

**Colorado Association for Manufacturing and Technology
On behalf of the Colorado Springs Manufacturing Task Force
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Submission Date: July 6, 2005

Number of Proposals Submitted: 2

Number of Pages Sent: 7, including cover page

Submission Category: MC2005.2/4 Peer Groups

Program Name: Collaborate to Compete in Manufacturing

Program Location: Colorado Springs, CO

Proposed Program Partners: Colorado Association for Manufacturing & Technology (CAMT)

Target Audience: 400+ Manufacturers in El Paso County & Southern Colorado

Purpose: Innovation through a “Collaboration to Compete” program to foster regional manufacturing infrastructure stabilization and cluster growth. Effective project completion will brand Colorado, particularly Colorado Springs (still home of 300+ manufacturers), as a premier location for innovative, entrepreneurial manufacturers.

Description of Program: The project is from the program plan of the Colorado Springs Manufacturing Task Force, which will provide oversight and stimulate broad community involvement. The Task Force has been operating on a voluntary basis and has to-date attracted participation from 80 of the 300 manufacturing firms in the Colorado Springs community. The program intends to extend participation in Task Force activities from the present total of 80 to all 400+ manufacturers in El Paso County and Southern Colorado, while considering best ways to affiliate this group of manufacturers with others in Colorado.

The Task Force has three initiatives to innovate through collaboration by providing a foundation in knowledge distribution, area marketing and manufacturing excellence. Proposed program content includes:

Knowledge Distribution

- **Focus knowledge distribution avenues to and for manufacturers**, providing information on change in the global competitive environment and evolving business development standards. Ongoing program content is provided in a series of open meeting presentation with knowledgeable speakers, and workshops dedicated to detailed examination of critical issues.
- **Conduct workshops** to define and review the database specifications and conduct training upon completion.
- **Construct a readily accessible, easy-to-use database** of manufacturing capabilities and certifications, strengthening the supply chain and knowledge of Southern Colorado manufacturers. This database will allow manufacturers to populate and update their own data and be responsible for its maintenance.
- **Integrate with the proposed CAMT web portal** through which database participants may identify business opportunities inside and outside Colorado.
- **Create a template of this model and associated materials for replication** in other regions and a roadmap for future work.

Area Marketing

- **Develop co-operative marketing campaigns and deliverables** to promote capabilities of manufacturers in the region.
- **Globalize manufacturers** through industry-supported participation in local, state-wide, national and international trade fairs.
- **Develop strategies** and identify specific industry interests that fit the community.

