processes and product capabilities. The CIEE aims to expand the south central Kansas cluster's ability to conceive, develop, and produce new technologies, to deploy new manufacturing processes, and to improve on the processes that already exist within the private industry sector. The goal of the CIEE is to escalate the development and predominance of the south central Kansas advanced manufacturing cluster in the global economy.

The CIEE employs an interdisciplinary approach with collaborative partners to promote industry diversification, new industry formation, and process and product improvements within existing firms. The Center extends and expands the training elements that focus on entrepreneurship and small business development and provides additional technical assistance and economic development support to business enterprises.

The CIEE is a recipient of a phase one planning grant for the Investing in Manufacturing Communities Partners (IMCP) an initiative that will help accelerate the

resurgence of manufacturing in the United States and create jobs in cities across the country.

Objectives and Scope

Objectives

There are two primary objectives of StarNet's assistance:

- Provide WSU CIEE managers with findings and conclusions of the designated region's advanced manufacturing capabilities and potential for the purpose of crafting a successfully advanced manufacturing strategy
- Facilitating regional stakeholders to an agreement on conditional commitments of resources to an agreed upon advanced manufacturing strategy that will be successful in securing a $20 million grant from the DOC under the IMCP initiative

A secondary StarNet objective is to the transfer the correct knowledge to the CIEE IMCP initiative manager that will provide an understanding of the region's strengths and weaknesses relative to other regional groups facilitated by StarNet (Paul Masson and Alyson Greenlee).

Scope

The scope of this analysis should include, but not be limited to the identification and prioritization of key tactical advanced manufacturing / high-technology sector investment(s). This analysis should identify inherent and emerging sub-sectors, strengths and other potential opportunities where the region should align its focus with respect to the advanced manufacturing / high-technology sector. When applicable, analysis should be provided on a Metropolitan Statistical Area (MSA), regional and national level.

Method and Approach

Method

StarNet views the tasks and deliverables as requiring two distinct but interrelated methods.

1. Review and Analyze- StarNet will review and analyze the existing strategic plans and investments with a stakeholder map that emphasizes the five elements of "clusters" that are specific to advancing innovation into a commercial marketplace. The five elements are based on a market-driven approach, i.e. identify first the market needs and assess the efficacy of plans and prioritized investments for advanced manufacturing in that context. The five elements would include:
   - End Users- The ultimate users of advanced manufacturing capabilities
   - Partner Suppliers- The key suppliers that have partnership with end users
   - Innovation Sources- The universities, small businesses and special "innovation centers" (e.g. incubators) that are the source of innovations
   - Staged Capital- The spectrum of "early stage" capital sources, both public and private, necessary to finance advanced manufacturing innovation including angel capital, venture, pocket equity funds, private equity pools, and special government investment funds
   - Adoption Groups- These are groups that promote the common architectures and standards of an innovation.

2. Facilitation for Strategic Alignment- StarNet will organize the sequence of meetings to prepare a “strategic plan” following the format of an innovation alliance, which is similar to an innovation cluster but contains a more precise organization of joint innovation and commitment to implementation.
3. StarNet will use the Decision Analysis (DA) method of strategic planning to guide the integration of the analysis and facilitated meeting decisions. Decision analysis is a discipline comprising the philosophy, theory, methodology, and professional practice necessary to address important decisions in a formal manner. Decision analysis includes multiple procedures, methods and tools for identifying, clearly representing, and formally assessing a decision. This approach applies a set of “value criteria”, generated by stakeholders, to choose among decision options to maximize return to the collective stakeholders. This approach is a “group process” of stakeholders that are guided through a series of steps leading to a collective decision. Paul Masson was trained in the DA method at SRI International by the Stanford Decision Analysis faculty and the consulting colleagues of the DA originator, Dr. Ron Howard. SRI International is a research, development and consulting organization staffed by full-time personnel and Stanford faculty.

