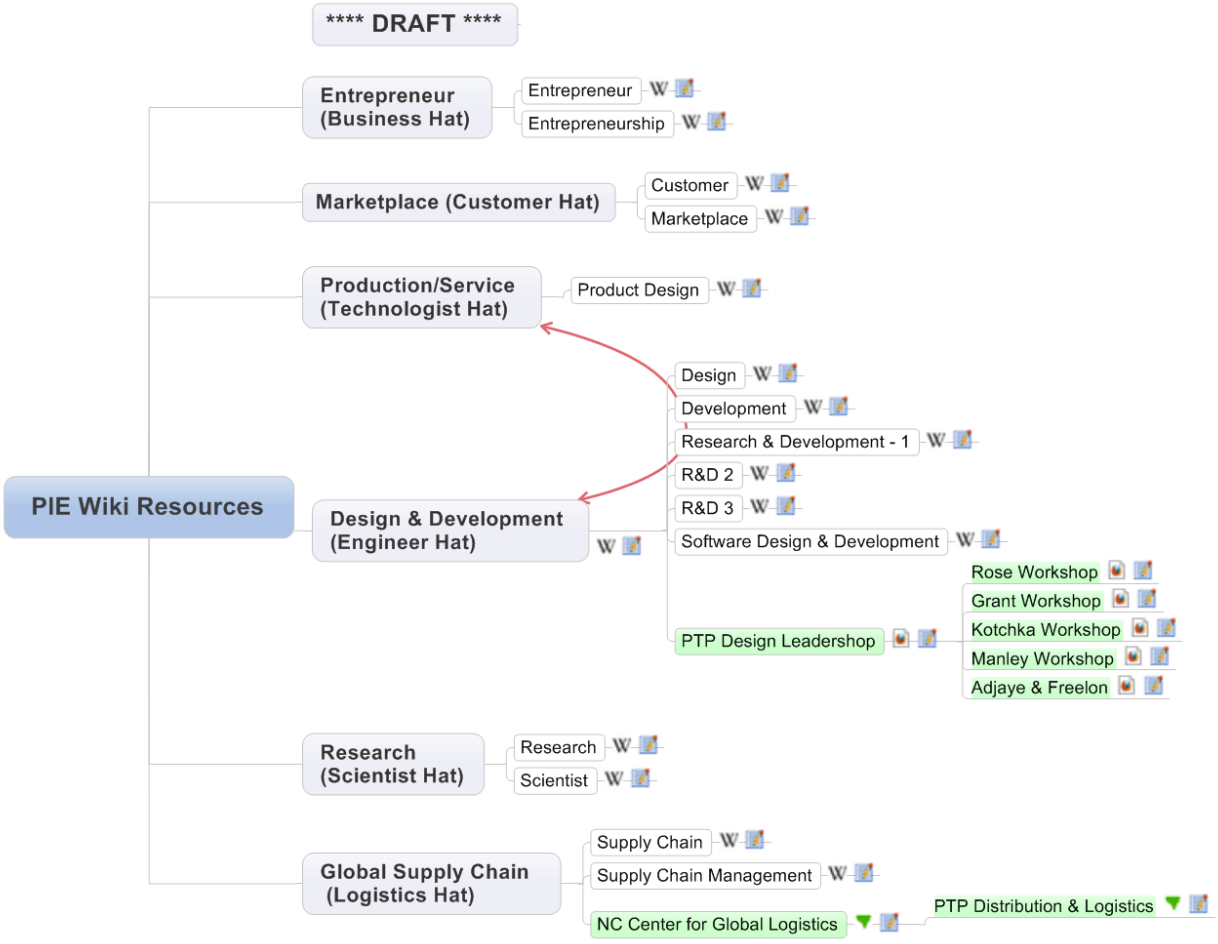
PIE Wiki Resources



1 Entrepreneur (Business Hat)

1.1 Entrepreneur

See document: Entreprenuer

An **entrepreneur** is a person who has possession of a new enterprise, venture or idea and assumes significant accountability for the inherent risks and the outcome.[1][note 1] The term is originally a loanword from French and was first defined by the Irish economist Richard Cantillon. Entrepreneur in English is a term applied to the type of personality who is willing to take upon himself a new venture or enterprise and accepts full responsibility for the outcome. Jean-Baptiste Say, a French economist is believed to have coined the word "entrepreneur" first in about 1800. He said an entrepreneur is "one who undertakes an enterprise, especially a contractor, acting as intermediatory between capital and labour

Entrepreneurs choose a level of personal, professional or financial risk to pursue opportunity.

Entrepreneurs tend to identify a market opportunity and exploit it by organizing their resources effectively to accomplish an outcome that changes existing interactions within a given sector.

Business entrepreneurs are viewed as fundamentally important in the capitalistic society. Some distinguish business entrepreneurs as either "political entrepreneurs" or "market entrepreneurs," while social entrepreneurs' principal objectives include the creation of a net social benefit.

Other entrepreneurs are necessity entrepreneurs. Entrepreneurship, particularly among women in developing countries (Minitti, 2010) seems to offer an improvement in the standard of living as well as a path out of poverty. Entrepreneurship is now growing at nearly three times the rate among women as it is among men.

1.2 Entrepreneurship

See document: Entrepreneurship

Entrepreneurship is the act of being an entrepreneur, which is a French word meaning "one who undertakes innovations, finance and business acumen in an effort to transform innovations into economic goods". This may result in new organizations or may be part of revitalizing mature organizations in response to a perceived opportunity. The most obvious form of entrepreneurship is that of starting new businesses (referred as Startup Company); however, in recent years, the term has been extended to include social and political forms of entrepreneurial activity. When entrepreneurship is describing activities within a firm or large organization it is referred to as intra-preneurship and may include corporate venturing, when large entities spin-off organizations.[1]

According to Paul Reynolds, entrepreneurship scholar and creator of the Global Entrepreneurship Monitor, "by the time they reach their retirement years, half of all working men in the United States probably have a period of self-employment of one or more years; one in four may have engaged in self-employment for six or more years. Participating in a new business creation is a common activity among U.S. workers over their course of their careers." [2] And in recent years has been documented by scholars such as David Audretsch to be a major driver of economic growth in both the United States and Western Europe.

Entrepreneurial activities are substantially different depending on the type of organization that is being started. Entrepreneurship ranges in scale from solo projects (even involving the entrepreneur only part-time) to major undertakings creating many job opportunities. Many "high value" entrepreneurial ventures seek venture capital or angel funding (seed money) in order to raise capital to build the business. Angel investors generally seek annualized returns of 20-30% and more, as well as extensive involvement in the business.[3] Many kinds of organizations now exist to support would-be entrepreneurs, including specialized government agencies, business incubators, science parks, and some NGOs. In more recent times, the term entrepreneurship has been extended to include elements not related necessarily to business formation activity such as conceptualizations of entrepreneurship as a specific mindset (see also entrepreneurial mindset) resulting in entrepreneurial initiatives e.g. in the form of social entrepreneurship, political entrepreneurship, or knowledge entrepreneurship have emerged.

2 Marketplace (Customer Hat)

2.1 Customer

See document: Customer

A **customer**, also called *client*, *buyer*, or *purchaser*, is usually used to refer to a current or potential buyer or user of the products of an individual or organization, called the supplier, seller, or vendor. This is typically through purchasing or renting goods or services. However, in certain contexts, the term *customer* also includes by extension any entity that uses or experiences the services of another. A customer may also be a viewer of the product or service that is being sold despite deciding not to buy them.

The word derives from "custom," meaning "habit"; a customer was someone who frequented a particular shop, who made it a habit to purchase goods of the sort the shop sold there rather than elsewhere, and with whom the shopkeeper had to maintain a relationship to keep his or her "custom," meaning expected purchases in the future.

The slogans "**the customer is king**" or "the customer is god" or "the customer is always right" indicate the importance of customers to businesses - although the last expression is sometimes used ironically.

