DOWNLOAD PDF INDUSTRIAL SYSTEMS DEVELOPMENT

Chapter 1 : Industrial and Systems Engineering (ISE) < North Carolina State University

CNIM provides turnkey, high value-added systems which include mechanics, electronics, optics, hydraulics and command & control systems. It can intervene throughout the value chain - FEED, design, manufacturing, assembly, installation and maintenance.

You can help by adding to it. February The gold standard formed the financial basis of the international economy from to Capitalism was carried across the world by broader processes of globalization and by the beginning of the nineteenth century a series of loosely connected market systems had come together as a relatively integrated global system, in turn intensifying processes of economic and other globalization. Industrialization allowed cheap production of household items using economies of scale while rapid population growth created sustained demand for commodities. Globalization in this period was decisively shaped by 18th-century imperialism. Also in this period, areas of sub-Saharan Africa and the Pacific islands were colonised. The conquest of new parts of the globe, notably sub-Saharan Africa, by Europeans yielded valuable natural resources such as rubber , diamonds and coal and helped fuel trade and investment between the European imperial powers, their colonies and the United States: The inhabitant of London could order by telephone, sipping his morning tea, the various products of the whole earth, and reasonably expect their early delivery upon his doorstep. Militarism and imperialism of racial and cultural rivalries were little more than the amusements of his daily newspaper. What an extraordinary episode in the economic progress of man was that age which came to an end in August The United Kingdom first formally adopted this standard in Soon to follow were Canada in , Newfoundland in , the United States and Germany de jure in New technologies, such as the telegraph , the transatlantic cable , the radiotelephone , the steamship and railway allowed goods and information to move around the world at an unprecedented degree. The postwar boom ended in the late s and early s and the situation was worsened by the rise of stagflation. The extension of universal adult male suffrage in 19th-century Britain occurred along with the development of industrial capitalism and democracy became widespread at the same time as capitalism, leading capitalists to posit a causal or mutual relationship between them. Moderate critics argue that though economic growth under capitalism has led to democracy in the past, it may not do so in the future as authoritarian regimes have been able to manage economic growth without making concessions to greater political freedom. Moderate critics have recently challenged this, stating that the current influence lobbying groups have had on policy in the United States is a contradiction, given the approval of Citizens United. This has led people to question the idea that competitive capitalism promotes political freedom. The ruling on Citizens United allows corporations to spend undisclosed and unregulated amounts of money on political campaigns, shifting outcomes to the interests and undermining true democracy. According to Hahnel, there are a few objections to the premise that capitalism offers freedom through economic freedom. These objections are guided by critical questions about who or what decides whose freedoms are more protected. Often, the question of inequality is brought up when discussing how well capitalism promotes democracy. An argument that could stand is that economic growth can lead to inequality given that capital can be acquired at different rates by different people. In Capital in the Twenty-First Century , Thomas Piketty of the Paris School of Economics asserts that inequality is the inevitable consequence of economic growth in a capitalist economy and the resulting concentration of wealth can destabilize democratic societies and undermine the ideals of social justice upon which they are built. Singapore has a successful open market economy as a result of its competitive, business-friendly climate and robust rule of law. Nonetheless, it often comes under fire for its brand of government which though democratic and consistently one of the least corrupt [66] it also operates largely under a one-party rule and does not vigorously defend freedom of expression given its government-regulated press as well as penchant for upholding laws protecting ethnic and religious harmony, judicial dignity and personal reputation. Hall and David Soskice argued that modern economies have developed two different forms of capitalism: Germany, Japan, Sweden and Austria. Those two types can be distinguished by the primary way in which firms coordinate with each other and other actors, such as trade unions. In LMEs, firms primarily coordinate their endeavors by way of hierarchies and market

mechanisms. Coordinated market economies more heavily rely on non-market forms of interaction in the coordination of their relationship with other actors for a detailed description see Varieties of Capitalism. These two forms of capitalisms developed different industrial relations , vocational training and education , corporate governance , inter-firm relations and relations with employees. The existence of these different forms of capitalism has important societal effects, especially in periods of crisis and instability. Since the early s, the number of labor market outsiders has rapidly grown in Europe, especially among the youth, potentially influencing social and political participation. Using varieties of capitalism theory, it is possible to disentangle the different effects on social and political participation that an increase of labor market outsiders has in liberal and coordinated market economies Ferragina et al. This signals an important problem for liberal market economies in a period of crisis. If the market does not provide consistent job opportunities as it has in previous decades , the shortcomings of liberal social security systems may depress social and political participation even further than in other capitalist economies. Academic perspectives on capitalism In general, capitalism as an economic system and mode of production can be summarised by the following: High levels of wage labour.

