Correlating Industry Trends to the Engineering Curriculum

Jaime Alava
Lehigh University

Andrew J. Stewart
Lehigh University

Keith Gardiner
Lehigh University

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Jaime Alava, Lehigh University Class of 2011

Andrew Stewart, Lehigh University Class of 2011

Industrial and Systems Engineering Department

Abstract

Higher level education establishments need to study industry trends and incorporate sought-after skills into their curriculum. The result will be the advancement of their engineering programs to benefit graduates by gaining for them the best job placement opportunities. While many colleges already claim to do just this, trends are always changing. The skills required in emerging industry sectors are constantly evolving. In recent years, the economic downturn has stifled manufacturing growth and left many college graduates jobless upon graduation. However, this trend is reversing and the unemployment rate is falling again as more job openings are becoming available. Graduates must be adequately prepared to gain employment over the competing candidates, many of whom come from overseas technical institutes. Specialization is one of the premier methods for distinguishing oneself from the competition. Through studying emerging fields that offer significant job placement, an establishment can tailor programs to fit these industry needs. CNBC has revealed that among the top 5 most in-demand jobs in the country are two often fielded by engineers; health care and information technology. Lehigh University already has a strong program in industrial engineering and information and systems engineering; however that does not mean those heading the department should become complacent with the status-quo. As technology advances, the university must prepare students to be confident with new systems and know how to create and use them properly. Concerning health care, Lehigh currently does not offer an undergraduate engineering degree in some form of health care study, but it was recently decided that a graduate degree in engineering dealing with health care will now be offered to students. This is certainly a step in the right direction as academic institutions adapt their available majors to accommodate the growing fields in industry, and ultimately it appears that an undergraduate degree such as this would also be beneficial. Academic institutions must maintain clear understanding of the industry sectors that are experiencing the most growth and expansion. This will place academic institutions in a position to best match the required skills for those sectors with course offerings that will best suit new job applicants and employees.

Fortune 1000 Data

Data was gathered through Fortune 1000, a list maintained by the magazine Fortune that ranks the 1000 largest public corporations with United States headquarters by revenue. Revenue and employment figures are discussed; but the list also keeps track of profits, assets, stockholder's equity, market value, earnings per share and total return to investors. Data was analyzed from 1996 to 2009 to project the characteristics of the future work force and the industry sector leading the work force. In 2006, Lehigh University professor and director Keith Gardiner collected and analyzed Fortune 1000 data from 1996 to 2004 in a paper titled "Manufacturing: The Future", which was presented at the 16th National Manufacturing Week in Chicago.[i] Three years later, Scott Pender and Andrew Foote followed a similar methodology for gathering the 2005 through 2007 figures. They titled their paper "The Evolution of US Industry & Manufacturing" which was presented at the American Society of Engineering Education in 2009.[ii] This paper analyzes the most up-to-date and available data which includes revenue and employment data for 2008 and 2009. It was not possible to include data for 2010 because it was not available when this report was being prepared in late April 2011.

Table's 1 and 2 were used to organize 2008 and 2009 Fortune 1000 data into the chemical, mechanical, electronics/communication, other, and financial industry sectors. Each of the five sectors contained categories unique to the respective industry, each made up of individual firms. It is important to note that categories can be

created and destroyed from year-to-year. The "Textiles" category, part of the "Other" industry sector, was discontinued in 2005. In most cases, the categories disappear, but not the firms. The firms in the "Industrial and Farm Equipment" category, part of the "Mechanical" industry sector, were moved to two newly created categories in 2009, "Industrial Machinery" and "Construction and Farm Equipment". This helps to partially explain why manufacturing employment has decreased over time. It may not be due to layoffs or manufacturing firms going out of business instead, manufacturing firms that may have once been considered goods-producing business enterprises are now part of the service industry. General Electric, for example, is considered a "Diversified Financial" by Fortune and was categorized as so for our data collection purposes. During the 1960's, GE was one of many primarily "electrical" manufacturing enterprises, which also included IBM (now ranked among "Information Technology Services" according to Fortune's list).

Table's 4 and 5 are aggregated data by the five industry sectors from 1996 to 2009, most of which was collected by Keith Gardiner, Scott Pender, and Andrew Foote. The aggregated Fortune 1000 revenue table is adjusted for Cost of Living (COLA)—the figures are plotted on Graph 1. COLA is used to adjust Social Security benefits and is based on increases in the Consumer Price Index for Urban Wage Earners and Clerical Workers.[iii] It is important to note that COLA is a formulaic invention that is notorious for being inaccurate because it does not include factors such as energy, but it does cover food and household products. Fortune 1000 employment data was also collected, graphed, and analyzed for trends. Graph 2 shows the aggregated employment data by industry sectors; while Graph 3 contains total manufacturing figures only, which excludes the financial sector figures of employment.

Selected Companies

Table 3 compares the most recently available revenues, 2009, for selected companies against the figures for 1996 and 1975 corrected for COLA and expresses these as a ratio. This metric serves as a measure of growth, in terms of revenue, over a 34 and 13 year period. (For example, a revenue ratio of 2 simply means that revenue, in constant dollars, has doubled)

Hewlett-Packard Company had an impressive revenue ratio of 33.5 from 1975 to 2009, and maintained a high ratio of 2.7 from 1996 to 2009. It is important to understand that the ratios do not consider factors, such as mergers and acquisitions, which may skew the actual state of the company. Like most profitable companies, H-P has grown rapidly by leveraging this corporate strategy. For example, H-P acquired Compaq in 2002 for $25 billion and Palm in 2010 for US$1.2 billion, giving H-P access to the smart phone market.[iv] [v]

The 1980's was a time when computer, integrated circuit, and microprocessor technology boomed; paving the way for newly formed Intel, Microsoft, Dell, and Apple. The companies have managed steady growth in the past 20 years due, in part, to society's dependence on the internet and the increasing demand for faster and more efficient technology. Apple has seen incredible growth since its Initial Public Offering on December 12, 1980. [vi] The company's name in 1983 was Apple Computer, Inc, a time when their revenue was a mere $582 million. The company culture and philosophy, along with its distinctive marketing techniques and innovative products brought about an impressive revenue ratio of 26 from 1983 to 2009. The destruction of their competition has even attracted attention from the Justice Department and the Federal Trade Commission. In February, 2011, antitrust officials investigated the terms Apple uses towards companies who sell their content on Apple's products. [vii] But these small bumps on the road have done everything but never slowed sales on their most popular products. The 9.0 magnitude earthquake and tsunami that destroyed the coast of Japan on March 2011 had minimal impact on the supply chain and lead time of the iPad 2 and iPhone 4. Sales of the iPad 2 surged as 632 people waited 33 hours outside of London's Regent Street, trumping the numbers recorded for its predecessor. [viii]