However, "customer" also has a more generalised meaning as in customer service and a less commercialised meaning in not-for- profit areas. To avoid unwanted implications in some areas such as government services, community services, and education, the term "customer" is sometimes substituted by words such as "constituent" or "stakeholder". This is done to address concerns that the word "customer" implies a narrowly commercial relationship involving the purchase of products and services. However, some managers in this environment, in which the emphasis is on being helpful to the people one is dealing with rather than on commercial sales, comfortably use the word "customer" to both internal and external customers

2.2 Marketplace

See document: Marketplace

A **marketplace** is the space, actual, virtual or metaphorical, in which a market operates. The term is also used in a trademark law context to denote the actual consumer environment, ie. the 'real world' in which products and services are provided and consumed.

A marketplace is a location where goods and services are exchanged. The traditional market square is a city square where traders set up stalls and buyers browse the merchandise. This kind of market is very old, and countless such markets are still in operation around the whole world.

- In the USA such markets fell out of favor, but renewed interest in local food has caused the reinvention of this type of market, called farmers' markets, in many towns and cities.
- In Europe, especially in France and Britain, street markets, as well as "marketplaces" (covered places where merchants have stalls, but not entire stores) are commonplace. Both resellers and producers sell their wares to the public.
- In Australia, the largest "open air" market is the Queen Victoria Market - at seven hectares (17 acres), in Melbourne, which is also the largest in the Southern Hemisphere.

- Markets are often temporary, with stalls only present for one or two days a week ("market days"), however some (such as Camden Market in London, UK) are open every day of the week. Such markets are normally specialist—the various stalls of Camden Market, along with the shops associated with it, sell a variety of alternative lifestyle products ranging from clothes and jewellery to CDs, instruments and furniture. An example of a large market is Chatuchak weekend market in Bangkok.
- Some large markets have become permanent institutions comparable to shopping malls. One example is the huge Seventh-Kilometer Market near Odessa, Ukraine.

The Roman term for market, still in use in a related sense, is **forum**. The modern shopping mall can be seen as an extension of this concept.

3 Production/Service (Technologist Hat)

See also: Design & Development (Engineer Hat)

3.1 Product Design

See document: Product design

Product design is concerned with the efficient and effective generation and development of ideas through a process that leads to new products.[1]

Product Designers conceptualize and evaluate ideas, making them tangible through products in a more systematic approach. Their role is to combine art, science and technology to create tangible three-dimensional goods. This evolving role has been facilitated by digital tools that allow designers to communicate, visualize and analyze ideas in a way that would have taken greater manpower in the past.

Product design is sometimes confused with industrial design, industrial design is concerned with the aspect of that process that brings that sort of artistic form and usability usually associated with craft design to that of mass produced goods

Process

Product designers follow various methodology that requires a specific skill set to complete.

Initial Stage

- **Idea Generation** can be from imagination, observation, or research.
- **Need Based Generation** can be from the need to solve a problem, the need to follow the popular trends, or the need for a product to do a specific task.

Mid Stage

- **Design Solutions** arise from meeting user needs, concept development, form exploration, ergonomics, prototyping, materials, and technology.
- **Production** involves fabrication and manufacturing the design.

Final Stage

- **Marketing** involves selling the product. It can either be client based which mean the a client buys the design and manufactures it and then sells it to customers. Or it can be user based where the product is sold directly to the user by the designer.

[3]

4 Design & Development (Engineer Hat)

See document: Engineer

See also: Production/Service (Technologist Hat)

An **engineer** is a professional practitioner of engineering, concerned with applying scientific knowledge, mathematics and ingenuity to design and develop solutions for technological systems problems. Engineers design materials, structures, machines and systems while considering the limitations imposed by practicality, safety and cost.[1][2] The word *engineer* is derived from the Latin root *ingenium*, meaning "cleverness".[3]

Engineers are grounded in applied sciences, and are distinguished from scientists whose focus is most often research[4], and artists who create with a focus on aesthetics.

Design

Many engineers develop new technological solutions. During the engineering design process, the responsibilities of the engineer may include defining problems, conducting and narrowing research, analyzing criteria, finding and analyzing solutions, and making decisions. Much of some engineers' time is spent on researching, locating, applying, and transferring information.

Some engineers must weigh different design choices on their merits and choose the solution that best matches the requirements. Their crucial and unique task is to identify, understand, and interpret the constraints on a design in order to produce a successful result.

[edit] Analysis

Engineers apply techniques of engineering analysis in testing, production, or maintenance. Analytical engineers may supervise production in factories and elsewhere, determine the causes of a process failure, and test output to maintain quality. They also estimate the time and cost required to complete projects. Supervisory engineers are responsible for major components or entire projects. Engineering analysis involves the application of scientific analytic principles and processes to reveal the properties and state of the system, device or mechanism under study. Engineering analysis proceeds by separating the engineering design into the mechanisms of operation or failure, analysing or estimating each component of the operation or failure mechanism in isolation, and re-combining the components. They may analyse risk.[5] [6] [7] [8].

Many engineers use computers to produce and analyze designs, to simulate and test how a machine, structure, or system operates, to generate specifications for parts, to monitor the quality of products, and to control the efficiency of processes.

[edit] Specialization

Most engineers specialize. Numerous specialties are recognized by professional societies, and each of the major branches of engineering has numerous subdivisions. Civil engineering, for example, includes structural and transportation engineering, and materials engineering includes ceramic, metallurgical, and polymer engineering. Engineers also may specialize in one industry, such as motor vehicles, or in one type of technology, such as turbines or semiconductor materials.

4.1 Design

See document: Design

No generally-accepted definition of "design" exists[1], and the term has different connotations in different fields (see design disciplines below). Informally, "a design" (noun) refers to a plan for the construction of an object (as in architectural blueprints, circuit diagrams and sewing patterns) and "to design" (verb) refers to making this plan[2]. However, one can also design by directly constructing an object (as in pottery, cowboy coding and graphic design).

More formally, design has been defined as follows.

> *(noun) a specification of an object, manifested by an agent, intended to accomplish goals, in a particular environment, using a set of primitive components, satisfying a set of requirements, subject to constraints;*
>
> *(verb, transitive) to create a design, in an environment (where the designer operates)*[3]

Here, a "specification" can be manifested as either a plan or a finished product and "primitives" are the elements from which the design object is composed.

With such a broad denotation, there is no universal language or unifying institution for designers of all disciplines. This allows for many differing philosophies and approaches toward the subject (see Philosophies and studies of design, below).

The person designing is called a *designer*, which is also a term used for people who work professionally in one of the various design areas, usually also specifying which area is being dealt with (such as a *fashion designer*, *concept designer* or *web designer*). A designer's sequence of activities is called a design process[4]. The scientific study of design is called design science [5].

Designing often necessitates considering the aesthetic, functional, economic and sociopolitical dimensions of both the design object and design process. It may involve considerable research, thought, modeling, interactive adjustment, and re-design. Meanwhile, diverse kinds of objects may be designed, including clothing, graphical user interfaces, skyscrapers, corporate identities, business processes and even methods of designing[6].

Design as a process

Design, as a process, can take many forms depending on the object being designed and the individual or individuals participating. A simple definition is that design is the process of giving form to an idea. "Form" could be a plan of action or a description of a physical thing.

[edit] Typical steps

A design process may include a series of steps followed by designers. Depending on the product or service, some of these stages may be irrelevant, ignored in real-world situations in order to save time, reduce cost, or because they may be redundant in the situation.

Typical stages of the design process include:

- Pre-production design
    1. Design brief or Parti – an early often the beginning statement of design goals
    2. Analysis – analysis of current design goals
    3. Research – investigating similar design solutions in the field or related topics
    4. Specification – specifying requirements of a design solution for a product (product design specification[7]) or service.
    5. Problem solving – conceptualizing and documenting design solutions
    6. Presentation – presenting design solutions
- Design during production
    1. Development – continuation and improvement of a designed solution
    2. Testing – in situ testing a designed solution
- Post-production design feedback for future designs
    1. Implementation – introducing the designed solution into the environment
    2. Evaluation and conclusion – summary of process and results, including constructive criticism and suggestions for future improvements
- Redesign – any or all stages in the design process repeated (with corrections made) at any time before, during, or after production.