Chapter 2 : Industrial and Systems Engineering - NIU - College of Engineering and Engineering Technolog

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Introductory course in computer-based modeling and programming using Visual Basic for Applications. Emphasis on algorithm development and engineering problem solving. Methodical development of VBA within applications like Microsoft Excel and Access from specifications; documentation, style; control structures; classes and methods; data types and data abstraction; object-oriented programming and design; graphical user interface design. Functional relationships will be given and programs will be designed and developed from a list of specifications. This is an 8 week course. An introductory engineering graphics course which builds on the foundations of computer-aided 2D sketching and 3D modeling for industrial engineers. Students will develop and refine their ability to communicate designs via modeling techniques prolific in industry. The concurrent nature of ideation, engineering analysis and manufacturing will be emphasized as students review case studies and develop their own models. Constraint-based design will drive strategies that accurately reflect design intent and promote part family relationships and automation. Students will work in small teams to create a mechanism that must achieve certain functional criteria. ISE majors have priority registration for this course. Introduction to product development and prototyping. Team-based development of a new product during the semester. Specific topics are voice of the customer, product specification and parameter specification, Quality Function Deployment and the House of Quality, concept generation, concept selection, detailed design using SolidWorks, prototyping, design for assembly, design for the environment, and intellectual properties and patents. Team presentations of a functional prototype of their product at the end of the semester. Engineering and managerial decision making. The theory of interest and its uses. Accounting depreciation and its tax effects. Economic lot size and similar cost minimization models. Replacement theory and economic life. Introduction to the principles of modern-day multi-axis machine tool control, using computer-aided manufacturing CAM software tools. Analytical study and design of manufacturing engineering with emphasis on mfg. Addresses the interaction of design, materials, and processing. Laboratory instruction and hands-on experience in metrology, machining, process planning,economic justification, and current mfg. Introduction to work methods and ergonomics. Coverage of methods to improve operator performance and production process efficiency. Techniques include project evaluation and review, operator-machine ratios, line balancing, work sampling, time study, learning curve analysis and pre-determined time systems. Ergonomics component includes job screening methods, anthropometry, workstation and hand-tool design, and methods for reducing hazard exposure and controlling cumulative trauma disorders. Introduction to mathematical modeling, analysis techniques, and solution procedures applicable to decision-making problems in a deterministic environment. Linear programming models and algorithms and associated computer codes are emphasized. Introduction to mathematical modeling, analysis, and solution procedures applicable to uncertain stochastic production systems. Methodologies covered include probability theory and stochastic processes. Applications relate to design and analysisof problems, capacity planning, inventory control, waiting lines, and system reliability and maintainability. Planning and control of production and service systems. Production organization flow and inventory control methods: Integration of design and mfg. Fixed and programmable automation in mfg. Rapid applications development RAD tools to design and implement database-based applications. The SQL database query language, a standard RAD environment and how to access information in a database from it, use of Visual Basic for Applications, and how to integrate these tools together to design and build engineering applications. Examples will be from manufacturing and production systems. Discrete-event stochastic simulation for the modeling and analysis of systems. Programming of simulation models in a simulation language. Input data analysis, variance reduction techniques, validation and verification, and analysis of simulation output. Random number generators and random variate generation. Statistical methods in quality control. Control charts for variables and attributes. Role of experimentation in designing for quality. Tools for continuous quality improvement. Advanced

