

## Project Overview

**Goal:** To develop and explore the usefulness of a value chain-based research approach to explain the “concept to commercialization” process and societal concerns that impact nanotechnology-enabled products

### Approach:

- During the course of the CNS summer internship program (2008), a group of undergraduate students from a variety of disciplines worked with a CNS graduate fellow to conduct a value chain analysis of a nano-enabled product.

- Key aspects of the research process included: analysis of the existing product (if applicable), the nanomaterial used to enhance the product, and the linkages between the steps of the supply chain.

- In addition to value chain mapping, each intern chose a societal implications theme to pursue.

### Results:

- At the end of the eight week internship, each student presented his analysis through a short report, presentation, fact sheet, and research poster.

- The project further developed and confirmed the need to develop a value chain-based process for nanotechnology-related research.

## Introduction

### Importance of project:

Develops and tests a way to teach, analyze, and disseminate information on a myriad of nanotechnology-related research topics that is comprehensive, yet easy to understand for someone unfamiliar with the subject.

### Previous research:

This project builds on research included in the Global Value Chains (GVC) Initiative and the North Carolina in the Global Economy project. The GVC Initiative outlines a GVC research framework that has been effectively applied to several other industries ranging from biotechnology to furniture. Other nanotechnology value chain analyses have been conducted for North Carolina and the textile industry.

### Fit with other CNS research:

This project assists the Global Diffusion group that is using a global value chain approach, to analyze the development and diffusion of nanotechnology and the linkages that exist between the countries, companies, and research centers engaged in research through commercialization of nanotechnologies. Interns' products were chosen based on potential contribution to CNS research.