These stages are not universally accepted but do relate typical design process activities. For each activity there are many best practices for completing them.[8]

[edit] Philosophies and studies of design

There are countless philosophies for guiding design as the design values and its accompanying aspects within modern design vary, both between different schools of thought and among practicing designers.[9] Design philosophies are usually for determining design goals. A design goal may range from solving the least significant individual problem of the smallest element, to the most holistic influential utopian goals. Design goals are usually for guiding design. However, conflicts over immediate and minor goals may lead to questioning the purpose of design, perhaps to set better long term or ultimate goals.

4.2 Development

See document: Development

Science and technology

1. Artificial development, an area of computer science and engineering

2. Branching (software) in software development
3. Development (differential geometry), the process of rolling one surface over another
4. *Development* (journal), an academic journal in developmental biology
5. Development (topology), a countable collection of open coverings
6. Developmental biology
7. Drug development
8. Embryogenesis, the process by which the embryo is formed
9. Energy development
10. Evolutionary developmental biology
11. Human development (biology)
12. Neural development
13. Photographic developer
14. Photographic processing
15. Prenatal development
16. Renewable energy development
17. Research and development
18. Software development
19. Technology development
20. Tooth development or odontogenesis
21. Web development

[edit] Social science

4.3 Research & Development - 1

See document: index.php

The phrase research and development (also R and D or, more often, R&D), according to the Organization for Economic Co-operation and **...**

10 KB (1,315 words) - 05:16, 22 July 2010 Research Development

Research Development is a set of strategic, proactive, catalytic, and capacity-building activities designed to facilitate individual **...**

7 KB (897 words) - 03:15, 15 July 2010 BBC Research (redirect from BBC Research & Development)

BBC Research & Development is the technical research department of the BBC. Function: It has responsibility for researching and developing **...**

5 KB (588 words) - 00:36, 13 May 2010 Defence Research and Development Organisation

The Defence Research and Development Organisation (DRDO. (रक्षा अनुसंधान एवं विकास संगठन. responsible for the development of technology for **...**

90 KB (13,818 words) - 11:29, 19 July 2010 Nintendo Research & Development 1

Nintendo Research and Development 1 (R&D1) was Nintendo 's oldest development team. Its creation coincided with Nintendo's entry into the **...**

8 KB (807 words) - 13:06, 27 June 2010 American Research and Development Corporation

American Research and Development Corporation was a venture capital and private equity firm founded in 1946 by Georges Doriot , the " **...**

3 KB (329 words) - 22:34, 21 December 2009 United States Army Engineer Research and Development Laboratory

The United States Army Engineer Research and Development Laboratory was a United States Army Corps of Engineers research facility located **...**

1 KB (129 words) - 20:55, 2 July 2010 Johnson & Johnson Pharmaceutical Research and Development

Johnson & Johnson Pharmaceutical Research and Development (J&JPRD) is a subsidiary of Johnson & Johnson that is responsible for **...**

2 KB (235 words) - 17:23, 14 June 2010 National Research Development Corporation

The National Research Development Corporation ('NRDC') was a non- departmental government body established by the British Government to **...**

2 KB (263 words) - 23:27, 26 May 2010 Nintendo Research & Development 2

Nintendo Research and Development 2 (R&D2) was a team within Nintendo that developed software and peripherals. to early development in the **...**

4 KB (358 words) - 16:56, 22 July 2010 United States Army Research, Development and Engineering Command

The U.S. Army Research, Development and Engineering Command is a major subordinate command of the Army Materiel Command , and is charged **...**

4 KB (429 words) - 12:24, 22 June 2010 U.S. Civilian Research & Development Foundation

The U.S. Civilian Research & Development Foundation (CRDF) is a "... nonprofit organization that promotes international scientific and **...**

11 KB (1,553 words) - 15:12, 30 June 2010 Scholz Research & Development, Inc.

Scholz Research & Development, Inc. or SR&D is the name of the company founded by Tom Scholz to design and manufacture music technology **...**

2 KB (322 words) - 21:29, 17 February 2010 Combat Vehicles Research and Development Establishment

Combat Vehicles Research and Development Establishment (CVRDE) is a laboratory of the Defence Research and Development Organisation (DRDO **...**

4 KB (483 words) - 07:49, 26 July 2010 Organic Process Research & Development

Organic Process Research & Development is a peer-reviewed scientific journal , published since 1997 by the American Chemical Society OPR& **...**

1 KB (140 words) - 08:04, 23 May 2010 Armament Research and Development Establishment

Armament Research & Development Establishment (ARDE) is a laboratory of the Defence Research and Development Organisation (DRDO). **...**

7 KB (1,002 words) - 07:08, 29 November 2009 Research, Development, and Evaluation Commission

The Research, Development, and Evaluation Commission.

1 KB (150 words) - 23:26, 27 April 2010 Vehicle Research and Development Establishment

Center for Vehicle Research and Development Establishment (VRDE) is a laboratory of the Defence Research & Development Organization (DRDO **...**

2 KB (170 words) - 19:07, 11 February 2010 United States Army Armament Research, Development and Engineering Center

The United States Army Armament Research, Development and Engineering Center (ARDEC), headquartered at the Picatinny Arsenal in New **...**

4 KB (554 words) - 18:33, 17 April 2010

4.4 R&D 2

See document: Research_&_development

The phrase **research and development** (also **R and D** or, more often, **R&D**), according to the Organization for Economic Co-operation and Development, refers to "creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications".[1]

http://en.wikipedia.org/wiki/File:Cycle_of_Research_and_Development.gif

New product design and development is more often than not a crucial factor in the survival of a company. In an industry that is fast changing, firms must continually revise their design and range of products. This is necessary due to continuous technology change and development as well as other competitors and the changing preference of customers.

A system driven by marketing is one that puts the customer needs first, and only produces goods that are known to sell. Market research is carried out, which establishes what is needed. If the development is technology driven then it is a matter of selling what it is possible to make. The product range is developed so that production processes are as efficient as possible and the products are technically superior, hence possessing a natural advantage in the market place.

R&D has a special economic significance apart from its conventional association with scientific and technological development. R&D investment generally reflects a government's or organization's willingness to forgo current operations or profit to improve future performance or returns, and its abilities to conduct research and development.

In general, R&D activities are conducted by specialized units or centers belonging to companies, universities and state agencies. In the context of commerce, "research and development" normally refers to future- oriented, longer-term activities in science or technology, using similar techniques to scientific research without predetermined outcomes and with broad forecasts of commercial yield.

Statistics on organizations devoted to "R&D" may express the state of an industry, the degree of competition or the lure of progress. Some common measures include: budgets, numbers of patents or on rates of peer- reviewed publications. Bank ratios are one of the best measures, because they are continuously maintained, public and reflect risk.

In the U.S., a typical ratio of research and development for an industrial company is about 3.5% of revenues. A high technology company such as a computer manufacturer might spend 7%. Although Allergan (a biotech company) tops the spending table 43.4% investment, anything over 15% is remarkable and usually gains a reputation for being a high technology company. Companies in this category include pharmaceutical companies such as Merck & Co. (14.1%) or Novartis (15.1%), and engineering companies like Ericsson (24.9%).[3] Such companies are often seen as poor credit risks because their spending ratios are so unusual.

Generally such firms prosper only in markets whose customers have extreme needs, such as medicine, scientific instruments, safety-critical mechanisms (aircraft) or high technology military armaments. The extreme needs justify the high risk of failure and consequently high gross margins from 60% to 90% of revenues. That is, gross profits will be as much as 90% of the sales cost, with manufacturing costing only 10% of the product price, because so many individual projects yield no exploitable product. Most industrial companies get only 40% revenues.