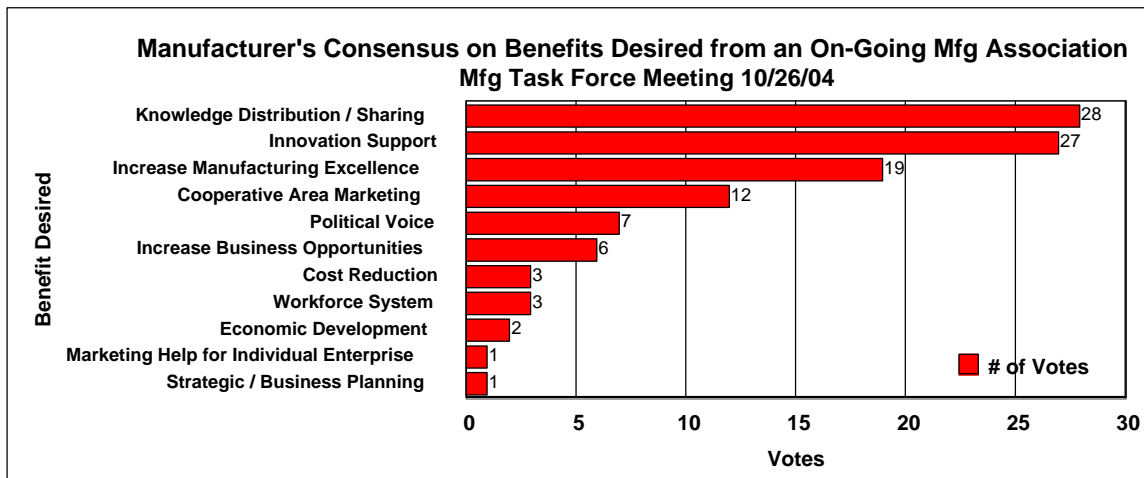
Manufacturing Excellence

- **Identify evolving competitive requirements in global industry sectors**, and what resources are available so that manufacturers can achieve global performance standards.
- **Identify and promote technical certifications** in place and sources available in the region.
- **Coordination with NIST-sponsored organizations like the Colorado Association For Manufacturing & Technology (CAMT)/ Mid-American Manufacturing Technology Center (MAMTC)**, to establish lean working groups and other workshops to bridge the gap between what capabilities are available and those needed.

Benefits to Target Audience:

Focused on Colorado-based organizations with less than 500 employees, the collaboration effort is intended to stabilize the present number of competitors, stanch the loss of manufacturing capability and capacity, and provide a foundation to renew growth through collaborative innovation initiatives to:

- **Provide networking opportunities** for manufacturing entrepreneurs to develop a knowledge base of manufacturing that is taking place in El Paso County
- **Build relationships with peer manufacturers** to promote collaborative, cross pollination supply chain business opportunities
- **Pool resources** for comprehensive co-operative marketing programs
- **Provide financially beneficial business opportunities** by developing contacts and business within and outside Colorado and the U.S. to expand the number of primary employers and create a positive regional trade balance.
- **Strengthen their foundation** of manufacturing excellence
- **Create a brand name for Colorado Springs**, and Colorado as a whole, as a robust state for innovation in the proposed program content to enhance regional manufacturing competitiveness and increase business opportunities and new product and service offerings.



This project supports top initiatives of the Colorado Springs Manufacturing Task Force (see chart), which has a goal of stimulating broad community involvement. For over 2 years, the Manufacturing Task Force has operated on a voluntary basis. We have learned over this time that there are many activities that require funding to not lose momentum and get a Manufacturing Association to the next level.

Economic Impact on Entrepreneurship & Innovation connection:

- Manufacturing provides communities with one of the top economic multipliers of all industries, with historically highest wages and benefits - stepping-stones that sustain a middle class.
- Process knowledge and production capability are prerequisites to stimulating innovation, providing channels through which those with viable market concepts may commercialize their ideas.
- Over the past five years, the U.S. economy has not created jobs in industry that generates tradable goods and services, which are necessary to reverse the growing international trade imbalance.

Proposed Budget for 1-year pilot program including publishing results:

Overall Budget Needed:	\$358,689
Knowledge Distribution:	\$155,973
Area Marketing:	\$171,883
Manufacturing Excellence:	\$ 30,833

Name of Project Manager(s):

Dave Anderson and Jo Ann Galvan

Managers' Qualifications:

Dave Anderson:

- Thirty years directing manufacturing turnarounds and stimulating manufacturing enterprise growth in Fortune 100 and INC 500 corporations.
- As an entrepreneur, grew an \$800k, 14 person turnaround to \$80M and 800 employees in a ten year period.
- Consulting presently in distressed business operations, referred by senior lenders and trusted legal advisors.
- Current leader of the Colorado Springs Manufacturing Task Force

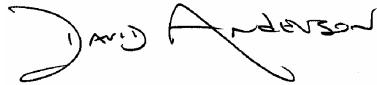
Jo Ann Galvan:

- Part of team that took start-up company to Fortune 50 corporation in a decade
- Developed and directed sales, marketing and manufacturing entity to generate \$20B in revenue while managing \$150M in operating expenses with an organization of 400+ employees
- Co-developed 2004 Strategic Economic Development Plans for Colorado Springs
- Initial leader of the Colorado Springs Manufacturing Task Force
- Colorado Springs Economic Development Leadership Award Recipient in 2004

Statement of Proprietary Rights:

The organization, tools and methods conceived in this project are intended to serve all manufacturers in Colorado. Participation is elective; programs are inclusive, promoted increasingly as capabilities are clear.