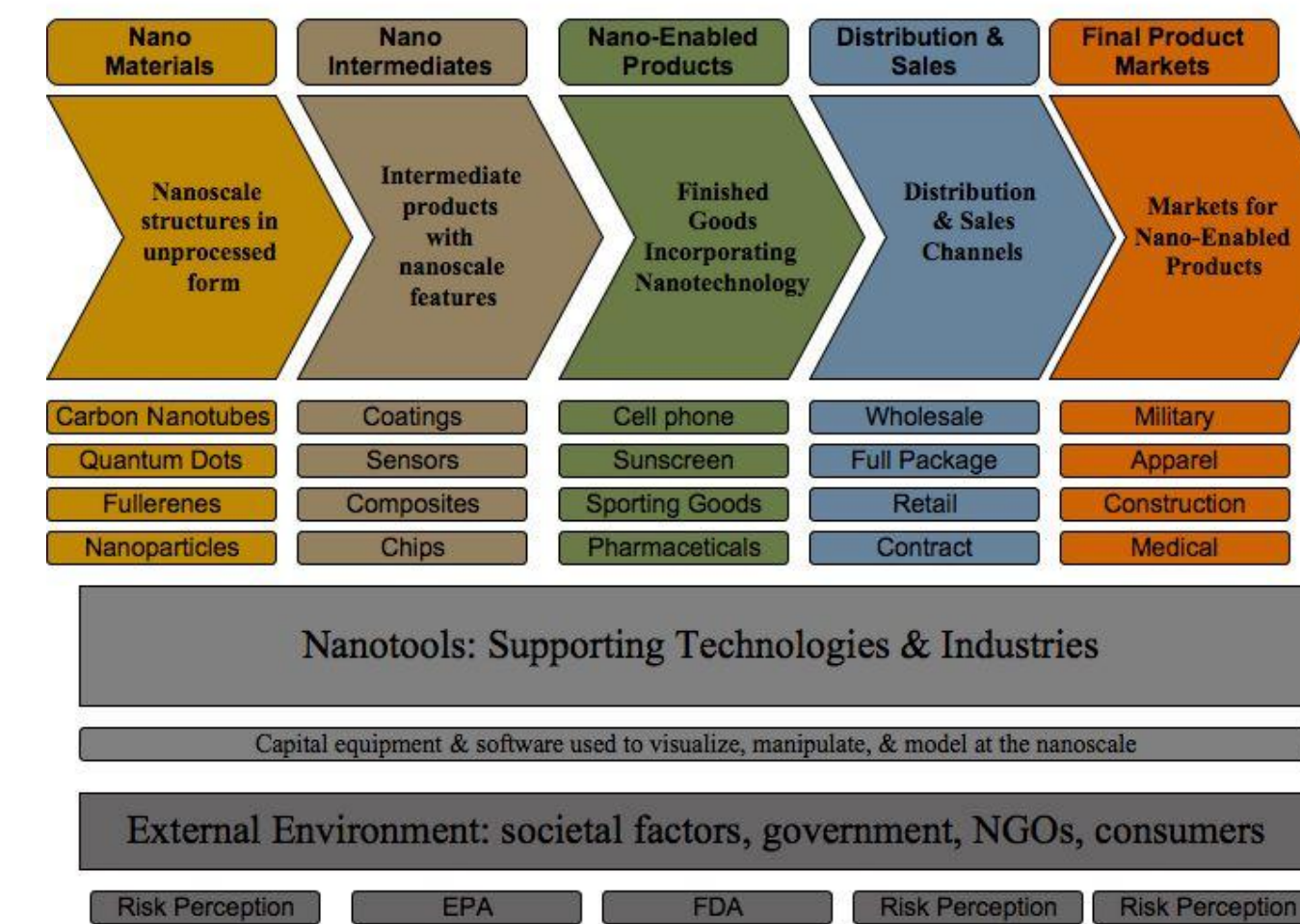
## Methods

### What is a value chain?

The full range of activities that are required to bring a product from its conception to its end use and beyond including activities such as design, production, marketing, distribution, and support to the final consumer. The activities can be contained within a single firm or divided among different firms; within a single geographic location or spread across wide areas.

### What is value chain analysis?

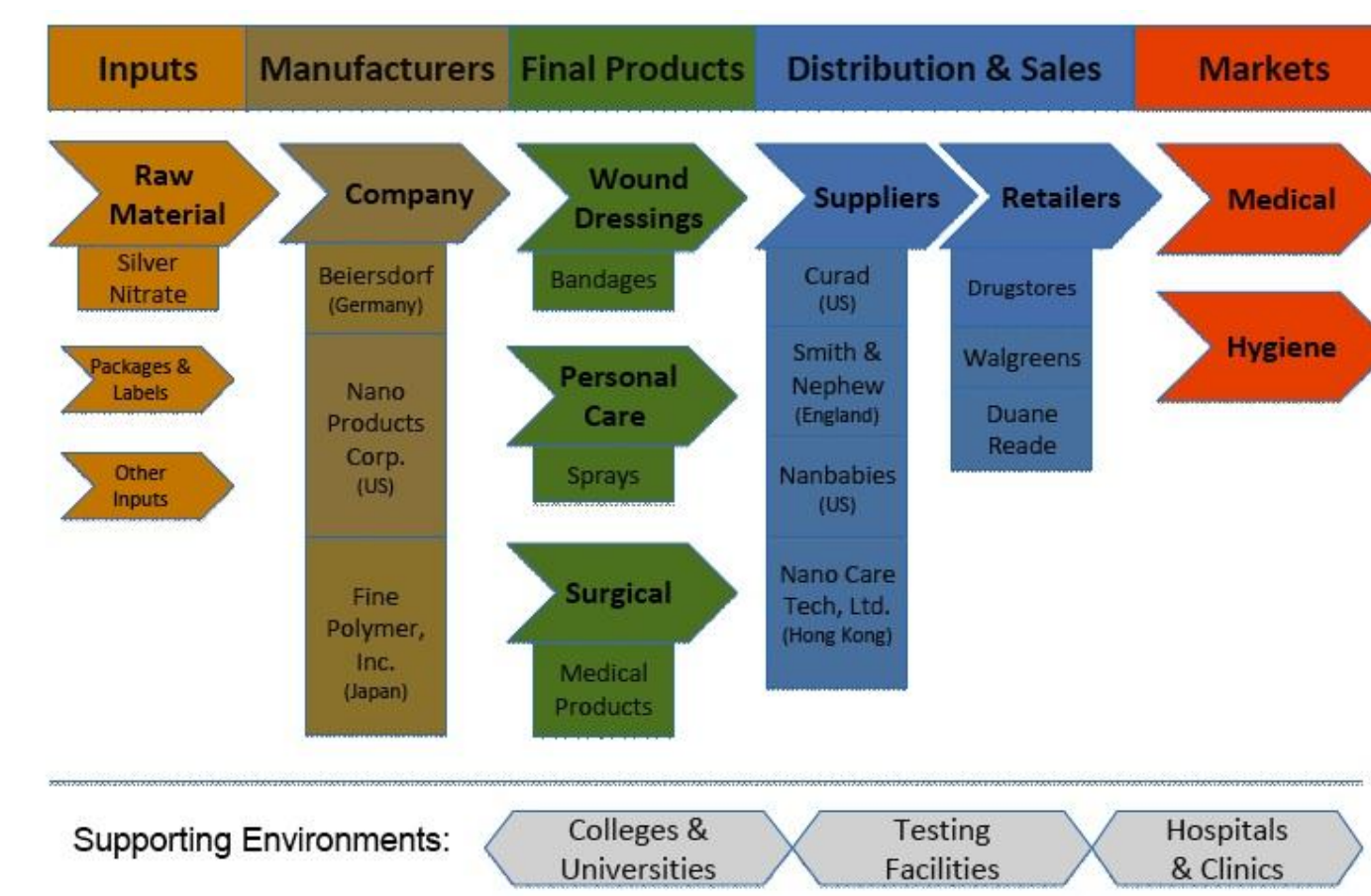
Value chain analysis provides a method to identify the internal and external stakeholders, actions, and relationships that impact the development, structure and geography of an industry. It is used by a wide range of practitioners from industry, government, and academia.