H-P and Apple are giants and part of the electronics/communications industry sector, one of the five sectors created for the purpose of this paper. We can see from the Fortune revenue and employment graphs that the industry has shown stable growth for the past 13 years. The only exception occurred between 1995 and 2000

during the dot-com bubble when the NASDAQ peaked at 5132.52 points on March 10, 2000. Only nine months passed when the Dow Jones Internet Index, made up of dot-com blue chips, dropped more than 70% forcing many internet start-ups to go out of business. [ix] Graph 2 proves that this is the industry sector that employs the most workers; and like the all of the sectors, there appears to be steady growth.

Not a single company explored has seen a decrease in revenue since 1975. The automakers Ford Motor Company and General Motors have amongst the lowest ratios since 1996; the companies suffered deficits of 0.8 and 0.6 respectively. The automotive crisis of the 2008-2009 recession affected the American and global automobile manufacturing industry which ultimately led to the bailouts of both General Motors and Chrysler. A decline in car sales forced many car manufacturers to sell many of their once valuable brands. GM sold Saab and discontinued the Pontiac, Saturn, and Hummer brands. Chrysler followed suit in 2008 discontinuing the Dodge Durango and the PT Cruiser, the North American Car of the Year in 2001. [x]

The mechanical sector, led by the aerospace corporation Boeing and the car manufacturers are projected to see steady growth. The car industry has seen an abundance of new electric and hybrid vehicles caused by an increase in gas prices and the availability of tax credits. Supporters of this new and clean technology include Nissan Motor Company who believes 10% of vehicles sold worldwide will be fully electric. [xi] Ford see's a profitable future in hybrids; since all-electric vehicles are expensive, have a long charging cycle, and result in short miles per charge. Even BMW and Mercedes have started to dip into the electric vehicle market, launching a hybrid version of their 7-series and S-class respectively. [xii]

Exxon Mobil was named America's largest company in 2009 on Fortune 1000's list. Will their unrivaled success last? Exxon Mobil certainly believes so and is willing to invest all of its resources because it is certain of one thing: oil, gas, and coal will remain the world's dominant energy sources for decades to come. [xiii] It is a common theme believed by all the big oil companies. Their television advertisements and other forms of marketing deceive the customer, telling them only what they want to hear. But in fact, investment in alternative fuels is a small fraction compared to what is spent on their oil ventures. A recent article details how Exxon "announced a $600 million partnership to develop next-generation biofuels from algae", but their crude oil investments are in billions of dollar. [xiv] Since 2004, Shell allocated $87 billion on oil and gas development and a mere $1.7 billion on alternative energy research. [xv] Royal Dutch Shell announced in 2009 that it would stop its wind, solar, and hydrogen research. In 2001 BP started their "Beyond Petroleum" campaign after merging with Amoco. While the catchy slogan is still used today, their effort to move away from the profitable prices of oil is slowly fading. The US Department of Energy reported an average national gas price of $3.562 during the third week of March, 2011. Hawaii became the first state to reach the $4 threshold, passing California and Alaska whose averages are $3.96 and $3.90 respectively. It is basic economics; the demand for gasoline is very inelastic, especially in the short-run. What will happen to the mechanical industry, especially auto manufacturing, when the average American has to spend $100 dollars to fill their tank? Fossil fuels like gas will surely not disappear but companies' business strategies will need to change and accommodate the new pricing structures that are foreseen. Present-day energy conglomerates have a plan to stay ahead in the future, and investors can expect to see the ball begin to roll in new directions with companies like Exxon.

Graph 3 displays total manufacturing employment derived from Fortune 1000 data which amalgamates the four industry sectors and omits the financial services sector figures. Note that is for companies with US HQ addresses and includes foreign-based employees also. The dot-com bubble is again evident in this graph since the electronics/communications industry has the most weight when creating the aggregate graph. The trend is comparable, at least from 1996 to 2006, to the United States unemployment rate trend shown in Graph 4. In 2006, the national unemployment rate dropped to 4.6% and sharply increased to 9.3% in 2009, due to the 2008-2009 recession. The trend did not agree with the total manufacturing employment data collected; which actually increased or remained stable from 2006 to 2009. The data shows that manufacturing is on the track to steady employment growth in the foreseeable future, but this does not explain why the unemployment rate is rising.

One particular industry that was hit hard by the 2008-2009 recession was the financial services industry, which includes commercial banks and insurance companies. The future of the financial industry is blurry as new government legislation changes the way firms do business. President Barack Obama passed the credit card overhaul bill on May 22, 2009 to restrict the use of high interest rates and fees on credit card companies. [xvi]The health-care reform is another issue that could greatly affect many service industries including insurance companies. Currently, the private insurance industry spends 83 cents for every premium dollar they receive. Net, after-tax income is a mere 4.1% as a percentage of revenue. [xvii]There is speculation that the reform will bring an issue of "public option" that allows the government to offer an insurance plan that competes with those offered by insurance companies, resulting in even lower profits.