Signatures:



David Anderson
Colorado Springs Manufacturing Task Force
Chief Organization Authority



Jo Ann Galvan
Project Manager

PROGRAM PARTNER SUPPORT:



Elaine Thorndike
Executive Director
Colorado Association for Manufacturing & Technology

Response to Magellan Center Request for Proposals #MC2005.2/1-8 Colorado Catalyst2 – Exponential Potential for Entrepreneurs and Innovation

Submission category: MC2005.2/1 Innovation Processes

Research topic: Fostering Innovation Dynamics

Target geographic region: The Greater Colorado Springs and Southern Colorado region

Proposed research partners, if applicable: Colorado Assoc. for Manufacturing & Technology (CAMT)

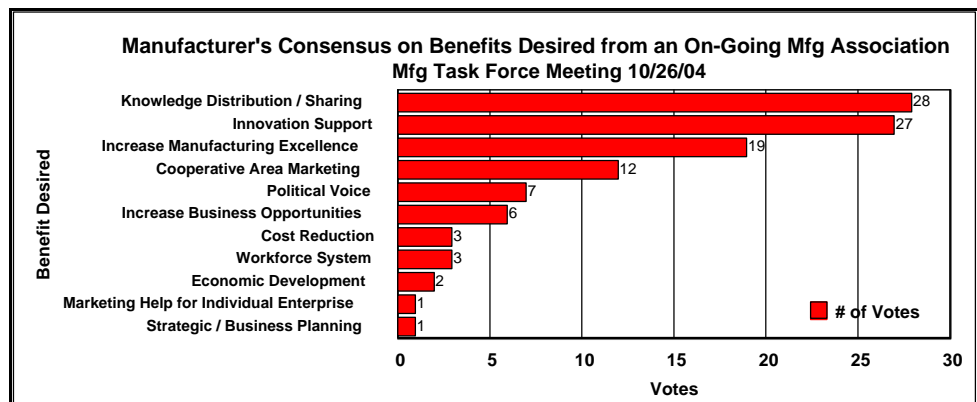
Purpose: Achieve and sustain a high level of manufacturing innovation for manufacturing firms and individuals to increase manufacturing activity and competitiveness in the region using a systems approach.

Abstract: This project will develop an innovation model and templates that can be replicated in, or adapted to, other regions to increase regional collaboration and manufacturing innovation. Initiatives will

- **Define innovation system structure:** Workshops to define the system structure of innovation using system dynamics stock & flow mapping (see appended draft system structure) to identify and develop
 - **stages of innovation** - from idea generation to products in production in order to improve the ability to manage and foster regional innovation
 - **opportunities for collaboration** - identify and enlist groups and organizations to collaborate and positively impact the innovation structure. Potential groups include the Colorado Springs Incubator; Colorado Institute for Technology Transfer and Implementation (CITTI); University of Colorado, Colorado Springs (CU-CS) Business School; Colorado Technical University; Pikes Peak Workforce Center; and the EDC.
 - **feedbacks for success** - structures to promote innovation success. Because nothing grows without reinforcing (positive) feedback. Nothing grows forever; balancing (negative) feedback always develops. Unless we understand system feedbacks, we cannot make them work for us rather than against us.
 - **innovation system templates** - describing policies, initiatives, & activities to make innovation more efficient, timely, and improve the probability of success, as well as identify policies that impede innovation.
- **Develop and enhance creativity skills:** Workshops to develop and enhance individual and group creativity skills to generate, share, and evaluate ideas.
- **Innovation workshops:** Opportunities to use creative skills to link company capabilities (products, services & processes) with market needs and opportunities to generate new product & service innovations and intellectual property to address technological and societal trends. Potential innovations could include new products, product design, function, quality, style, applications and marketing; services and platforms for different organizations, markets, and institutions; and manufacturing and production processes. A prototype creativity workshop was conducted on 2/23/05 at the Center for Creative Leadership. The twenty participants were from manufacturing, government, arts, law, banking and the university.
- **Manufacturing roundtables:** Small group sessions with manufacturers and CU-CS faculty to increase community connections to advance process and market knowledge, strategy definition, organization development and operational execution. An initial 4/6/05 Task Force meeting introduced eight CU-CS faculty members interested in participating.