Approach

StarNet will work with the WSU personnel as a “joint team” to deliver the requested Strategic Planning Services. StarNet will transfer to the team knowledge of the of a the methods and plan implementation. This is intended to assure the WSU team has sufficient information and understanding to implement the plan without further StarNet engagement. We will also provide the team a set of “planning guides” that address one or more of the following topics:

- Stakeholder- Who are the stakeholders? What are their interests?
- Decision Topics- What decisions must the stakeholders make?
- Outcomes- What are the stakeholder’s common-interest outcomes?
- Current Position- What are the current strengths, weaknesses, opportunities, threats?
- Competition- Who are the competitors?
- Macroforces- What are the trends of external forces?
    - Politics/Policy
    - Economy
    - Technology
    - Social Values
- Alternative Plans- What are the stakeholder’s alternative strategic options?
- Implementation Plan- What is the implementation plan for the chosen option?

Timeline

The timeline is based on the RFP and contract issuance within two weeks of award.

	Deliverable	Form	Schedule
1.	Findings: Review Existing Regional Plans	One PowerPoint Brief w/Text Report	Week four of sixteen
2.	Discussion Guide for Meeting Facilitation	Text of Meeting Guide	Week six of sixteen
3.	Facilitated Meetings	On-site Facilitation per Guide	Weeks seven thru thirteen
4.	Final Strategic Plan	One PowerPoint Brief w/Text Report	Week sixteen

Tasks

A. Review existing regional strategic plans and map key strategic investment elements / initiatives.

B. Review existing regional strategic plans to identify / define market trends, to identify key technology industry sectors that have competitive advantage, and to determine the degree of consensus (within the documents) around one or more strategic vision(s) for manufacturing. The 10-county region includes Butler, Cowley, Harper, Harvey, Kingman, Marion, McPherson, Reno, Sedgwick, and Sumner counties.

C. Facilitate a series of meetings with regional task force and or industry groups to identify, verify, refine, and prioritize key tactical advanced manufacturing / high-technology sector investment(s) and,

D. Assist in strategically aligning resources to support the region's advanced manufacturing / high-technology sector and associated supply chain intentionally focusing on inclusion of small- and medium-sized enterprises and historically underrepresented populations.

Publicly available information and reports will be reviewed and supplemented through interviews with representatives from industry, associations, government and educational institutions.

Deliverables

A. A preliminary report will be provided to WSU for review and comment prior to facilitation of meetings. Content will include preliminary findings from the review of existing regional strategic plans. The preliminary report will:

1. Identify the strengths, weaknesses, opportunities and threats facing the advanced manufacturing / high-technology sector in the 10-county region.
2. Identify and prioritize short and long-term goals and strategies that effectively position the region for job growth, business expansion and global competitiveness related to advanced manufacturing / high-technology sector, taking into consideration, the specific community, economic, and workforce development priorities of the region and individual counties.
3. Identify previously identified and new strategies that will grow the advanced manufacturing / high-technology industry sectors/clusters and promote and develop entrepreneurs to create positive impact in the region.

4. Identify and make preliminary recommendations to develop and deploy the region's resources to achieve the identified goals and strategies.
5. Relevant data that becomes apparent though research will also be included in the report

B. Discussion guide for meeting facilitation will be provided to the CIEE for review and input prior to facilitation of meetings.

C. Final report will include a complete strategic plan document / report for the region's advanced manufacturing / high-technology sector that prioritizes key tactical manufacturing investment(s) and provides specific recommendation to strategically align resources to more efficiently and effectively support the region's advanced manufacturing / high-technology sector and associated supply chain intentionally focusing on inclusion of small- and medium-sized enterprises and historically underrepresented populations.

D. Once a final timeline is set for the project, WSU will request periodic updates regarding the project. WSU will review and comment on the draft report and issues pertaining to the project.

Project Team

StarNet will staff the project with two individuals:

- Mr. Paul Masson- Project Manager, Analyst and Strategic Planning Facilitator
- Ms. Alyson Greenlee- Economic Development Specialist

We may draw on a third expert in intellectual property, Ms. Josette Ferrer, depending on the issues raised in the facilitated meetings.