On a technical level, high tech organizations explore ways to re-purpose and repackage advanced technologies as a way of amortizing the high overhead. They often reuse advanced manufacturing processes, expensive safety certifications, specialized embedded software, computer-aided design software, electronic designs and mechanical subsystems.

Research has shown that firms with a persistent R&D strategy outperform those with an irregular or no R&D investment programme.[4]

4.5 R&D 3

See document: Research_and_development

The phrase **research and development** (also **R and D** or, more often, **R&D**), according to the Organization for Economic Co-operation and Development, refers to "creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications".[1]

4.6 Software Design & Development

See document: Software_Design_and_Development

The phrase **research and development** (also **R and D** or, more often, **R&D**), according to the Organization for Economic Co-operation and Development, refers to "creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications".[1]

HSC Course

In New South Wales, SDD is separated into the Preliminary (Year 11) and HSC (Year 12) courses. A prerequisite for the HSC Course is successful completion of the Preliminary Course, which is the same

for any other course in the HSC. The course in NSW is set out in the NSW Board of Studies HSC Software Design and Development syllabus document.[1]

[edit] Preliminary Course

Concepts and Issues in the Design and Development of Software (30%)

- Social and ethical issues
- Hardware and software
- Software development approaches

Introduction to Software Development (50%)

- Defining the problem and planning software solutions
- Building software solutions
- Checking software solutions
- Modifying software solutions

Developing Software Solutions (20%)

[edit] Course Structure

Development and Impact of Software Solutions (15%)

- Social and ethical issues
- Application of software development approaches

Software Development Cycle (40%)

- Defining and understanding the problem
- Planning and design of software solutions
- Implementation of software solutions
- Testing and evaluation of software solutions
- Maintenance of software solutions

Developing a Solution Package (25%)

Options (20%) One of the following options:

- Evolution of programming languages, or
- The Software Developer's view of the hardware

4.7 PTP Design Leadershop

See document: www.triaddesignleadershop.com

Video Overview

Now more than ever, it's essential to step back from day-to-day tasks and examine how imaginative thinking helps businesses of all sizes and disciplines succeed. The Triad Design Leadershop is an opportunity for our area's creative thinkers and doers to learn from world- class designers spanning a variety of practice areas.

Immerse yourself in a series of keynotes and participatory workshops that will leave you energized, motivated and equipped to bring a new approach to thinking for co-worker and clients.

4.7.1 Rose Workshop

See document: david-rose

Enchanted Objects: The Next Wave of the Internet

David Rose is a serial entrepreneur and now a faculty member at the MIT Media Lab. He works with sensing technologies and Internet communications capabilities built into everyday objects.

One local example is Truliant Credit Union's headquarters in Winston-Salem. Its campus has one of David's devices at the top of an outdoor obelisk that glows different colors to indicate levels of customer satisfaction.

David's most recent project addresses the serious problem of patients' adherence to doctors' advice. One of David's devices is being built into the caps of vials containing prescription medicines. The cap will glow when it's time for a patient to take their pill.

Join David to learn more about these and other thoughtful applications of technology to enhance and better our lives.

4.7.2 Grant Workshop

See document: bill-grant

From Product to Market

As the boundaries of traditional communication design continue to fade, designers must continue to define new frontiers for their work. So how do we promote and embed "design thinking" into every level of business and society?

Since its beginning, Grant Design Collaborative has practiced a cross- disciplinary approach to brand design by working in corporate identity, brand strategy, print, advertising, interiors, interactive, packaging and public relations. Recently, Grant expanded its strategic position with a novel "Product-to-Market" approach to design that encompasses a whole systems design process, from product design and brand strategy through marketing and distribution.

Bill Grant, president and creative director of Grant Design Collaborative and former national president

of AIGA, will discuss his firm's evolution and how it intends to not only gain a seat at the table but design the table as well. Bill will also present case studies of some of the firm's product-to-market clients and discuss its latest retail venture, the Store at Grant Design Collaborative.

4.7.3 Kotchka Workshop

See document: claudia-kotchka

Using the Power of Design Thinking to Transform Your Business

Join Claudia as she discusses the different perspectives offered by design thinking and how unique approaches to problem solving change and enhance business

4.7.4 Manley Workshop

See document: jason-manley

Realizing Your Creative Dreams

Manley will discuss how to make aspirations real in the interactive digital media space. He will convey his personal story of how he and his partners used a meager initial investment to build a website that is a leading educational resource for multiple creative industries.

4.7.5 Adjaye & Freelon

See document: david-adjaye-phil-freelon

Collaboration: The Creative and Strategic Advantage

Join David and Phil as they share their insights on the value of strategic alliances and collaboration. These two world-renowned architects will draw on a spectacular case in point: their own international competition winning design for The Smithsonian National Museum of African American History and Culture.

5 Research (Scientist Hat)

5.1 Research

See document: Research

Research can be defined as the search for knowledge or any systematic investigation to establish facts. The primary purpose for applied research (as opposed to basic research) is discovering, interpreting, and the development of methods and systems for the advancement of human knowledge on a wide variety of scientific matters of our world and the universe. Research can use the scientific method, but need not do so.

Scientific research relies on the application of the scientific method, a harnessing of curiosity. This research provides scientific information and theories for the explanation of the nature and the properties of the world around us. It makes practical applications possible. Scientific research is funded by public authorities, by charitable organizations and by private groups, including many companies. Scientific research can be subdivided into different classifications according to their academic and application disciplines.

Artistic research, also seen as 'practice- based research', can take form when creative works are considered both the research and the object of research itself. It is the debatable body of thought which offers an alternative to purely scientific methods in research in its search for knowledge and truth.

Historical research is embodied in the scientific method.

The term *research* is also used to describe an entire collection of information about a particular subject.[*citation needed*]

Scientific research

Main article: Scientific method

Generally, research is understood to follow a certain structural process. Though step order may vary depending on the subject matter and researcher, the following steps are usually part of most formal research, both basic and applied:

- Formation of the topic
- Hypothesis
- Conceptual definitions
- Operational definition
- Gathering of data
- Analysis of data
- Test, revising of hypothesis
- Conclusion, iteration if necessary

A common misunderstanding is that by this method a hypothesis could be proven or tested. Generally a hypothesis is used to make predictions that can be tested by observing the outcome of an experiment. If the outcome is inconsistent with the hypothesis, then the hypothesis is rejected. However, if the outcome is consistent with the hypothesis, the experiment is said to support the hypothesis. This careful language is used because researchers recognize that alternative hypotheses may also be consistent with the observations. In this sense, a hypothesis can never be proven, but rather only supported by surviving rounds of scientific testing and, eventually, becoming widely thought of as true (or better, predictive), but this is not the same as it having been proven. A useful hypothesis allows prediction and within the accuracy of observation of the time, the prediction will be verified. As the accuracy of observation improves with time, the hypothesis may no longer provide an accurate prediction. In this case a new hypothesis will arise to challenge the old, and to the extent that the new hypothesis makes more accurate predictions than the old, the new will supplant it.

The goal of the research process is to produce new knowledge, which takes three main forms (although, as previously discussed, the boundaries between them may be obscure.):

- Exploratory research, which structures and identifies new problems
- Constructive research, which develops solutions to a problem
- Empirical research, which tests the feasibility of a solution using empirical evidence

The research room at the New York Public Library, an example of secondary research in progress.

Research can also fall into two distinct types:

- Primary research (collection of data that does not already exist)
- Secondary research (summary, collation and/or synthesis of existing research)

In social sciences and later in other disciplines, the following two research methods can be applied, depending on the properties of the subject matter and on the objective of the research:

- Qualitative research (understanding of human behavior and the reasons that govern such behavior)
- Quantitative research (systematic empirical investigation of quantitative properties and phenomena and their relationships)

Research is often conducted using the hourglass model Structure of Research[1]. The hourglass model starts with a broad spectrum for research, focusing in on the required information through the methodology of the project (like the neck of the hourglass), then expands the research in the form of discussion and results.