How this research will benefit or reflect the entrepreneurship/innovation connection in the region and in Colorado:

This project supports a top initiative of the Colorado Springs Manufacturing Task Force (see chart), which has a goal of stimulating broad community involvement, including areas other than manufacturing (e.g., engineering, banking, education, arts).



For over 2 years, the Manufacturing Task Force has operated on a voluntary basis as an EDC initiative. To-date the Manufacturing Task Force has attracted the participation of 80 of the 300 manufacturing firms in the region. We have

learned over this time that there are many activities that require funding to not lose momentum and get a Manufacturing Association to the next level.

Proposed budget for 1-year research completion, including published results:

<u>Activities</u>	<u>Amount</u>	<u>Notes</u>
Initiative Outreach	\$11,100	
Innovation Skills Workshops	\$34,500	4 workshops
Product Innovation Workshops	\$47,000	4 workshops
Innovation System Structure Workshops	\$56,200	4 workshops
Foster Organization Connections	\$21,600	6 workshops
Foster Idea Collaboration	\$22,000	
Roundtables	\$37,800	6 roundtable groups meet 6 times
Innovation Framework & Final Report	\$20,300	
Total	\$250,500	

Name of researchers: Bob Powell, Dave Anderson

Researchers qualifications:

Researcher: Bob Powell - MBA, Ph.D. (physics); adjunct professor teaching "Systems Thinking & Problem Solving" at Colorado Technical University; applies systems thinking to organizational, social and economic problems & "messes" in dynamically complex systems; in depth examination of the issues and structures affecting the loss of manufacturing (and other industry) from the U.S.; and work with groups in developing the workforce system and urban growth models. Member of the Colorado Springs Manufacturing Task Force for over 2 years. Developed a unique practical systems thinking approach to go from issues to causal loops to action. Extensive use of systems thinking and system dynamics mapping to provide guidance relative to:

- profiting from innovation
- the product life cycle & the diffusion of innovation
- improving the innovation process
- surviving disruptive technologies that improve performance to shift advantage from integrated designs to modular designs that meet the needs of the most-demanding customers
- dealing with "winning strategies" that impede effective response to economic and technological shifts.
- a university-affiliated organization becoming a more effective catalyst for forming and growing high tech companies
- forming and growing economic clusters
- addressing barriers to long-term improvement
- improvement process & strategy development
- coping with organizational evolution & revolution
- dealing with the loss of manufacturing from the U.S. and offshoring

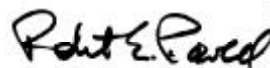
This foundation provides perspectives to address a wide variety of issues that could be raised in the innovation workshops and collaborative discussions with other organizations.

Manufacturing Task Force Leader & Researcher: Dave Anderson - AB (Economics), MBA (Harvard); consultant and entrepreneur with leadership experience in all phases of enterprise formation and strategic development, including startup, growth, restructuring, acquisitions, integration and financing. Demonstrated results in manufacturing, business operations, policy, procedure, and compliance initiatives, information technology implementation, and all dimensions of distressed business operations.

Statement of Proprietary Rights: The results of this research, including documented structures and methods, will be made freely available for other regions and industries to adapt and use.