The stability of manufacturing is backed by the demand for jobs in the field, most of which include some form of engineering. The National Association of Colleges and Employers found that 8 of the top best-paid majors are in the applied sciences and are expected to grow at a fast clip over the next eight years with 178,300 jobs added by 2018. [xviii] Although it will require many more jobs to be added to account for the millions of jobs lost, engineering jobs are growing at a faster rate than liberal arts majors and other non-engineering majors. Among some of the top growing sectors in terms of job opportunities, Health Care establishments are experiencing an increase of 40% in job listings from last year. It was also not as affected by the recession as most other sectors, and the current growth is expected to continue well into the future. Lehigh University has recently passed a motion to install a possible Master's degree in health care engineering; medical engineering was previously unchartered territory in the Lehigh engineering college. While an undergraduate degree in this direction of study has yet to be talked of, this data is in strong support that such a degree would be strongly supported by graduate job placement. Up 75% in November 2010 from January 2010, the information technology sector is growing at a rapid rate and is predicted to continue to do so. Lehigh University already features a strong Industrial and Information and Systems Engineering program, and this increase in job placement serves as reinforcement to continue to invest in the program. Some of the jobs experiencing the most demand are network engineers, software engineers, and cloud computing specialists. The reasoning behind the growth is simple: as our society becomes more technologically involved through digital methods, the demand for people to help create and monitor these systems increases. Keith Gardiner described these fundamental manufacturing systems as entities providing concept implementation from design through realization of a product and completion of the lifecycle to satisfy the customer.[xix] The systems transform resources to solve problems, generate revenues, and sustain prosperity. The establishments enacting the most hiring in this sector include Amazon, General Dynamics, IBM, Microsoft, Northrop Grumman, SAIC. The ISE department at Lehigh University should look toward forming strong relationships with these companies in an effort to help graduates secure future jobs. [xx]

Global Fortune 500

Fortune magazine releases an annual ranking of the leading national and international businesses across all industry sectors. The aim of the release is to inform the general public which firms are currently witnessing the most success as is measured through annual revenues. After examining the 2008 and 2009 yearly revenues, the delta was computed to show which businesses have exhibited the most growth or shrinkage. A sample number of about thirty businesses of the Global Fortune 500 were selected to exemplify their industry sectors. Those chosen reside at the top of the list, ranked highest in terms of 2009 revenues. A second table shows businesses grouped by market sectors, isolating firms into chemical, communication, electric, financial, health services, mechanical, retail, and service areas. Table 6 is an excerpt from the highest grossing companies (Global).

There has been much controversy over the retail giant Wal-Mart, and how the company's effective monopoly has affected the other retail businesses around the globe, and most specifically those within the United States. According to some, Wal-Mart's ultra-competitive low prices have forced other players out of the retail game,

potentially destroying jobs for many Americans as those jobs are transferred overseas. Unemployment is to be considered when evaluating the positive or negative effects a business such as Wal-Mart has on the public. Many people are unfamiliar with how a company offering such low prices can negatively affect the job market; by controlling its suppliers Wal-Mart has forced many vendors to outsource production to overseas countries like China. If a vendor refuses to outsource, Wal-Mart simply finds a new vendor who will comply with its low-price demands. In just the past five years, Wal-Mart "has doubled its imports from China". [xxi]

Wal-Mart aside, the two industry sectors that dominate the Fortune list are chemical and mechanical businesses. The nature of the top chemical firms is directly linked to acquiring crude/refined oil and processing. The world has become undeniably dependent on fossil fuels to power our way of life, and with a finite supply of these resources, the chemical companies in control can charge a premium. This premium translates directly into massive revenues and profits that are unparalleled by most other industries.

The mechanical sector also features several companies atop Fortune's list, many of which have begun to undertake new methods for design and development of their products. For engineering students and especially industrial engineering students, this appears to be the area with the most promise for job placement and growth. Graph 5 summarizes a few performance aspects of the auto industry since 2007. [xxii]

Although the first noticeable trait is the clearly defined decrease in overall vehicles sold, the most important takeaway for engineering programs is the line signifying the increase in changes since the year 2007. It has long been known that the auto manufacturers became complacent with products and methods in the past, and were able to survive simply on the abundance of fossil fuels and economic booms. Now that the dust has settled, those manufacturers realize that they must make drastic changes to developmental efforts and product offerings if they wish to remain competitive and profitable in an evolving industry. Many manufacturers are adopting hybrid technologies and incorporating them into their most successful models in an attempt to stay even with the depletion of fossil fuels. For these reasons, engineers should be looking towards the auto industry for job placement above all other industries; the opportunities for innovation are ever-present as is the demand.

Bureau of Labor Statistics: Manufacturing Sector

Manufacturing is a subgroup of the goods-producing industries sector covered by the Bureau of Labor Statistics. A company that transforms raw materials into new products for sale is considered to be part of the manufacturing sector. This definition is given by the North American Industry Classification System (NAICS) referenced by the Bureau of Labor Statistics (BLS). The following are included subsectors for manufacturing: [xxiii]

- Food Manufacturing
- Beverage and Tobacco Product Manufacturing
- Textile Mills
- Textile Product Mills
- Apparel Manufacturing
- Leather and Allied Product Manufacturing
- Wood Product Manufacturing
- Paper Manufacturing
- Printing and Related Support Activities
- Petroleum and Coal Products Manufacturing
- Chemical Manufacturing
- Plastics and Rubber Products Manufacturing
- Nonmetallic Mineral Product Manufacturing
- Primary Metal Manufacturing

- Fabricated Metal Product Manufacturing
- Machinery Manufacturing
- Computer and Electronic Product Manufacturing
- Electrical, Appliance, and Component Manufacturing
- Transportation Equipment Manufacturing
- Furniture and Related Product Manufacturing
- Miscellaneous Manufacturing

The data in Graph 6 has been collected through employer surveys and national surveys. It clearly shows the effects of the economic recession on the manufacturing industry. With clear declines from 2008 to 2010, the job market for recent college graduates looking to enter the manufacturing sector was not promising. However, recent economic upturns have changed this situation to a more favorable one. These values featured in the above graph are all taken from the month of January in each respective year. Looking more closely, the overall number of employees in manufacturing increased by 32,000 for February and another 17,000 by March. Indicative of industry growth, the market for job opportunities continues to become more favorable for those seeking employment. The figure also shows how past employment numbers have far exceeded the current numbers; it should be noted that the U.S. has the infrastructure to support much larger industry employment than currently exists.