5.2 Scientist

See document: Scientist

A **scientist** in a broad sense is one engaging in a systematic activity to acquire knowledge. In a more restricted sense, a scientist is an individual who uses the scientific method.[1] The person may be an expert in one or more areas of science.[2] This article focuses on the more restricted use of the word. Scientists perform research toward a more comprehensive understanding of nature, including physical, mathematical and social realms. This is distinct from philosophers, those who use logic toward a more comprehensive understanding of intangible aspects of reality that lack a direct connection to nature, focusing on the realm of thought itself. Scientists are also distinct from engineers, those who develop devices that serve practical purposes. When science is done with a goal toward practical utility, it is called 'applied science' (short of the creation of new devices that fall into the realm of engineering). When science is done with an inclusion of intangible aspects of reality it is called 'natural philosophy'.

Social roles that partly correspond with the modern scientist can be identified going back at least until 17th century natural philosophy, but the term *scientist* is much more recent. Until the late 19th or early 20th century, those who pursued science were called "natural philosophers" or "men of science".[3][4][5][6]

English philosopher and historian of science William Whewell coined the term *scientist* in 1833, and it was first published in Whewell's anonymous 1834 review of Mary Somerville's *On the Connexion of the Physical Sciences* published in the *Quarterly Review*. Whewell's suggestion of the term was partly satirical, a response to changing conceptions of science itself in which natural knowledge was increasingly seen as distinct from other forms of knowledge. Whewell wrote of "an increasing proclivity of separation and dismemberment" in the sciences; while highly specific terms proliferated—chemist,

mathematician, naturalist—the broad term "philosopher" was no longer satisfactory to group together those who pursued science, without the caveats of "natural" or "experimental" philosopher. Members of the British Association for the Advancement of Science had been complaining about the lack of a good term at recent meetings, Whewell reported in his review; alluding to himself, he noted that "some ingenious gentleman proposed that, by analogy with *artist*, they might form [the word] *scientist*, and added that there could be no scruple in making free with this term since we already have such words as *economist*, and *atheist*—but this was not generally palatable".[7]

Whewell proposed the word again more seriously (and not anonymously) in his 1840 *The Philosophy of the Inductive Sciences*:

> We need very much a name to describe a cultivator of science in general. I should incline to call him a *Scientist*. Thus we might say, that as an Artist is a Musician, Painter, or Poet, a Scientist is a Mathematician, Physicist, or Naturalist.

He also proposed the term *physicist* at the same time, as a counterpart to the French word *physicien*. Neither term gained wide acceptance until decades later; *scientist* became a common term in the late 19th century in the United States and around the turn of the 20th century in Great Britain.[8][9][10] By the twentieth century, the modern notion of science as a special brand of information about the world, practiced by a distinct group and pursued through a unique method, was essentially in place.

Description

Science and technology have continually modified human existence. As a profession the scientist of today is widely recognized. Scientists include theoreticians who mainly develop new models to explain existing data and predict new results, and experimentalists who mainly test models by making measurements — though in practice the division between these activities is not clear- cut, and many scientists perform both tasks.

Mathematics is often grouped with the sciences. Some of the greatest physicists have also been creative mathematicians. There is a continuum from the most theoretical to the most empirical scientists with no distinct boundaries. In terms of personality, interests, training and professional activity, there is little difference between applied mathematicians and theoretical physicists.

Scientists can be motivated in several ways. Many have a desire to understand why the world is as we see it and how it came to be. They exhibit a strong curiosity about reality. Other motivations are recognition by their peers and prestige, or the desire to apply scientific knowledge for the benefit of people's health, the nations, the world, nature or industries (academic scientist and industrial scientist).

[edit] Scientists versus engineers

Engineers and scientists are often confused in the minds of the general public, with the former being closer to applied science. While scientists explore nature in order to discover general principles, engineers apply established principles drawn from science in order to create new inventions and improve upon the old ones.[11][12] In short, scientists study things whereas engineers design things. However, there are plenty of instances where significant accomplishments are made in both fields by the same individual. When a scientist has also an engineering education, the same individual would explore principles in nature to solve problems and to design new technology. Scientists often perform some engineering tasks in designing experimental equipment and building prototypes, and some engineers do

first-rate scientific research. Biomedical, mechanical, electrical, chemical, and aerospace engineers are often at the forefront of scientific investigation of new phenomena and materials. Peter Debye received a degree in electrical engineering and a doctorate in physics before eventually winning a Nobel Prize in chemistry. Similarly, Paul Dirac, one of the founders of quantum mechanics, began his academic career as an electrical engineer before proceeding to mathematics and later theoretical physics. Claude Shannon, a theoretical engineer, founded modern information theory.

6 Global Supply Chain (Logistics Hat)

6.1 Supply Chain

See document: Supply chain

A **supply chain** is a system of organizations, people, technology, activities, information and resources involved in moving a product or service from supplier to customer. Supply chain activities transform natural resources, raw materials and components into a finished product that is delivered to the end customer. In sophisticated supply chain systems, used products may re-enter the supply chain at any point where residual value is recyclable. Supply chains link value chains.[2]

Overview

The Council of Supply Chain Management Professionals (CSCMP) defines Supply Chain Management as follows: "Supply Chain Management encompasses the planning and management of all activities involved in sourcing and procurement, conversion, and all logistics management activities. Importantly, it also includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, third-party service providers, and customers. In essence, supply chain management integrates supply and demand management within and across companies. Supply Chain Management is an integrating function with primary responsibility for linking major business functions and business processes within and across companies into a cohesive and high-performing business model. It includes all of the logistics management activities noted above, as well as manufacturing operations, and it drives coordination of processes and activities with and across marketing, sales, product design, finance and information technology."

A typical supply chain begins with ecological and biological regulation of natural resources, followed by the human extraction of raw material, and includes several production links (e.g., component construction, assembly, and merging) before moving on to several layers of storage facilities of ever-decreasing size and ever more remote geographical locations, and finally reaching the consumer.

Many of the exchanges encountered in the supply chain will therefore be between different companies that will seek to maximize their revenue within their sphere of interest, but may have little or no knowledge or interest in the remaining players in the supply chain. More recently, the loosely coupled, self- organizing network of businesses that cooperates to provide product and service offerings has been called the *Extended Enterprise*.[*citation needed*]

Supply chain modeling

A diagram of a supply chain. The black arrow represents the flow of materials and information and the gray arrow represents the flow of information and backhauls. The elements are (a) the initial supplier, (b) a supplier, (c) a manufacturer, (d) a customer, (e) the final customer.

There are a variety of supply chain models, which address both the upstream and downstream sides. However the SCOR model is most common.

The SCOR Supply-Chain Operations Reference model, developed by the Supply Chain Council, measures total supply chain performance. It is a process reference model for supply-chain management, spanning from the supplier's supplier to the customer's customer.[3] It includes delivery and order fulfillment performance, production flexibility, warranty and returns processing costs, inventory and asset turns, and other factors in evaluating the overall effective performance of a supply chain.

The Global Supply Chain Forum (GSCF) introduced another Supply Chain Model. This framework[4] is built on eight key business processes that are both cross-functional and cross-firm in nature. Each process is managed by a cross-functional team, including representatives from logistics, production, purchasing, finance, marketing and research and development. While each process will interface with key customers and suppliers, the customer relationship management and supplier relationship management processes form the critical linkages in the supply chain.

The American Productivity & Quality Center (APQC) Process Classification Framework (PCF) SM is a high-level, industry-neutral enterprise process model that allows organizations to see their business processes from a cross-industry viewpoint. The PCF was developed by APQC and its member companies as an open standard to facilitate improvement through process management and benchmarking, regardless of industry, size, or geography. The PCF organizes operating and management processes into 12 enterprise level categories, including process groups and over 1,000 processes and associated activities.