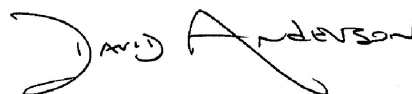
Submission Signature of project manager and chief organization authority:

Robert E. Powell, Continuous Improvement Associates



7/06/05

David Anderson, Colorado Springs Manufacturing Task Force



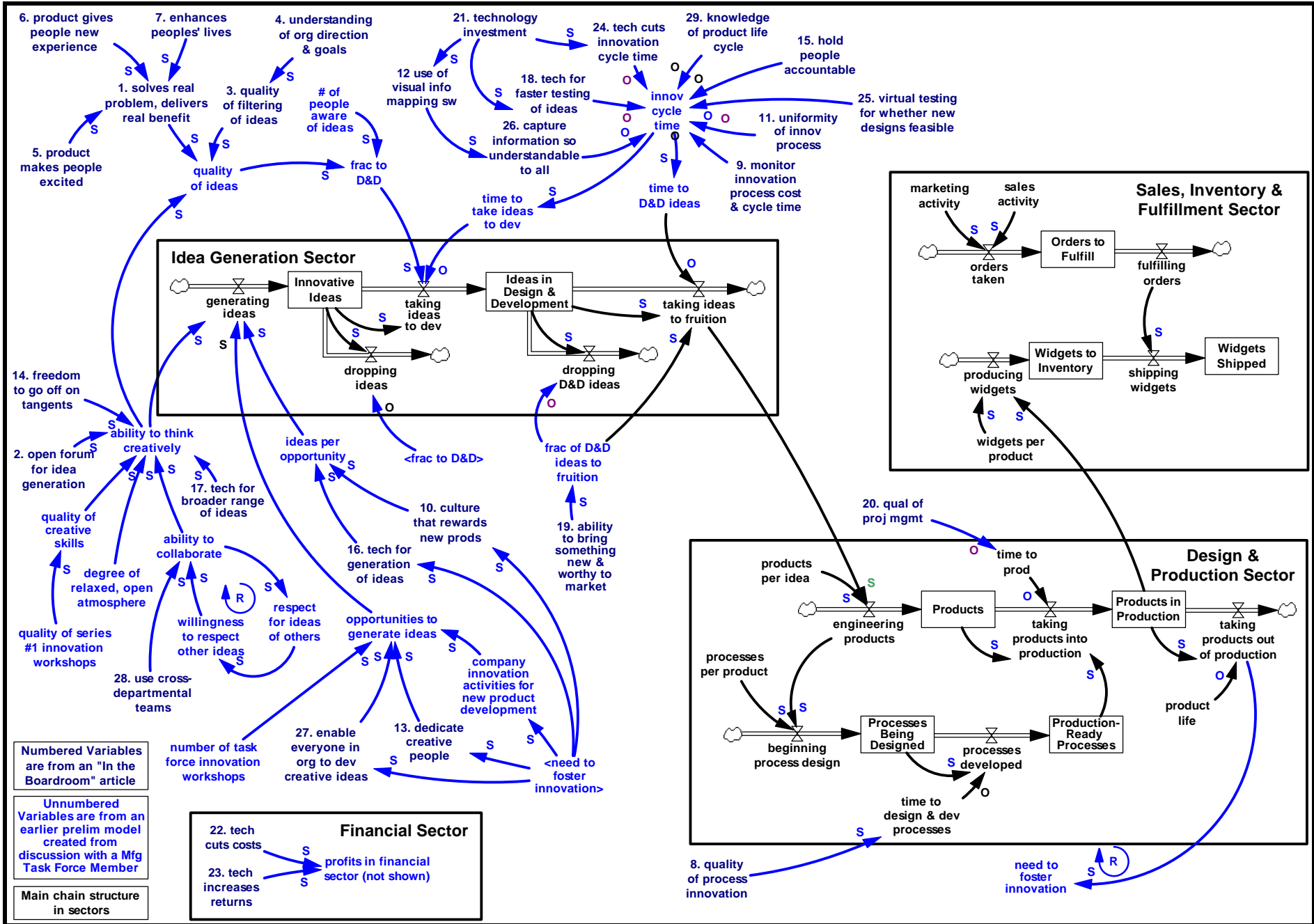
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Program Partner: Elaine Thorndike, Executive Director Colorado Association for Manufacturing & Technology



7/06/05

Preliminary System Structure of Innovation - System Dynamics Stock and Flow Map



System Dynamics Map of Innovation

This map is based on the concepts in "Can Innovation Be Managed?" that "Joe Pentlicki" <Joe_CSMfgTF@msn.com> sent to the Manufacturing Task Force on 5/31/05.