Recommendations

Academic institutions should look introspectively at the courses offered in various departments and compare the courses to growing industry sectors. If a given course falls in line with the skills needed in a major field, the course should be kept. Those courses that have become obsolete through technology advancements must cease to be offered in favor of other coursework. This will provide opportunities for new courses to be offered; specifically those educating students in soft skills. Due to technology, computers are now performing many of the functions that company employees would perform in the past. This transition in duties removes a degree of dependency on human technical skills and places more focus on interpersonal skills in the workplace. Some of these course offerings are already available at Lehigh, such as IE 382: Engineering Leadership and IE 334: Organizational Planning and Control. Courses such as these serve students in providing insight into what soft skills are valued in the workplace, and how to sharpen their networking and presenting skills. In a similar way, rudimentary homework assignments are better replaced by more group projects and reports. Projects and reports more closely mimic items that students are likely to work on in the field, while the simplicity of homework assignments seems to distract students from their actual academic goals related to their respective fields. The goal is to create a classroom environment that resembles the workplace. In addition, the classroom environment should be more focused on real life and global situations. International issues and conflicts are prevalent in our society, and the new technological world brings these countries closer to our border. It is essential to adapt the students' learning experiences to include the modern topics of today's world, and help trigger in depth analysis of global issues. A strong understanding of how to adapt to industry occupation from the classroom will allow domestic engineers to outperform foreign competition in the workplace. Furthermore, an in depth analysis of current topics will only strengthen students' perspectives and allow for a greater understanding of different options, inspirations, and obstacles.

Recommendations for Future Work

Our project began with the interest of employment statistics in an effort to understand industry trends. Throughout our research, we took an interest to which businesses were thriving and which were experiencing stagnating growth. This pointed us in the direction of researching the college degrees necessary to obtain employment with these thriving companies. In a roundabout way, we ended with a report that was focused on two separate entities; industry trends and company growth, and in-demand occupations and the necessary college degree to hold that position.

In the future, we believe that linking the two areas of research for our report would provide the backbone necessary to expand on the research. To enhance the link between these two topics, the specific occupations of the Fortune companies should be studied. Working from there, determine which college programs provide the best suited skills for taking on those occupations. Colleges and universities are ranked by national services, and often individual programs are ranked as well. Examining which schools experience significant job placement with these Fortune companies can also shed light on what defines a successful specialty program.

Another area of investigation may involve an introspective look into Lehigh University's specialty programs, and the engineering school. Comparing Lehigh's programs to other successful schools may lead to a shared learning experience resulting in improved programs for both institutions.

This report is only the tip of the iceberg, and with more time and resources there is a wealth of information that can lend itself to additional research.

Table 1: 2008 Fortune Manufacturing Industries by Categories/Sectors

Process Sectors	Industries (Fortune index)	#	Firms 2008	Rev $B 2008	Employ 2008	Total Employ	Total Revenue
CHEM	Beverages (6)		8	98	307,294		
	Food Products (23)		20	204	686,819		
	Food Production (24)		7	102	281,063		
	Chemicals (8)		40	268	515,454		
	Forest and Paper (26)		9	58	145,192		
	Household and Personal (34)		13	149	375,550		
	Petroleum Refining (51)		14	1,055	300,200		
	Pharmaceuticals (48)		21	284	625,414		
	Tobacco (61)	137	5	54	125,510	3,362,496	2,271
MECH	Aerospace and Defense (2)		16	333	1,143,198		
	Engineering Construction (19)		12	76	333,971		
	Homebuilders (30)		12	78	56,355		
	Motor Vehicles & Parts (42)		27	570	1,427,979		
	Home Equip, Furnishings		4	31	130,527		
	Industrial and Farm Equipment		36	241	808,176		
	Transportation Equipment (64)	111	4	18	54,405	3,954,611	1,348
ELEC	Information Technology Services (10)		10	166	844,858		
	Peripherals (11		5	29	89,957		
	Software (12)		8	89	215,633		
	Computers (13)		7	233	431,065		
	Network & Equip (43)		10	102	221,682		
	Electronic & Electrical (17)		15	80	414,638		
	Semiconductors (56)		23	139	334,613		
	Scientific & Controls (54)		8	45	166,300		
	Medical Products (39)	100	14	67	231,680	2,950,426	951
COM	Telecommunications (58)		22	397	936,926		
also inc.	GE	23	1	177	327,000	1,263,926	574
OTHER	Apparel (4)		11	55	218,316		
	Textiles (61)						
	Building Materials (7)		5	20	62,477		
	Metals (40)		17	118	252,218		
	Toys/sporting Goods (62)		2	10	36,885		
	Packaging & Containers (45)		18	78	257,898		
	Waste Management (67)		3	23	83,450		
	3M (miscellaneous)	65	9	51	184,070	1,095,314	354
Banking & Financial	Commercial Banks (9)		27	686	1,509,383		
	Diversified Financials (14)		17	413	629,578		
	Insurance (Life & Health) (34)		12	140	61,272		
	Insurance (Life & Health) (35)		15	174	169,715		
	Insurance (Property) (36)		4	72	80,346		
	Insurance (Property) (37)		32	514	768,425		
	Saving Institutions (53)		5	36	75,408		
	Securities (55)	132	20	368	259,309	3,553,436	2,404
	Grand Totals		568	7,902	16,180,209	16,180,209	7,902

Table 2: 2009 Fortune Manufacturing Industries by Categories/Sectors

Process Sectors	Industries (Fortune index)	#	Firms 2009	Rev $B 2009	Employ 2009	Total Employ	Total Revenue
CHEM	Beverages (6)		8	89	298,680		
	Food Products (23)		20	222	671,321		
	Food Production (24)		8	135	294,723		
	Chemicals (8)		40	292	517,098		
	Forest and Paper (26)		9	63	136,400		
	Household and Personal (34)		12	160	376,880		
	Petroleum Refining (51)		15	1,310	305,651		
	Pharmaceuticals (48)		21	305	606,611		
	Tobacco (61)	138	5	55	122,450	3,329,814	2,631
MECH	Aerospace and Defense (2)		20	353	1,205,329		
	Engineering Construction (19)		12	100	355,731		
	Homebuilders (30)		10	432	33,502		
	Motor Vehicles & Parts (42)		29	516	1,333,496		
	Home Equip, Furnishings		11	53	215,750		
	Industrial Machinery (35)		26	126	515,644		
	Construction and Farm Equip. (13)		11	131	305,212		
	Transportation (64)	123	4	17	46,230	4,010,894	1,727
ELEC	Information Technology Services (10)		10	155	748,842		
	Peripherals (11		5	33	115,387		
	Software (12)		10	109	251,068		
	Computers (13)		7	255	579,169		
	Network & Equip (43)		8	101	214,271		
	Electronic & Electrical (17)		17	90	430,236		
	Semiconductors (56)		26	143	446,015		
	Scientific & Controls (54)		8	47	166,200		
	Medical Products (39)	109	18	81	270,951	3,222,139	1,014
COM	Telecommunications (58)		21	402	909,864		
also inc.	GE	22	1	183	323,000	1,232,864	585
OTHER	Apparel (4)		11	57	208,968		
	Textiles (61)						
	Building Materials (7)		7	24	66,313		
	Metals (40)		12	124	219,767		
	Toys/sporting Goods (62)		2	10	34,900		
	Packaging & Containers (45)		18	82	255,400		
	Waste Management (67)		2	17	80,900		
	3M (miscellaneous)	60	8	48	168,173	1,034,421	363
Banking &	Commercial Banks (9)		28	725	1,676,739		
Financial	Diversified Financials (14)		11	278	452,602		
	Insurance (Life & Health) (34)		10	131	58,817		
	Insurance (Life & Health) (35)		19	148	186,896		
	Insurance (Property) (36)		4	71	81,634		
	Insurance (Property) (37)		29	350	745,965		
	Saving Institutions (53)		2	6	13,059		
	Securities (55)	117	14	66	156,459	3,372,171	1,776
	Grand Totals		569	8,095	16,202,303	16,202,303	8,095