6.2 Supply Chain Management

See document: Supply_Chain_Management

Supply chain management (SCM) is the management of a network of interconnected businesses involved in the ultimate provision of product and service packages required by end customers (Harland, 1996).[1] Supply Chain Management spans all movement and storage of raw materials, work-in-process inventory, and finished goods from point of origin to point of consumption (supply chain).

Another definition is provided by the APICS Dictionary when it defines SCM as the "design, planning, execution, control, and monitoring of supply chain activities with the objective of creating net value, building a competitive infrastructure, leveraging worldwide logistics, synchronizing supply with demand, and measuring performance globally."

Idea

More common and accepted definitions of Supply Chain Management are:

- Supply Chain Management is the systemic, strategic coordination of the traditional business functions and the tactics across these business functions within a particular company and across businesses within the supply chain, for the purposes of improving the long-term

performance of the individual companies and the supply chain as a whole (Mentzer et. al., 2001).[2]

- Global Supply Chain Forum - Supply Chain Management is the integration of key business processes across the supply chain for the purpose of creating value for customers and stakeholders (Lambert, 2008)[3].
- According to the Council of Supply Chain Management Professionals (CSCMP), Supply chain management encompasses the planning and management of all activities involved in sourcing, procurement, conversion, and logistics management. It also includes the crucial components of coordination and collaboration with channel partners, which can be suppliers, intermediaries, third-party service providers, and customers. In essence, supply chain management integrates supply and demand management within and across companies. More recently, the loosely coupled, self-organizing network of businesses that cooperate to provide product and service offerings has been called the *Extended Enterprise*.

A supply chain, as opposed to supply chain management, is a set of organizations directly linked by one or more of the upstream and downstream flows of products, services, finances, and information from a source to a customer. Managing a supply chain is 'supply chain management' (Mentzer et. al., 2001).[4]

Supply chain management software includes tools or modules used to execute supply chain transactions, manage supplier relationships and control associated business processes.

Supply chain event management (abbreviated as SCEM) is a consideration of all possible events and factors that can disrupt a supply chain. With SCEM possible scenarios can be created and solutions devised.

[edit] Supply chain management problems

Supply chain management must address the following problems:

- **Distribution Network Configuration**: number, location and network missions of suppliers, production facilities, distribution centers, warehouses, cross-docks and customers.
- **Distribution Strategy**: questions of operating control (centralized, decentralized or shared); delivery scheme, e.g., direct shipment, pool point shipping, cross docking, DSD (direct store delivery), closed loop shipping; mode of transportation, e.g., motor carrier, including truckload, LTL, parcel; railroad; intermodal transport, including TOFC (trailer on flatcar) and COFC (container on flatcar); ocean freight; airfreight; replenishment strategy (e.g., pull, push or hybrid); and transportation control (e.g., owner-operated, private carrier, common carrier, contract carrier, or 3PL).
- **Trade-Offs in Logistical Activities**: The above activities must be well coordinated in order to achieve the lowest total logistics cost. Trade-offs may increase the total cost if only one of the activities is optimized. For example, full truckload (FTL) rates are more economical on a cost per pallet basis than less than truckload (LTL) shipments. If, however, a full truckload of a product is ordered to reduce transportation costs, there will be an increase in inventory holding costs which may increase total logistics costs. It is therefore imperative to take a systems approach when planning logistical activities. These trade-offs are key to developing the most efficient and effective Logistics and SCM strategy.
- **Information**: Integration of processes through the supply chain to share valuable information, including demand signals, forecasts, inventory, transportation, potential collaboration, etc.

- **Inventory Management**: Quantity and location of inventory, including raw materials, work-in-progress (WIP) and finished goods.
- **Cash-Flow**: Arranging the payment terms and methodologies for exchanging funds across entities within the supply chain.

Supply chain execution means managing and coordinating the movement of materials, information and funds across the supply chain. The flow is bi-directional.

[edit] Activities/functions

Supply chain management is a cross-function approach including managing the movement of raw materials into an organization, certain aspects of the internal processing of materials into finished goods, and the movement of finished goods out of the organization and toward the end-consumer. As organizations strive to focus on core competencies and becoming more flexible, they reduce their ownership of raw materials sources and distribution channels. These functions are increasingly being outsourced to other entities that can perform the activities better or more cost effectively. The effect is to increase the number of organizations involved in satisfying customer demand, while reducing management control of daily logistics operations. Less control and more supply chain partners led to the creation of supply chain management concepts. The purpose of supply chain management is to improve trust and collaboration among supply chain partners, thus improving inventory visibility and the velocity of inventory movement.

Several models have been proposed for understanding the activities required to manage material movements across organizational and functional boundaries. SCOR is a supply chain management model promoted by the Supply Chain Council. Another model is the SCM Model proposed by the Global Supply Chain Forum (GSCF). Supply chain activities can be grouped into strategic, tactical, and operational levels . The CSCMP has adopted The American Productivity & Quality Center (APQC) Process Classification Framework^{SM} a high-level, industry-neutral enterprise process model that allows organizations to see their business processes from a cross-industry viewpoint[5].

[edit] Strategic

- Strategic network optimization, including the number, location, and size of warehousing, distribution centers, and facilities.
- Strategic partnerships with suppliers, distributors, and customers, creating communication channels for critical information and operational improvements such as cross docking, direct shipping, and third-party logistics.
- Product life cycle management, so that new and existing products can be optimally integrated into the supply chain and capacity management activities.
- Information technology chain operations.
- Where-to-make and what-to-make- or-buy decisions.
- Aligning overall organizational strategy with supply strategy.
- It is for long term and needs resource commitment.

[edit] Tactical

- Sourcing contracts and other purchasing decisions.
- Production decisions, including contracting, scheduling, and planning process definition.
- Inventory decisions, including quantity, location, and quality of inventory.
- Transportation strategy, including frequency, routes, and contracting.
- Benchmarking of all operations against competitors and implementation of best practices throughout the enterprise.
- Milestone payments.
- Focus on customer demand.

[edit] Operational

- Daily production and distribution planning, including all nodes in the supply chain.
- Production scheduling for each manufacturing facility in the supply chain (minute by minute).
- Demand planning and forecasting, coordinating the demand forecast of all customers and sharing the forecast with all suppliers.
- Sourcing planning, including current inventory and forecast demand, in collaboration with all suppliers.
- Inbound operations, including transportation from suppliers and receiving inventory.
- Production operations, including the consumption of materials and flow of finished goods.
- Outbound operations, including all fulfillment activities, warehousing and transportation to customers.
- Order promising, accounting for all constraints in the supply chain, including all suppliers, manufacturing facilities, distribution centers, and other customers

Supply chain management

Organizations increasingly find that they must rely on effective supply chains, or networks, to compete in the global market and networked economy.[6] In Peter Drucker's (1998) new management paradigms, this concept of business relationships extends beyond traditional enterprise boundaries and seeks to organize entire business processes throughout a value chain of multiple companies.

During the past decades, globalization, outsourcing and information technology have enabled many organizations, such as Dell and Hewlett Packard, to successfully operate solid collaborative supply networks in which each specialized business partner focuses on only a few key strategic activities (Scott, 1993). This inter-organizational supply network can be acknowledged as a new form of organization. However, with the complicated interactions among the players, the network structure fits neither "market" nor "hierarchy" categories (Powell, 1990). It is not clear what kind of performance impacts different supply network structures could have on firms, and little is known about the coordination conditions and trade-offs that may exist among the players. From a systems perspective, a complex

network structure can be decomposed into individual component firms (Zhang and Dilts, 2004). Traditionally, companies in a supply network concentrate on the inputs and outputs of the processes, with little concern for the internal management working of other individual players. Therefore, the choice of an internal management control structure is known to impact local firm performance (Mintzberg, 1979).