Brief explanation of the mapping technique:

The system dynamics approach to mapping accurately depicts how a process actually works (or should work). Most mapping languages fail to distinguish between the three fundamental building blocks of all processes: *accumulations (stocks), flows, and information links*. These are essential from the definition of a process as described in the *isee systems* "Process Improvement Manual" for the **ithink**[®] system dynamics software: *A process is a sequence of activities through which material flows for purposes of undergoing some sort of transformation that adds value*. Other "things" can flow, too, like ideas.

In this mapping approach, the stocks are the integral over time (the accumulation) of the net flows. Stocks cannot change without a change in some flow. We observe the stock and, via information links on the state of the stocks, we make decisions about, or determine policies for, adjusting the flows. For example, that's the way we fill a glass of water: as the water approaches the top of the glass we turn off the tap. The accumulation of water in the glass is the integral of the flow over time.

This system dynamics "stock & flow" diagram maps the flow, factors and activities described in this article ... using the terminology of the article. Essentially, I used the article as a surrogate group. It's not that this model is complete (it's not), it at least partially reflects the understanding described in the article (though I'm sure I've made mistakes). It's not unlike what Gene Ashe and I began to develop a month or so ago except that it covers more of the innovation process ... note that also shown on the diagram are the variables from the discussion with Gene.

Three points:

1. The diagram illustrates the complexity of attempting to foster and manage innovation.
2. There's lot more involved than shown. For example, there's no financial sector. A vital issue is whether the organization can actually profit from innovation (see the section in my paper on a "Systems Thinking Perspective on Manufacturing Base Restoration" at <http://www.exponentialimprovement.com/cms/STMfgBaseRestorInit.shtml>).
3. The diagrams could be used (with additions recommended by an interested group) to generate ideas for how the Manufacturing Task Force might help local companies foster and manage innovation.

Notes:

- In the maps, separate chains are required when different "things" are flowing. For example, in a system dynamics model, ideas for products can't flow into products.
- Values and equations can be added and these models can be simulated
- On the units: Examples for a stock and a flow:
 - Units of a stock in a chain: widgets
 - Units of associated flows in a chain: widgets/unit time ... e.g. time unit could be weeks, months, etc.

The bolded text in **turquoise** in the article below describes the innovation process from idea generation through production. These main chain activities are mapped in the first figure.

The factors and activities described in the article are added in the second figure using the numbers inserted in the text below that's highlighted in **yellow**.

Can Innovation Be Managed?

In the Boardroom asked four manufacturing executives to weigh in on this important topic.

For most manufacturing companies, new products are the lifeblood that, if the business is to stay vibrant and prosper, must continually be developed. To that end, creative ideas must be nurtured. **Manufacturers need a way to foster this process of development, from the creation of ideas to design and development, and on to engineering, process design and improvement, and production.**

The question is, how? How best can innovation - the process of bringing new ideas to fruition in the marketplace - be fostered and managed? Or, is the creative process inherently unmanageable? ***In the Boardroom*** talked with four

executives - three in manufacturing and one from the software world -- and asked each to weigh in on the finer points of "managing innovation."

In the Boardroom spoke with these executives:

Chris Seams, Executive Vice President for Worldwide Manufacturing at Cypress Semiconductor, San Jose, CA, manages an R&D budget for new product and technology totaling more than \$250 million USD annually.

Jack Dawson, Director of Technical Resource Park at Dana Corp.'s in Ottawa Lake, Mich., manages the huge automotive supplier's new product development teams.

Chris Holmes, as Vice President of Business Development at Mindjet LLC, Larkspur, Calif., deals with ideas and innovation every day, as his software firm develops brainstorming software that companies use to sketch, refine, and catalog ideas on the tablet PC.