### Sample Research Questions:

- What are the benefits of this nano-enabled product and how does it differ from existing products?
- Where, how, and to whom does the use of nanotechnology add value (and cost) in the chain?
- What opportunities exist to apply this nanotechnology to other products?
- What regulations exist for this product?
- What societal concerns, such as risk and risk perception, media framing, the public sphere, innovation, globalization, and historical context, impact this product?

## Results



### Strengths of the Project:

- The results and the participants' insights on the research process clearly demonstrate the usefulness of using a value chain approach to understanding the structural dynamics and societal impacts of nano-enabled products.
- The interns were very satisfied with how much they learned. They enjoyed collaborating with professors and students from diverse backgrounds, in a non-intimidating atmosphere. They felt the experience gave them more confidence in their research skills and knowledge of science and social science topics.



Figure 1. Value Chain for Medical Applications with Silver Nanoparticles: Created by Brian Billones (2008)

### Challenges of the Project:

- Participants did not have much prior experience conducting value chain research. Resultantly, they were not as familiar with the concepts and types of data sources that can be used to find product and company information.

- Achieving the purposed depth and the breadth of the project was difficult given the relatively short time frame to complete (8 weeks).

- Commercial applications and firms' engagement in nano-enabled product development is difficult to identify given a lack of industry codes and standards.