In the 21st century, changes in the business environment have contributed to the development of supply chain networks. First, as an outcome of globalization and the proliferation of multinational companies, joint ventures, strategic alliances and business partnerships, significant success factors were identified, complementing the earlier "Just-In- Time", "Lean Manufacturing" and "Agile Manufacturing" practices.[7] Second, technological changes, particularly the dramatic fall in information communication costs, which are a significant component of transaction costs, have led to changes in coordination among the members of the supply chain network (Coase, 1998).

Many researchers have recognized these kinds of supply network structures as a new organization form, using terms such as "Keiretsu", "Extended Enterprise", "Virtual Corporation", "Global Production Network", and "Next Generation Manufacturing System".[8] In general, such a structure can be defined as "a group of semi-independent organizations, each with their capabilities, which collaborate in ever-changing constellations to serve one or more markets in order to achieve some business goal specific to that collaboration" (Akkermans, 2001).

The security management system for supply chains is described in ISO/IEC 28000 and ISO/IEC 28001 and related standards published jointly by ISO and IEC.

[edit] Developments in Supply Chain Management

Six major movements can be observed in the evolution of supply chain management studies: Creation, Integration, and Globalization (Lavassani et al., 2008[a]), Specialization Phases One and Two, and SCM 2.0.

1. Creation Era

The term supply chain management was first coined by a U.S. industry consultant in the early 1980s. However, the concept of a supply chain in management was of great importance long before, in the early 20th century, especially with the creation of the assembly line. The characteristics of this era of supply chain management include the need for large-scale changes, re-engineering, downsizing driven by cost reduction programs, and widespread attention to the Japanese practice of management.

2. Integration Era

This era of supply chain management studies was highlighted with the development of Electronic Data Interchange (EDI) systems in the 1960s and developed through the 1990s by the introduction of Enterprise Resource Planning (ERP) systems. This era has continued to develop into the 21st century with the expansion of internet-based collaborative systems. This era of supply chain evolution is characterized by both increasing value-adding and cost reductions through integration.

3. Globalization Era

The third movement of supply chain management development, the globalization era, can be characterized by the attention given to global systems of supplier relationships and the expansion of

supply chains over national boundaries and into other continents. Although the use of global sources in the supply chain of organizations can be traced back several decades (e.g., in the oil industry), it was not until the late 1980s that a considerable number of organizations started to integrate global sources into their core business. This era is characterized by the globalization of supply chain management in organizations with the goal of increasing their competitive advantage, value-adding, and reducing costs through global sourcing.

4. Specialization Era—Phase One: Outsourced Manufacturing and Distribution

In the 1990s industries began to focus on "core competencies" and adopted a specialization model. Companies abandoned vertical integration, sold off non-core operations, and outsourced those functions to other companies. This changed management requirements by extending the supply chain well beyond company walls and distributing management across specialized supply chain partnerships.

This transition also re-focused the fundamental perspectives of each respective organization. OEMs became brand owners that needed deep visibility into their supply base. They had to control the entire supply chain from above instead of from within. Contract manufacturers had to manage bills of material with different part numbering schemes from multiple OEMs and support customer requests for work -in-process visibility and vendor-managed inventory (VMI).

The specialization model creates manufacturing and distribution networks composed of multiple, individual supply chains specific to products, suppliers, and customers who work together to design, manufacture, distribute, market, sell, and service a product. The set of partners may change according to a given market, region, or channel, resulting in a proliferation of trading partner environments, each with its own unique characteristics and demands.

5. Specialization Era—Phase Two: Supply Chain Management as a Service

Specialization within the supply chain began in the 1980s with the inception of transportation brokerages, warehouse management, and non- asset-based carriers and has matured beyond transportation and logistics into aspects of supply planning, collaboration, execution and performance management.

At any given moment, market forces could demand changes from suppliers, logistics providers, locations and customers, and from any number of these specialized participants as components of supply chain networks. This variability has significant effects on the supply chain infrastructure, from the foundation layers of establishing and managing the electronic communication between the trading partners to more complex requirements including the configuration of the processes and work flows that are essential to the management of the network itself.

Supply chain specialization enables companies to improve their overall competencies in the same way that outsourced manufacturing and distribution has done; it allows them to focus on their core competencies and assemble networks of specific, best-in-class partners to contribute to the overall value chain itself, thereby increasing overall performance and efficiency. The ability to quickly obtain and deploy this domain-specific supply chain expertise without developing and maintaining an entirely unique and complex competency in house is the leading reason why supply chain specialization is gaining popularity.

Outsourced technology hosting for supply chain solutions debuted in the late 1990s and has taken root primarily in transportation and collaboration categories. This has progressed from the Application

Service Provider (ASP) model from approximately 1998 through 2003 to the On-Demand model from approximately 2003-2006 to the Software as a Service (SaaS) model currently in focus today.

6. Supply Chain Management 2.0 (SCM 2.0)

Building on globalization and specialization, the term SCM 2.0 has been coined to describe both the changes within the supply chain itself as well as the evolution of the processes, methods and tools that manage it in this new "era".

Web 2.0 is defined as a trend in the use of the World Wide Web that is meant to increase creativity, information sharing, and collaboration among users. At its core, the common attribute that Web 2.0 brings is to help navigate the vast amount of information available on the Web in order to find what is being sought. It is the notion of a usable pathway. SCM 2.0 follows this notion into supply chain operations. It is the pathway to SCM results, a combination of the processes, methodologies, tools and delivery options to guide companies to their results quickly as the complexity and speed of the supply chain increase due to the effects of global competition, rapid price fluctuations, surging oil prices, short product life cycles, expanded specialization, near-/far- and off-shoring, and talent scarcity.

SCM 2.0 leverages proven solutions designed to rapidly deliver results with the agility to quickly manage future change for continuous flexibility, value and success. This is delivered through competency networks composed of best-of-breed supply chain domain expertise to understand which elements, both operationally and organizationally, are the critical few that deliver the results as well as through intimate understanding of how to manage these elements to achieve desired results. Finally, the solutions are delivered in a variety of options, such as no-touch via business process outsourcing, mid-touch via managed services and software as a service (SaaS), or high touch in the traditional software deployment model.

[edit] Supply chain business process integration

Successful SCM requires a change from managing individual functions to integrating activities into key supply chain processes. An example scenario: the purchasing department places orders as requirements become known. The marketing department, responding to customer demand, communicates with several distributors and retailers as it attempts to determine ways to satisfy this demand. Information shared between supply chain partners can only be fully leveraged through process integration.

Supply chain business process integration involves collaborative work between buyers and suppliers, joint product development, common systems and shared information. According to Lambert and Cooper (2000), operating an integrated supply chain requires a continuous information flow. However, in many companies, management has reached the conclusion that optimizing the product flows cannot be accomplished without implementing a process approach to the business. The key supply chain processes stated by Lambert (2004) [9] are:

- Customer relationship management
- Customer service management
- Demand management
- Order fulfillment
- Manufacturing flow management

- Supplier relationship management
- Product development and commercialization
- Returns management

Much has been written about demand management. Best-in-Class companies have similar characteristics, which include the following: a) Internal and external collaboration b) Lead time reduction initiatives c) Tighter feedback from customer and market demand d) Customer level forecasting

One could suggest other key critical supply business processes which combine these processes stated by Lambert such as:

- Customer service management
- Procurement
- Product development and commercialization
- Manufacturing flow management/support
- Physical distribution
- Outsourcing/partnerships
- Performance measurement

a) Customer service management process

Customer Relationship Management concerns the relationship between the organization and its customers. Customer service is the source of customer information. It also provides the customer with real-time information on scheduling and product availability through interfaces with the company's production and distribution operations. Successful organizations use the following steps to build customer relationships:

- determine mutually satisfying goals for organization and customers
- establish and maintain customer rapport
- produce positive feelings in the organization and the customers

b) Procurement process

Strategic plans are drawn up with suppliers to support the manufacturing flow management process and the development of new products. In firms where operations extend globally, sourcing should be managed on a global basis. The desired outcome is a win- win relationship where both parties benefit, and a reduction in time required for the design cycle and product development. Also, the purchasing function develops rapid communication systems, such as electronic data interchange (EDI) and Internet linkage to convey possible requirements more rapidly. Activities related to obtaining products and materials from outside suppliers involve resource planning, supply sourcing, negotiation, order placement, inbound transportation, storage, handling and quality assurance, many of which include the

responsibility to coordinate with suppliers on matters of scheduling, supply continuity, hedging, and research into new sources or programs.