Table 3: Ratio of Revenue for Major US Companies (Corrected for Cost of Living Adjustment)

Firm Sector	1975 to 2009	1996 to 2009
ELEC/COM		
GE	3.4	1.9
H-P	33.5	2.7
Intel	n/a	1.7
IBM	2.0	1.0
Motorola	5.5	0.8
MECH		
Boeing	4.1	2.2
Caterpillar	3.2	2.3
Deere	2.9	2.0
Ford	1.6	0.8
GM	2.9	0.6
Various		
Nucor	11.1	4.9
J & J	8.2	2.4
Merck	4.5	1.0
Pfizer	7.8	3.5
Exxon	2.6	2.9
Coca-Cola	3.2	1.3
DuPont	1.2	0.6
Others		
Dell	n/a	8.3
Microsoft	n/a	7.3
Apple	n/a	2.1

Table 4: Aggregated Fortune 1000 Revenue data by Industry Sector – 1996 - 2009

Fortune Manufacturing Industries Revenues by Sector - Actual 2009 $'s Billions

Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Finance	917	*1075*	*1125*	1358	1541	1511	1470	1478	1606	1692	2013	2228	2404	1776
Elec/Com	900	997	1027	1024	1434	1249	1120	1252	1322	1318	1393	1564	1524	1599
Chem	1284	1306	1184	1284	1432	1351	1293	1619	1761	2026	2160	2271	2271	2631
Mech	810	886	849	952	947	938	966	1040	1184	1266	1335	1348	1348	1727
Other	158	164	180	173	173	229	233	357	283	318	353	373	354	363
Tot. Mfg.	3152	3353	3241	3433	3985	3768	3613	4267	4549	4927	5242	5556	5498	6320

Fortune Manufacturing Industries Revenues by Sector - 2009 $'s Billions

Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Finance	1277	1467	1515	1785	1956	1870	1794	1766	1869	1891	2179	2357	2404	1776
Elec/Com	1254	1360	1383	1346	1820	1546	1367	1496	1539	1474	1508	1655	1524	1599
Chem	1789	1782	1595	1687	1818	1672	1578	1935	2049	2265	2338	2403	2271	2631
Mech	1128	1209	1144	1251	1202	1161	1179	1243	1378	1415	1445	1426	1348	1727
Other	220	223	243	227	219	283	285	426	329	356	382	394	354	363
Tot. Mfg.	4391	4575	4365	4511	5059	4663	4410	5101	5295	5509	5673	5878	5498	6320
COLA		1.4%	1.4%	1.3%	1.3%	1.3%	1.2%	1.2%	1.2%	1.2%	1.1%	1.1%	1.1%	0.0%

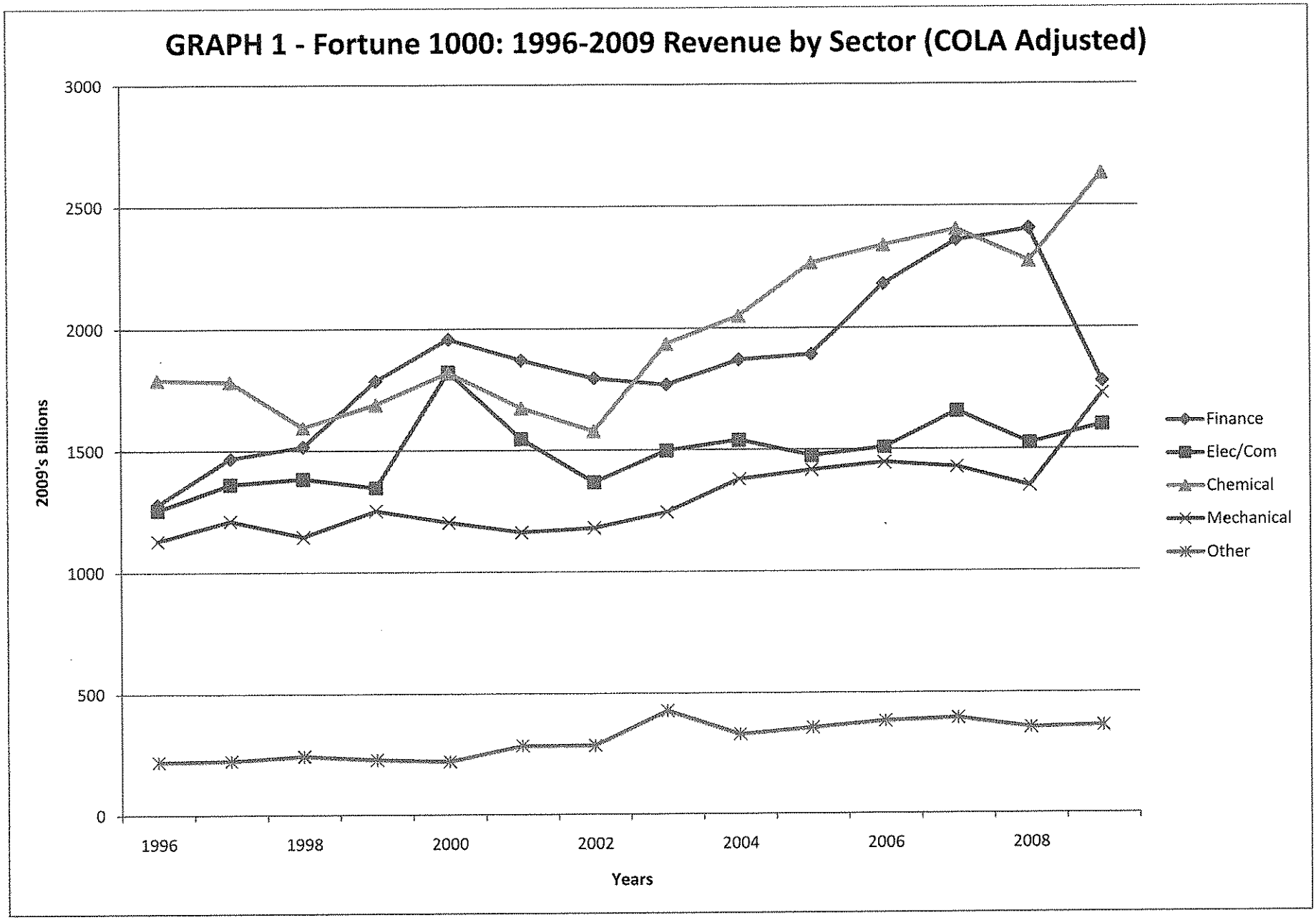
Table 5: Aggregated Fortune 1000 Employment data by Industry Sector – 1996 - 2009