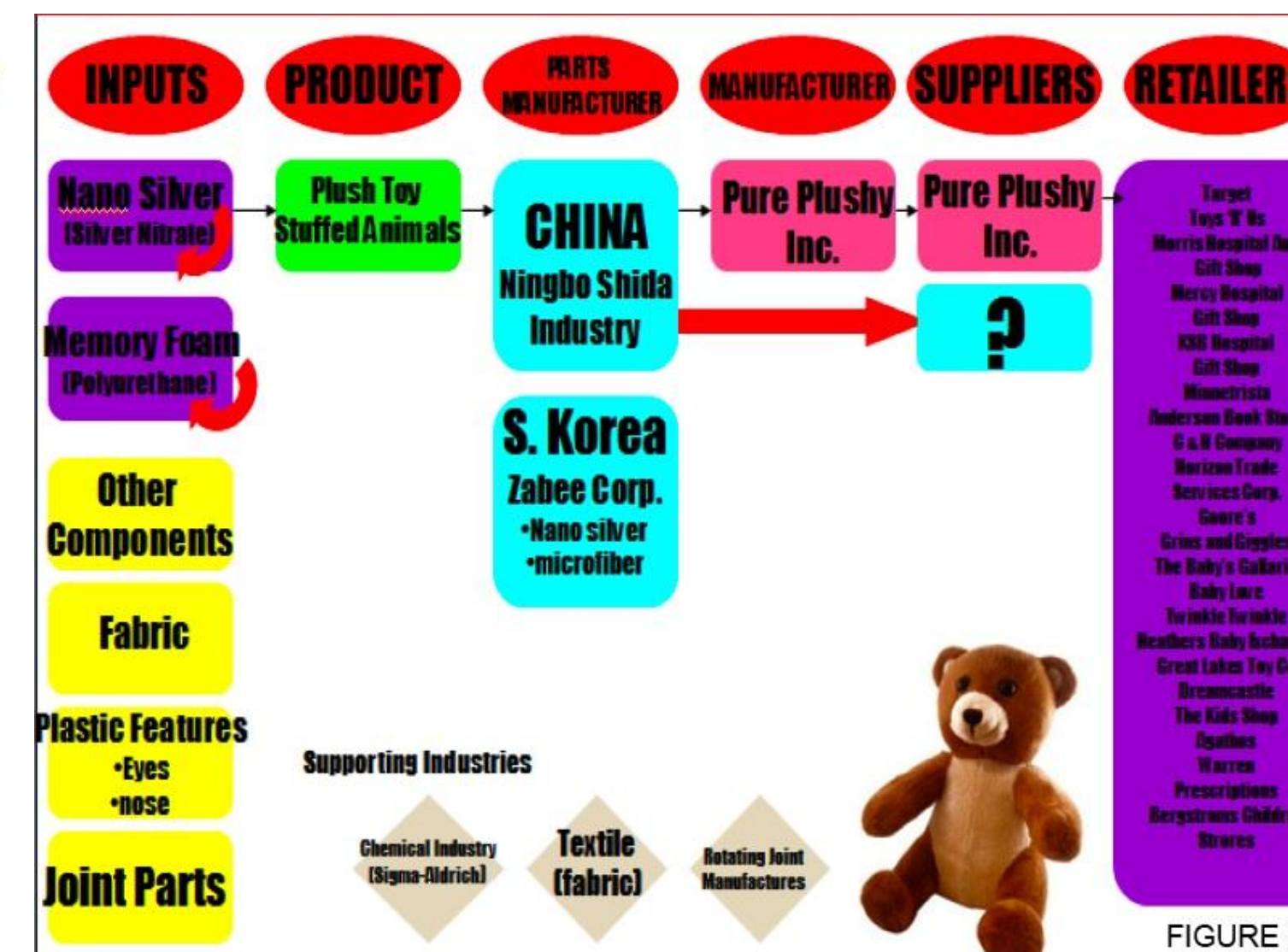


Figure 2. Value chain for Pure Plushy's "Benny the Bear," the first antimicrobial teddy bear made using nanosilver: Created by Dayna Meyer (2008)

## Conclusions & Continuing Work

### Directions for continued work:

- Develop more thorough introductory materials for the interns and graduate fellows that explains and provides examples of the concepts and theories of value chain research.
- Focus on creating results that can be easily disseminated to the public (e.g. create product fact sheets instead of research reports).
- Create a way to continue and/or use the interns research in projects beyond the summer internship program
- Results fit with other CNS research projects:
  - The experience provided a foundation to further develop a nanotechnology value chain reference model and process that can be used in future projects.

## References

- Gereffi, G. & Frederick, S. (2008). *Nanotechnology, Commercialization, and Innovation: the Case of North Carolina*. Presentation for the 2008 AAAS Annual Meeting, Boston, MA.
- Global Value Chains Initiative: [www.globalvaluechains.org](http://www.globalvaluechains.org)
- NC in the Global Economy (2008). Center on Globalization, Governance, & Competitiveness, Duke University. [www.soc.duke.edu/NC\\_GlobalEconomy/index.shtml](http://www.soc.duke.edu/NC_GlobalEconomy/index.shtml)

## Acknowledgements

This material is based upon work supported by the National Science Foundation under Grant No. SES 0531184. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