c) Product development and commercialization

Here, customers and suppliers must be integrated into the product development process in order to reduce time to market. As product life cycles shorten, the appropriate products must be developed and successfully launched with ever shorter time-schedules to remain competitive. According to Lambert and Cooper (2000), managers of the product development and commercialization process must:

- coordinate with customer relationship management to identify customer- articulated needs;
- select materials and suppliers in conjunction with procurement, and
- develop production technology in manufacturing flow to manufacture and integrate into the best supply chain flow for the product/market combination.

d) Manufacturing flow management process

The manufacturing process produces and supplies products to the distribution channels based on past forecasts. Manufacturing processes must be flexible to respond to market changes and must accommodate mass customization. Orders are processes operating on a just-in-time (JIT) basis in minimum lot sizes. Also, changes in the manufacturing flow process lead to shorter cycle times, meaning improved responsiveness and efficiency in meeting customer demand. Activities related to planning, scheduling and supporting manufacturing operations, such as work-in- process storage, handling, transportation, and time phasing of components, inventory at manufacturing sites and maximum flexibility in the coordination of geographic and final assemblies postponement of physical distribution operations.

e) Physical distribution

This concerns movement of a finished product/service to customers. In physical distribution, the customer is the final destination of a marketing channel, and the availability of the product/service is a vital part of each channel participant's marketing effort. It is also through the physical distribution process that the time and space of customer service become an integral part of marketing, thus it links a marketing channel with its customers (e.g., links manufacturers, wholesalers, retailers).

f) Outsourcing/partnerships

This is not just outsourcing the procurement of materials and components, but also outsourcing of services that traditionally have been provided in-house. The logic of this trend is that the company will increasingly focus on those activities in the value chain where it has a distinctive advantage, and outsource everything else. This movement has been particularly evident in logistics where the provision of transport, warehousing and inventory control is increasingly subcontracted to specialists or logistics partners. Also, managing and controlling this network of partners and suppliers requires a blend of both central and local involvement. Hence, strategic decisions need to be taken centrally, with the monitoring and control of supplier performance and day-to-day liaison with logistics partners being best managed at a local level.

g) Performance measurement

Experts found a strong relationship from the largest arcs of supplier and customer integration to market share and profitability. Taking advantage of supplier capabilities and emphasizing a long-term supply chain perspective in customer relationships can both be correlated with firm performance. As logistics competency becomes a more critical factor in creating and maintaining competitive advantage, logistics measurement becomes increasingly important because the difference between profitable and unprofitable operations becomes more narrow. A.T. Kearney Consultants (1985) noted that firms engaging in comprehensive performance measurement realized improvements in overall productivity. According to experts, internal measures are generally collected and analyzed by the firm including

- Cost
- Customer Service
- Productivity measures
- Asset measurement, and
- Quality.

External performance measurement is examined through customer perception measures and "best practice" benchmarking, and includes 1) customer perception measurement, and 2) best practice benchmarking.

Components of Supply Chain Management are as follows: 1. Standardization 2. Postponement 3. Customization

6.3 NC Center for Global Logistics

See document: default.aspx

(AEROTROPOLIS) - Center for Global Logistics

Center for Global Logistics

The North Carolina Center for Global Logistics is a resource provider of logistics education and training furnished by a collaborative arrangement with community colleges, four-year colleges and universities. The initiative will be strengthened by the participation of businesses and industries in the 12-county Piedmont Triad Region. Having training resources and industry expertise “under one roof” will strengthen the regions existing logistics and distribution infrastructure and assist with marketing and recruitment of new enterprises.

THE CENTER – The Center will be housed in a new 80,000 sf $20 million dollar facility located at Guilford Technical Community College’s new Northwest Campus in Guilford County. Building design and infrastructure projects are in the planning stages on the 100-acre campus for the new facility targeted for completion in 2012.

Through a collaborative public/private partnership between regional educational institutions, the center will provide a state-of-the-art industry clearinghouse for inquiries, education, outreach and research. Services to be offered at the center include; logistics and supply chain education for both new students, businesses and continuing education; research programs and consulting as well as logistics conference capabilities. A state-of-the-art teaching warehouse will also be located within the center building.

INSTITUTIONS – The following institutions have indicated a strong commitment to the success of the Global Logistics Center: Elon University, High Point University, UNCG, Wake Forest University, Winston-Salem State University, N.C. A&T State University, UNC School of the Arts, Bennett College, Greensboro College, Guilford College, Salem College, Davidson County Community College, Guilford Technical Community College, Forsyth Technical Community College, Randolph Community College, Rockingham Community College, Piedmont Community College, Montgomery Community College and Surry Community College.

INDUSTRY COLLABORATION – In addition to the membership of the regional Logistics & Distribution Roundtable, the following companies have been instrumental in collaborating with the participating educational institutions in developing the model for the Center: Old Dominion Freight Line, Epes Logistics, Tyco Electronics, Volvo Logistics, Fastenal and Polo Ralph Lauren.

GLOBAL LOGISTICS TECHNOLOGY GOALS:

- Provide qualified supply chain & logistics employees to regional industries.
- Grow industry involvement in education.
- Grow the breadth and technology of the program.
- Add more and varied curriculum options such as in-depth warehousing and distribution.
- Meet the needs of area professionals who want to expand their career with certificate and degree programs.
- Establish Articulation agreements with participating educational institutions which will provide students the opportunity to progress from certificates to advanced degrees in supply chain/logistics. These articulations are in the developmental stage.

With the cooperation of the regions 20 institutions of higher education in collaboration with the regions industrial partners, this center will be unlike any facility that currently exists. The NC Center for Global Logistics will be a cornerstone of the regions logistics and supply chain efforts.

6.3.1 PTP Distribution & Logistics

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Logistics & Distribution

The Piedmont Triad's strategic location, extensive transportation infrastructure and supply-chain support capabilities combine to make the 12-county region a preferred location for logistics and distribution operations. In addition to the ideal East Coast location at the intersection of several major interstates within the region, other logistics and transportation resources significantly facilitate operations in this field.

Transit Times via Interstates from the Piedmont Triad

Piedmont Triad International Airport makes air cargo service a central component of the region's supply-chain cluster. The FedEx Mid-Atlantic Hub opened at the airport in 2009, and will significantly increase the 160-million pounds of freight currently processed each year at the facility. At full capacity, the one-million square foot facility will be capable of sorting 24,000 packages per hour, and will be served by 20-25 aircraft each weekday. The FedEx Hub will also ease stress on high-technology life science operations, giving an edge to companies that express ship low-weight, high-value products.

Rail service is provided by Norfolk Southern, CSX Transportation and several short line companies. Norfolk Southern operates a north-south mainline that connects the Northeast and Midwest to Atlanta via Greensboro. The company runs an intermodal terminal in Greensboro and a bulk transfer terminal in Winston-Salem. CSX operates a rail-to-truck TRANSFLOSM transloading facility in Winston-Salem.

Rail Lines and Major Ports

Third-party logistics companies, major distribution centers and warehouses, and a large concentration of trucking firms in the region also provide support. Nine percent of the region's workforce, more than 58,000 workers, is employed in the Logistics and Distribution industry.

The industry also benefits from relevant programs of study at the region's educational institutions. Four-year colleges and universities offer business and economics courses along with transportation and supply-chain management, global trade and international business. Community colleges offer programs that include global logistics technology, truck driver training, aviation management, and heavy equipment and transport technology. Our community colleges offer customized training through the North Carolina Department of Commerce's New and Expanding Industry Training programs. Services are made available to companies that create 12 or more new jobs in any one North Carolina community during a one-year period.