Fortune Manufacturing Companies - Employees, Thousands

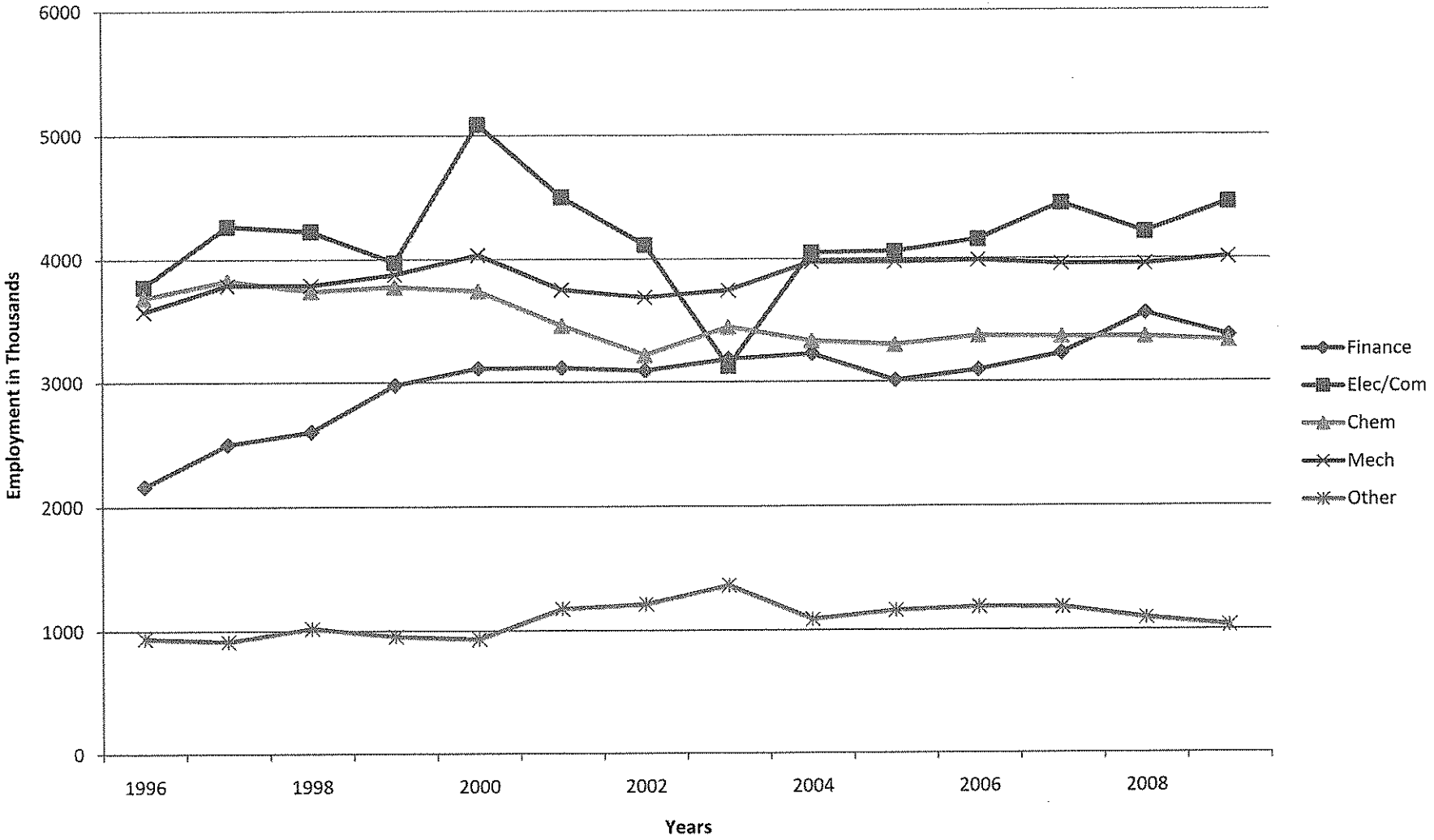
Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Finance	2159	*2500*	*2600*	2975	3112	3115	3091	3184	3226	3008	3092	3226	3553	3372
Elec/Com	3777	4267	4227	3974	5088	4501	4114	3125	4050	4058	4156	4445	4214	4455
Chem	3688	3829	3741	3778	3743	3460	3218	3445	3332	3300	3371	3362	3362	3330
Mech	3573	3789	3790	3876	4033	3752	3689	3746	3973	3973	3985	3955	3955	4011
Other	937	913	1020	953	931	1174	1210	1360	1086	1157	1183	1182	1095	1034
Tot. Mfg.	11975	12798	12778	12581	13795	12887	12231	11676	12441	12488	12695	12944	12627	12830