concepts in human-machine systems design. Consideration of anatomical and physiological bases for design of work systems. Advanced biomechanical analysis and modeling for manual material handling design. Physiological and psychological capabilities and limitations as related to work systems design and human performance. Coverage of human information processing and performance theories and models, including pipe-line, signal detection theory, information theory, and motor control theory. Additional topics include human factors experimentation and neuroergonomics brain and behavior. Principles and practice in design of facilities and logistics networks. Integration of supply chain design, capacity planning, facility layout, material handling, and storage and warehousing issues into overall production system design. Emphasis on economic justification of alternative designs and use of computer software to aid design process. Advanced topics related to mathematical modeling, analysis, and solution procedures applicable to uncertain stochastic production systems. Methodologies covered include economic analysis under uncertainty, discrete and continuous time stochastic processes. Applications relate to design, analysis and control relating to capacity planning, inventory control, waiting lines, and system reliability and maintainability. Special investigations, study or research related to the field of industrial engineering. Individual or group design projects requiring problem definition and analysis, synthesis, specification and presentation of a designed solution. Students work under faculty supervision either on actual industrial engineering problems posed by local industrial, service and governmental organization or on emerging research issues. Problems of multiple criteria, optimization, model validation and systems design. Production smoothing problem; linear and quadratic cost functions. Theory of games for two-person competitive situations. Engineering economy analysis of alternative projects including tax and inflation aspects, sensitivity analysis, risk assessment, decision criteria. Manufacturing process engineering, primary, secondary, finishing and assembly processes. Traditional and non-traditional manufacturing processes, group technology, manufacturing analyses and application of economic analyses. Graduate standing in Engineering. Rapid application development RAD tools to design and implement database-based applications. Examples from manufacturing and production systems. Restricted to advanced undergraduates and graduate students. Methods used to improve the performance of health care delivery systems with emphasis on patient care cost, access, and quality. Adaptation of lean and six-sigma to rapid and continuous health care systems improvement through organizational and process transformation. Fundamentals of scheduling, staffing, and productivity in health systems employing simulation and optimization. Health care policy and management. Project must employ the tools and techniques of healthcare systems process improvement. The project is done in conjunction with a diverse and multi-disciplinary team from the healthcare institution. The student must serve as a facilitator and coach, resulting in a project with measured success. Success will be determined by the improvement in patient care as quantified in cost, quality, and access. Introduction to problems of the systems development cycle, including human-machine function allocation, military specifications, display-control compatibility, the personnel sub-system concept and maintainability design. Detailed treatment given to people as information processing mechanisms. Occupational accident-injury study; morbidity, mortality; investigation and analysis. Hazard control; energy countermeasure strategies; control technology. Impact biomechanics, trauma and survivability. Risk assessment; systems safety analysis. Product design, manufacturing defects, system failures and human error as causative factors. Accident, trauma and forensic case studies from manufacturing, motor carrier andconstruction industries. Anatomy, physiology and biomechanics of musculoskeletal system including muscle bone, tendon, ligament, cartilage, nerve. Modeling of tissue and joints with special emphasis on spine and upper extremity. Physical, mathematical, optimization and finite element modeling techniques as applied in biomechanics research. Anatomical, physiological, and biomechanical bases of physical ergonomics. Strength of biomaterials, human motor capabilities, body mechanics, kinematics and anthropometry. Use of bioinstrumentation, active and passive industrial surveillance techniques and the NIOSH lifting guide. Acute injury and cumulative trauma disorders. Static and dynamic biomechanical modeling. Planning, design, and development and implementation of comprehensive computer-based information systems to support management decisions. Formal information systems principles; information requirements analysis; knowledge acquisition techniques; information modeling.

Chapter 3 : Capitalism - Wikipedia

Industrial systems design and development We offer our expertise to meet industrial requirements with the highest commitment and flexibility in a wide range of industrial sectors. Specifically, we have long-term experience in the design of mechanical systems, automation of production systems and process diagnostics.