David Earle, as Director of Engineering at the innovative Santa Cruz Bicycles, Santa Cruz, Calif., is constantly on the lookout for new ideas to put between two wheels that will keep his company ahead of the pack.

Virtual Roundtable

In the Boardroom :

What is innovation? Is it new product development? Enhancement of customer value?

HOLMES : An early step in the process of developing a new product, process, or service should strive for an affirmative answer to the question: Does this innovation (1) **solve a problem or deliver a real benefit** compared to existing products or solutions? If it doesn't, then it is just innovation for innovation's sake, which is a nice, but costly, exercise.

SEAMS : Innovation is a (1 - repeated) new feature or a new level of performance not given to customers in previous offerings. It could be a new design, or a new technology on which to manufacture the product. But it must have a feature set, performance, or function that offers new value to the customer.

EARLE : Managed innovation is inhibited. Unmanaged innovation is directionless and therefore, a bit dangerous. There needs to be an (2) **open forum for ideas to be generated**, for thinking outside the box. But ideas must be (3) **filtered** by a (4) **well-understood set of goals and direction** set by the organization. This is not to say that crazy ideas are not tried and followed even though everything points to failure-- they are-- they are just not brought to market.

Everything that is developed at Santa Cruz Bicycles is derived from and guided by our Mission Statement, which says in part, "Our ultimate goal is to intersect the transparency of the bike when in use and its beauty when still." Transparency means that the machine is so flawless that you forget it is there and easily becomes lost in the experience of riding. That is why you develop new products, to make it better, to (5) **make people excited**, to (6) **give them a new experience**, (7) **enhance their life**.

DAWSON : True innovation meets a customer's needs and requirements in a specific area. For example, at Dana, we created a microwave plasma process to do braising and heat treating for processing steel or aluminum. That's an (8) **innovation in processes**. We are always looking for ways to improve our processes. Sometimes the improvements come in ways the customer never asked for.

In the Boardroom :

How can innovation be managed across a supply or value chain? Can process improvement be a meaningful market differentiator?

HOLMES : Innovation is really the culmination of a series of steps, the first of which is the appearance of the germ of an idea. **The challenge to the company comes in managing the cascading of that idea through the creative process to fruition**. Successful companies have a process to place some kind of value judgment on that idea and, if it (1 - repeated) **meets some criteria**, a process to bring it to life.

DAWSON : We are always looking to achieve greater competitive advantage through more advanced and highly engineered products. We collect ideas and (3 repeated) **put them through a filtration process**, and then we center our development work around the 10 best ideas. We make prototypes and do experimentation with these, and then we decide, based on an updated business plan, which one or two of these will go into production and be commercialized.

SEAMS : Yes, innovation can be managed. If left unmanaged, a company can be left with many stillborn products in the marketplace that are inferior to the competitors'. We have to manage our whole value chain on an ongoing basis, upgrading the performance of our existing products and at the same time, introducing new products.

Under our new product and new technology process, we let designers and process technology engineers go off and architect new products, which may come to market 18 months after the early marketplace analysis. We had better be right on these, because our company spends 23 percent of sales on our new product and new technology engine. We are more often right than not. We have a very rigorous seven-step process to manage that function. We (9) **monitor the cost and the cycle time for the total seven steps**. In our business, time to market is everything.

In the Boardroom :

How does a company create a culture that values innovation? What differences (if any) are there in fostering innovation across cultural boundaries?

EARLE : Innovation requires courage, it requires not becoming attached to your ideas, (2 - repeated) letting everyone speak and think openly and frankly. Even when things seem crazy you have to let go, try it and prove it wrong, or right. Not just stay in the comfort zone of what is common knowledge within the organization. Owners must allow it and encourage it, but also must guide it with firm goals and direction.

SEAMS : Within our company, we consider new products our lifeblood, and we consider that to be our culture. We track the average age of our products (29 knowledge of product life cycle), and we know that products under 18 months old represent 50 percent of our revenues. In our business, you absolutely better have a new product engine that is growing. We definitely have a (10) culture that pushes and rewards new products.