Table 6: Global Fortune 500 Revenue Data by Industry Sector

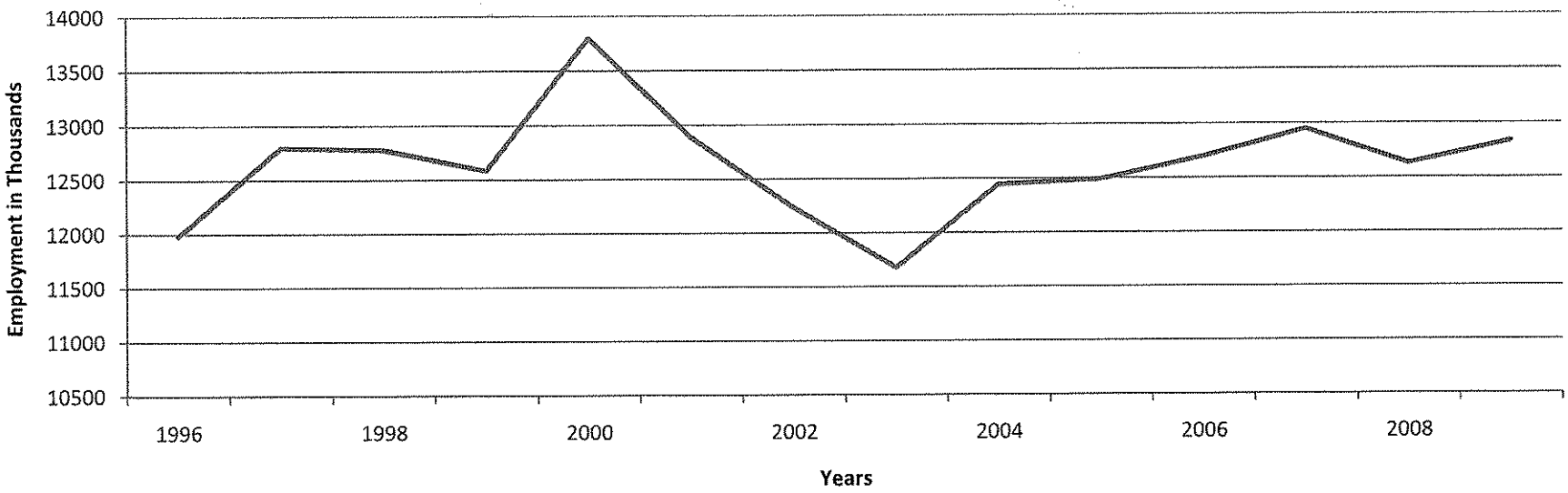
Fortune Global Rankings		2008	2009	2008-2009
By 2009 Revenues		Revenues	Revenues	Delta
Company	Industry	$B	$B	%
Wal-mart	Retail	378.8	405.6	7.08%
BP	Chem	291.4	367.1	25.95%
Exxon	Chem	372.8	442.9	18.78%
R Dutch/Shell	Chem	355.8	458.4	28.83%
GM	Mech	182.3	149.0	-18.30%
DaimlerChrysler	Mech	177.2	140.3	-20.79%
Toyota	Mech	230.2	204.4	-11.23%
Ford	Mech	172.5	146.3	-15.19%
GE	Elec*	176.7	183.2	3.71%


GRAPH 1 - Fortune 1000: 1996-2009 Revenue by Sector (COLA Adjusted)
3000
2500
2000
1500
1000
500
0
2009's Billions
1996
1998
2000
2002
2004
2006
2008
Years
Finance
Elec/Com
Chemical
Mechanical
Other

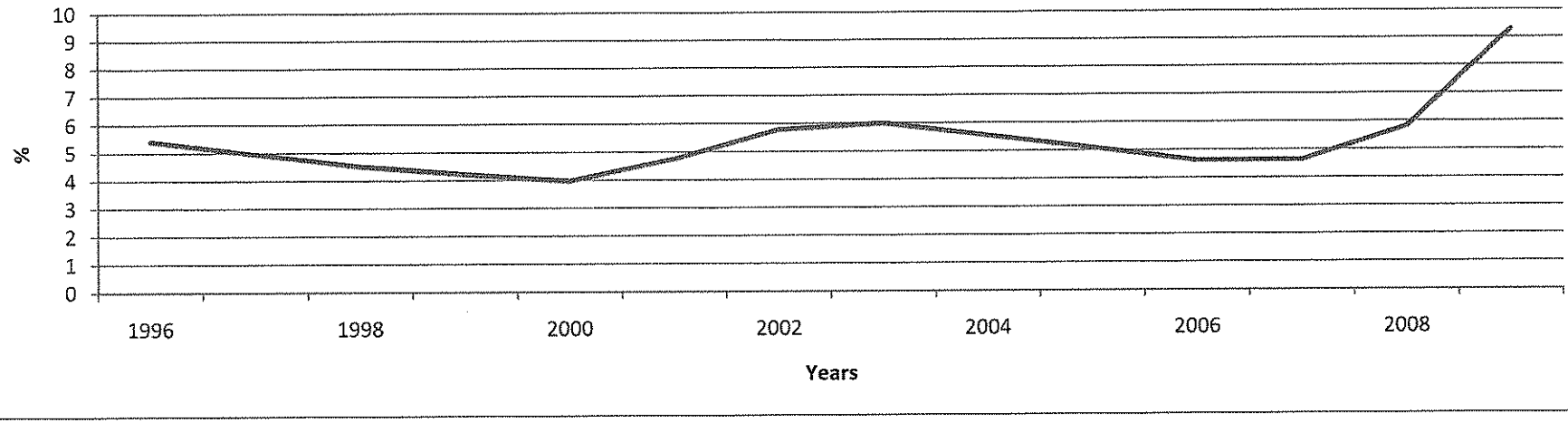
GRAPH 2 - Fortune 1000: 1996-2009 Employment by Sector