Historical development Prehistoric and preliterate economic systems Although economics is primarily concerned with the modus operandi of the market mechanism, an overview of premarket coordinative arrangements not only is interesting in itself but throws a useful light on the distinctive properties of market-run societies. The earliest and by far the most historically numerous of economic systems has been that of primitive society , for which tradition serves as the central means of bestowing order. Such economic forms of social organization are likely to be far more ancient than Cro-Magnon people, although a few of these forms are still preserved by such groups as the Eskimo , Kalahari hunters, and Bedouin. So far as is known, all tradition-bound peoples solve their economic problems today much as they did 10, years or perhaps 10, centuries agoâ€”adapting by migration or movement to changes in season or climate, sustaining themselves by hunting and gathering or by slash-and-burn agriculture , and distributing their output by reference to well-defined social claims. It seems very unequal when you watch Bushmen divide the kill, yet it is their system, and in the end no person eats more than the other. Besides the shared property that is perhaps the outstanding attribute of these hunting and gathering societies, two further aspects deserve attention. The first concerns their level of subsistence, long deemed to have been one of chronic scarcity and want. According to the still controversial findings of the anthropologist Marshall Sahlins , this notion of scarcity is not true. His studies of several preliterate peoples found that they could easily increase their provisioning if they so desired. Centralized states Very little is known of the origin of the second of the great systems of social coordinationâ€”namely, the creation of a central apparatus of command and rulership. From ancient clusters of population, impressive civilizations emerged in Egypt, China, and India during the 3rd millennium bc, bringing with them not only dazzling advances in culture but also the potent instrument of state power as a new moving force in history. The appearance of these centralized states is arguably the single most decisive alteration in economic, and perhaps in all, history. It lay in the ability of centralized authority to wrest considerable portions of the population away from their traditional occupations and to use their labour energies in ways that expressed the wishes of a ruling personage or small elite. Herodotus recounts how the pharaoh Khufu used his power to this end: Some, accordingly, were appointed to draw stones from the quarries in the Arabian mountains down to the Nile, others he ordered to receive the stones when transported in vessels across the river. The time during which the people were thus harassed by toil lasted ten years on the road which they constructed, and along which they drew the stones; a work, in my opinion, not much less than the Pyramids. The creation of these monuments illustrates an important general characteristic of all systems of command. Such systems, unlike those based on tradition, can generate immense surpluses of wealthâ€”indeed, the very purpose of a command organization of economic life can be said to lie in securing such a surplus. Command systems thereby acquire the wherewithal to change the conditions of material existence in far-reaching ways. Prior to the modern era, when command became the main coordination system for socialism , it was typical of such command systems to use this productive power principally to cater to the consumption or to the power and glory of their ruling elites. Moral judgments aside, this highly personal disposition of surplus has the further consequence of again resisting any sharp analytic distinction between the workings of the economy of such a society and that of its larger social framework. Thus, in command systems, as in tradition-based ones, there is no autonomous economic sphere of life separate from the basic organizing principles of the society in general. Preconditions for market society These general considerations throw into relief the nature of the economic problems that must be resolved in a system of market coordination. Such a system must be distinguished from the mere existence of marketplaces, which originated far back in history. Trading relations between the ancient Levantine kingdoms and the pharaohs of Egypt about bc are known from the tablets of Tell el-Amarna. A thousand years later Isocrates boasted of the thriving trade of Classical