In terms of cultural differences, we have 18 design centers around the world, two thirds of them in the U.S. Inside each of these, though, they all live within the (11 - uniformity of innovation process) same innovation process. We can't see any difference. These centers look very homogeneous.

HOLMES : One thing we have learned in working with non-native English speakers is that it helps to keep things simple. For example, the (12) use of visual information-mapping software has helped Hewlett Packard take full advantage of the knowledge and experience of its consultants working in other cultures. By using these maps to place key words and commonly understood graphic symbols in a visual context, HP has been able to clearly and concisely communicate complex information to non-native English speakers. The maxim that one picture is worth a thousand words holds just as true describing a business challenge as it does for describing a sunset.

DAWSON : I'm a firm believer that you need to (13) dedicate creative people) set aside creative people in each business unit to work on new ideas and new designs. You have to let creative people have the (14) freedom to go off on tangents- any move in a new direction might result in a winner. At the same time, you have to (15 hold people accountable) hold them accountable.

In the Boardroom :

How does technology help or hinder the innovation process? What factors should executives evaluate when trying to "digitize" the innovation or product development process?

EARLE : Technology is a tool. Tools should make something easier. It seems pretty straight forward, if the tool

allows the (16 technology for) generation of more ideas, a (17 tech for) broader range of ideas, a (18) faster way to test ideas, or an increased (19) ability to bring something new and worthy to market, it should be used. The tool (technology) shouldn't be used if it doesn't provide this advantage.- use of technology to)

SEAMS : We use a lot of technology in our company. All our projects are tracked. I can click on our intranet and see if a project is ahead or behind schedule, who the project leaders are, and so forth. That's something new that has come about in the last five years. (20 - quality of project management)

We spend upwards of \$50 million USD to \$70 million USD a year on new technology to develop new designs and new manufacturing technology (21 - investment). As far as digitization of the new product development process, if a new technology can (22) cut cost, (23) increase return, or (24) cut innovation cycle time, you should invest in it.

DAWSON : Technology is a prime mover in helping the innovation process. We believe advanced technology is good for the creative process. We're doing a lot of (25) virtual testing to see if new designs are feasible and will actually work. We can design anything in the digital world, but we have to be sure we can run those parts on the vehicle.

HOLMES : The root of good innovation is taking the time and having the resources (21 investing - repeated) to let people who have some stake in an idea collaborate in developing that idea-ideally, more than scribbling on paper pads or trading e-mails (13 set aside people - repeated).

If the company is involved in complex scientific or engineering processes, the original ideas might take the form of highly technical papers or diagrams. But the people who need to go out and sell the latest innovation might not have the same level of special training needed to understand the ideas as presented. An ideal process will have a step that captures key information using a kind of common denominator- a (26) way to capture information understandable to all. Information visualization is one such solution.

Another factor is ease of use. Companies should (27) enable every single person in the organization to develop creative ideas. Consolidated Edison of New York recently concluded a project in which (28 use of) cross-departmental teams convened to lower internal overhead, using information visualization software to gain new insight into existing processes. In reviewing less than 15 percent of its internal processes, Con Edison employees were able to find more than \$6 million in annual savings. By using a technology that was transparent enough to be understandable to all participants, Con Edison's non-management employees now are more apt to look for better ways of doing their jobs. This change from a passive to an engaged workforce sets the

stage for the kind of ongoing innovation that can help a company win new markets.

Can innovation be managed? *In the Boardroom's* panel believes that it can - by focusing on three key principles:

- True innovation is customer driven, focusing on products or services that meet unique customer needs.
- Innovation is more than a great idea; it is a multi-step process that improves with collaboration among internal teams and external partners focused on serving a particular customer or market.
- Technology today plays a vital role in fostering innovation and keeping new product development on-target, on-time and on-budget.

What does innovation look like at your firm? Do you believe that innovation is a process, a culture or a happy accident? *In the Boardroom* would like your feedback - and your ideas on how innovation can best be leveraged for growth and profitability. E-mail us today.