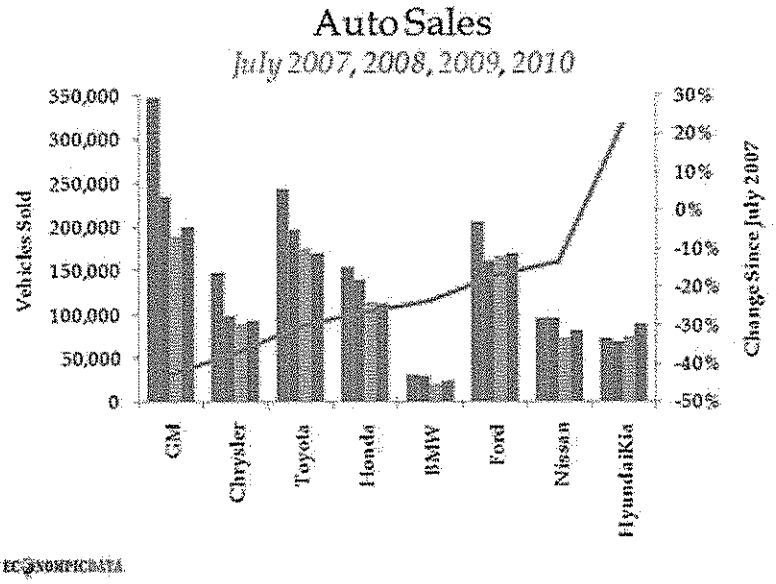
GRAPH 3 - Fortune 1000: 1996-2009 Total Manufacturing Employment

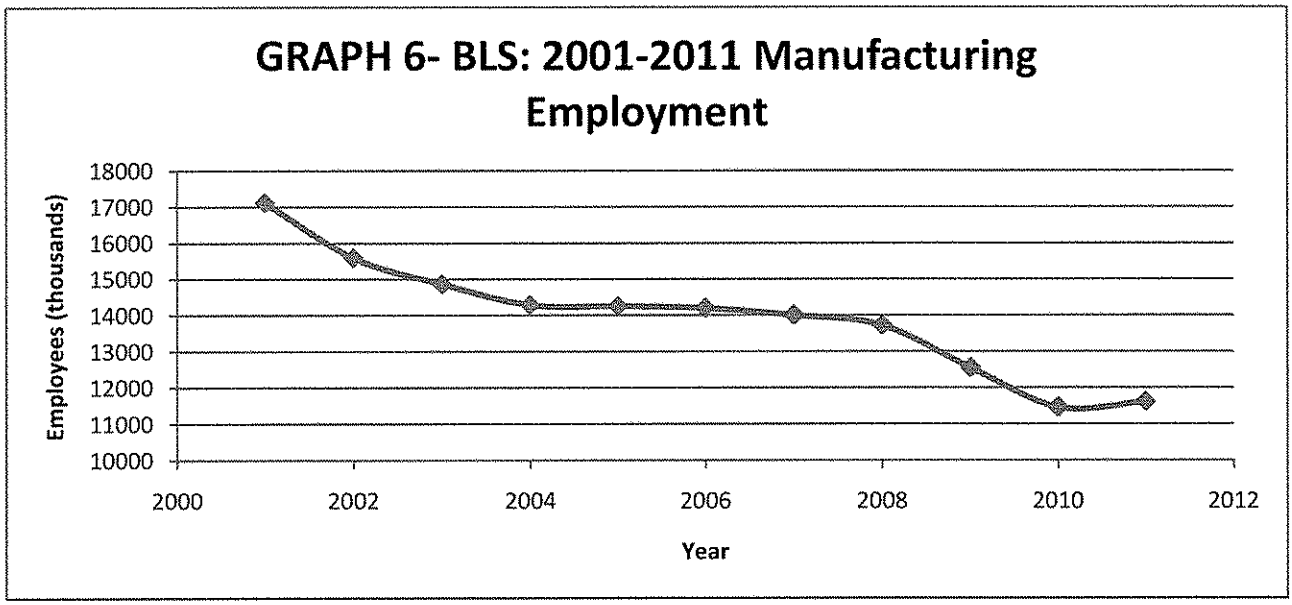


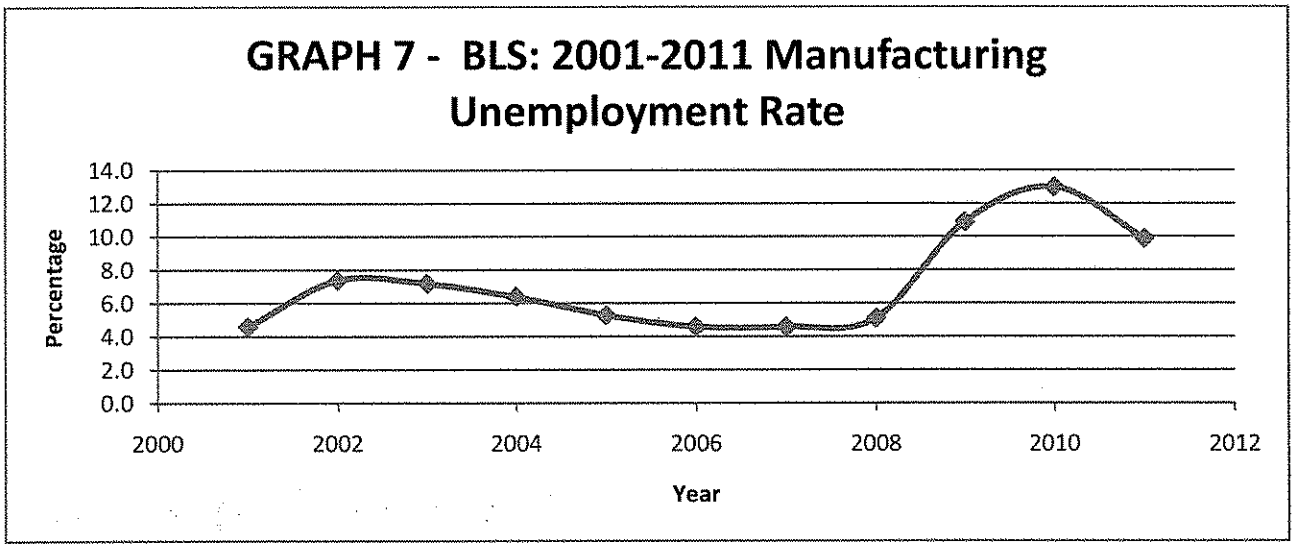
GRAPH 4 - BLS: 1996-2009 U.S. Unemployment Rate



Graph 5 -Performance Measures of the Auto Industry






GRAPH 7 - BLS: 2001-2011 Manufacturing Unemployment Rate
Percentage
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
2000
2002
2004
2006
2008
2010
2012
Year

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