Greece, while a rich and varied network of commodity exchange and an established market for monetary capital were prominent features of Classical Rome. These flourishing institutions of commerce testify to the ancient lineages of money, profit-mindedness, and mercantile groups, but they do not testify to the presence of a market system. In premarket societies, markets were the means to join suppliers and demanders of luxuries and superfluities, but they were not the means by which the provision of essential goods and services was assured. For these purposes, ancient kingdoms or republics still looked to tradition and command, utilizing slavery as a basic source of labour including captives taken in war and viewing with disdain the profit orientation of market life. This disdain applied particularly to the use of the incentives and penalties of the market as a means of marshaling labour. The difference between a society with flourishing markets and a market-coordinated society is not, therefore, merely one of attitudes. Before a system orchestrated by the market can replace one built on obedience to communal or authoritarian pressure, the social orders dependent on tradition and command must be replaced by a new order in which individuals are expected to fend for themselves and in which all are permittedâ€”even encouragedâ€”to improve their material condition. A rearrangement of this magnitude entails wrenching dislocations of power and prerogative. A market society is not, consequently, merely a society coordinated by markets. It is, of necessity, a social order with a distinctive structure of laws and privileges. It follows that a market society requires an organizing principle that, by definition, can no longer be the respect accorded to tradition or the obedience owed to a political elite. This principle becomes the generalized search for material gainâ€”a striving for betterment that is unique to each individual. Such a condition of universal upward striving is unimaginable in a traditional society and could be seen only as a dangerous threat in a society built on established hierarchies of authority. But, for reasons that will be seen, it is accommodated by, and indeed constitutive of, the workings of a market system. The process by which these institutional and attitudinal changes are brought about constitutes a grand themeâ€”perhaps the grand themeâ€”of economic history from roughly the 5th to the 18th and even into the 19th century in Europe. In terms of political history, the period was marked by the collapse of the Roman Empire, the rise of feudalism , and the slow formation of national states. In this vast transformation the rise of the market mechanism became crucial as the means by which the new social formation of capitalism ensured its self-provisioning, but the mechanism itself rested on deeper-lying social, cultural, and political changes that created the capitalist order it served. To attempt to trace these lineages of capitalism would take one far beyond the confines of the present subject. Of greatest significance, however, was the transformation of the lower orders, a process that began in Elizabethan England but did not take place en masse until the 18th and even the 19th century. As feudal lords became profit-minded landlords, peasants moved off the land to become an agricultural proletariat in search of the best wages obtainable, because traditional subsistence was no longer available. The resulting social order made it possible for markets to coordinate production and distribution in a manner never before possible. The evolution of capitalism From mercantilism to commercial capitalism It is usual to describe the earliest stages of capitalism as mercantilism , the word denoting the central importance of the merchant overseas traders who rose to prominence in 17th- and 18th-century England, Germany, and the Low Countries. Adam Smith complained bitterly about the government monopolies that granted exclusive trading rights to groups such as the East India or the Turkey companies, and modern commentators have emphasized the degree to which mercantilist economies relied on regulated, not free, prices and wages. The economic society that Smith described in The Wealth of Nations in is much closer to modern society, although it differs in many respects, as shall be seen. For example, with few exceptions, the production and distribution of all goods and services were entrusted to market forces rather than to the rules and regulations that had abounded a century earlier. The level of wages was likewise mainly determined by the interplay of the supply of, and the demand for, labourâ€”not by the rulings of local magistrates. The role of government had been gradually narrowed until Smith could describe its duties as consisting of only three functions: And if the role of government in daily life had been delimited, that of commerce had been expanded. The accumulation of capital had come to be recognized as the driving engine of the system. Thus, The Wealth of Nations offered the first precise description of both the dynamics and the coordinative processes of capitalism. The latter were entrusted to the market mechanismâ€”which is to say, to the universal drive for material betterment, curbed

and contained by the necessary condition of competition. Later economists would devote a great deal of attention to the question of whether competition in fact adequately constrains the workings of the acquisitive drive and whether a market system might not display cycles and crises unmentioned in The Wealth of Nations. These were questions unknown to Smith, because the institutions that would produce them, above all the development of large-scale industry , lay in the future. Smith also saw that the competitive search for capital accumulation would impart a distinctive tendency to a society that harnessed its motive force. He pointed out that the most obvious way for a manufacturer to gain wealth was to expand his enterprise by hiring additional workers. As firms expanded their individual operations , manufacturers found that they could subdivide complex tasks into simpler ones and could then speed along these simpler tasks by providing their operatives with machinery. Thus, the expansion of firms made possible an ever-finer division of labour , and the finer division of labour, in turn, improved profits by lowering the costs of production and thereby encouraging the further enlargement of the firms. In this way, the incentives of the market system gave rise to the augmentation of the wealth of the nation itself, endowing market society with its all-important historical momentum and at the same time making room for the upward striving of its members. One final attribute of the emerging system must be noted. This is the tearing apart of the formerly seamless tapestry of social coordination. Under capitalism two realms of authority existed where there had formerly been only oneâ€”a realm of political governance for such purposes as war or law and order and a realm of economic governance over the processes of production and distribution. Each realm was largely shielded from the reach of the other. The capitalists who dominated the market system were not automatically entitled to governing power, and the members of government were not entrusted with decisions as to what goods should be produced or how social rewards should be distributed. This new dual structure brought with it two consequences of immense importance. The first was a limitation of political power that proved of very great importance in establishing democratic forms of government. The second, closer to the present theme, was the need for a new kind of analysis intended to clarify the workings of this new semi-independent realm within the larger social order. As a result, the emergence of capitalism gave rise to the discipline of economics. From commercial to industrial capitalism Commercial capitalism proved to be only transitional. The succeeding form would be distinguished by the pervasive mechanization and industrialization of its productive processes, changes that introduced new dynamic tendencies into the economic system while significantly transforming the social and physical landscape. There is no doubt, however, that a remarkable confluence of advances in agriculture, cotton spinning and weaving, iron manufacture, and machine-tool design and the harnessing of mechanical power began to alter the character of capitalism profoundly in the last years of the 18th century and the first decades of the 19th. The alterations did not affect the driving motive of the system or its reliance on market forces as its coordinative principles. Their effect was rather on the cultural complexion of the society that contained these new technologies and on the economic outcome of the processes of competition and capital accumulation. This aspect of industrialization was most immediately apparent in the advent of the factory as the archetypal locus of production. The increase in the scale of employment brought a marked change in the character of work itself. It was from the spectacle of mill labour, described in unsparing detail by the inspectors authorized by the first Factory Act of , that Marx drew much of the indignation that animated his analysis of capitalism. More important, it was from this same factory setting, and from the urban squalor that industrialization also brought, that capitalism derived much of the social consciousnessâ€”sometimes revolutionary, sometimes reformistâ€”that was to play so large a part in its subsequent political life. While these works brought attention to the social problems stemming from industrialization, they also tended to discount the significant improvements in the overall standard of living as measured by the increases in life expectancy and material comforts that accompanied modernization. Country life of just a generation earlier had been no less cruel, and in some respects it was more inhuman than the factory system being criticized. Those critics who failed to compare the era of industrialization with the one that immediately preceded it also failed to account for the social and economic progress that had touched the lives of ordinary people. The degradation of the physical and social landscape was the aspect of industrialization that first attracted attention, but it was its slower-acting impact on economic growth that was ultimately to be judged its most

significant effect. A single statistic may dramatize this process. Between and the output of pig iron in Britain rose from 68, to 1,, tons. To fully grasp the significance of this fold increase, one has to consider the proliferation of iron pumps, iron machine tools, iron pipes, iron rails, and iron beams that it made possible; these iron implements , in turn, contributed to faster and more dependable production systems. This was the means by which the first Industrial Revolution promoted economic growth, not immediately but with gathering momentum. Thirty years later this effect would be repeated with even more spectacular results when the Bessemer converter ushered in the age of steel rails, ships, machines, girders, wires, pipes, and containers. This seemingly persistent gap between the richest and the poorest countries, which contradicts the predictions of the standard theory of economic growth, has increasingly occupied the attention of contemporary economists. Although the question is answered in part by explaining that the rich countries have experienced industrialization and the poor ones have not, the question remains why some have experienced industrialization and others have not. The development of industrialization was accompanied by periodic instability in the 18th and 19th centuries. Not surprisingly, then, one side effect of industrialization was the effort to minimize or prevent economic shocks by linking firms together into cartels or trusts or simply into giant integrated enterprises. Although these efforts dampened the repercussions of individual miscalculations, they were insufficient to guard against the effects of speculative panics or commercial convulsions. By the end of the 19th century, economic depressions had become a worrisome and recurrent problem, and the Great Depression of the s rocked the entire capitalist world. During that debacle , GNP in the United States fell by almost 50 percent, business investment fell by 94 percent, and unemployment rose from 3. Economists have long debated the causes of the extraordinary increase in economic instability from to Some point to the impact of growth in the scale of production evidenced by the shift from small pin factories to giant enterprises.

Chapter 4 : Industry - Wikipedia

As a leader in the design and production of industrial machinery and systems, New York State produces everything from turbines and pumps to compressors and generators.

Over time the nature of technological change shifted from the introduction of new mechanical contrivances to developments in the application of power primarily water and wind to old devices andâ€”even more significantlyâ€”to the organization of work that would allow production on a largerâ€¦ The factory system replaced the domestic system , in which individual workers used hand tools or simple machinery to fabricate goods in their own homes or in workshops attached to their homes. The use of waterpower and then the steam engine to mechanize processes such as cloth weaving in England in the second half of the 18th century marked the beginning of the factory system. This system was enhanced at the end of the 18th century by the introduction of interchangeable parts in the manufacture of muskets and, subsequently, other types of goods. Prior to this, each part of a musket or anything else assembled from multiple components had been individually shaped by a workman to fit with the other parts. In the new system, the musket parts were machined to such precise specifications that a part of any musket could be replaced by the same part from any other musket of the same design. This advance signaled the onset of mass production , in which standardized parts could be assembled by relatively unskilled workmen into complete finished products. The resulting system, in which work was organized to utilize power-driven machinery and produce goods on a large scale, had important social consequences: The location of work also changed. Whereas many workers had inhabited rural areas under the domestic system, the factory system concentrated workers in cities and towns, because the new factories had to be located near waterpower and transportation alongside waterways, roads, or railways. The movement toward industrialization often led to crowded, substandard housing and poor sanitary conditions for the workers. Moreover, many of the new unskilled jobs could be performed equally well by women, men, or children, thus tending to drive down factory wages to subsistence levels. Factories tended to be poorly lit, cluttered, and unsafe places where workers put in long hours for low pay. These harsh conditions gave rise in the second half of the 19th century to the trade-union movement, in which workers organized in an attempt to improve their lot through collective action. Two major advances in the factory system occurred in the early 20th century with the introduction of management science and the assembly line. Scientific management, such as time-and-motion studies , helped rationalize production processes by reducing or eliminating unnecessary and repetitious tasks performed by individual workers. The old system in which workers carried their parts to a stationary assembly point was replaced by the assembly line, in which the product being assembled would pass on a mechanized conveyor from one stationary worker to the next until it was completely assembled. By the second half of the 20th century, enormous increases in worker productivityâ€”fostered by mechanization and the factory systemâ€”had yielded unprecedentedly high standards of living in industrialized nations. Ideally, the modern factory was a well-lit, well-ventilated building that was designed to ensure safe and healthy working conditions mandated by government regulations. The main advance in the factory system in the latter part of the century was that of automation , in which machines were integrated into systems governed by automatic controls, thereby eliminating the need for manual labour while attaining greater consistency and quality in the finished product. Factory production became increasingly globalized, with parts for products originating in different countries and being shipped to their point of assembly. As labour costs in the developed countries continued to rise, many companies in labour-intensive industries relocated their factories to developing nations, where both overhead and labour were cheaper. Learn More in these related Britannica articles:

Chapter 5 : DSS / Industrial Security

ITRI is a nonprofit government-sponsored institute with two critical missions for industrial development. One is to upgrade existing industries through technology infusion and the other is to implement government industrial policies by spearheading new high-tech industries.

This is a finished A This is a RORO roll on roll off This is a barge Components being transferred to lorry in Langon Task 4 - Now create a simple flow diagram that shows the inputs, processes and outputs of an A aircraft. What could this feedback be? Can you link any Quaternary jobs to this and the Airbus site in Filton , Bristol? Task 5 - Watch the video beneath to see what happens when all the parts finally reach the factory in Toulouse. Industries that are focused on research and development and the production of products that often contain microchips. The process of clustering together in one area. Airbus by nature is a High Tech industry where plane manufacturing takes centre stage using the latest technologies and expertise from a vast and high experienced workforce. We will be focusing on Airbus Futures as an example of High Tech industry and why Toulouse is at the centre of this operation. How many years do Airbus have to think ahead? How many people does the plant employ? How many wings are made every year d. How much does each wing cost e. How many component parts does each wing contain? What is the economic boost created by Airbus for the surrounding area and the UK as a whole? Toulouse as a location for High Tech Industry Task 2 - Read the statements beneath carefully, then complete the worksheet to the right blue tab. Toulouse has its own international airport - Blagnac. The Airbus factory is on site and has access to the runways. Other Airbus locations such as Hamburg and Madrid also have their own universities producing skilled and knowledgeable potential workers. By sharing services it should reduce costs and increase the amount offered to potential customers. October - Airbus planes of the future. Read about the amazing new developments here.

Chapter 6 : Engineering: Industrial and Systems

Industrial engineering (IE) is the most wide-ranging engineering discipline in terms of career options. While other traditional engineering majors tend to focus on specific applications of skill sets, an industrial engineering education offers you the flexibility to build your career in the industry of your choice.

Chapter 7 : Industrial Systems - GEOGRAPHY FOR & BEYOND

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Industrial Controls Systems and Cybersecurity Automation and Industrial Control Systems - often referred to as ICS - have an interesting and fairly long history.