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Chapter 1 : R&D management - Wikipedia

Technological information MANAGING TECHNOLOGICAL DEVELOPMENT somewhere in the world does not exist everywhere because of the costs of advertising or discovering its existence. Nor are the international markets for many elements of technology competitive.

Automate bank transactions Map transportation schedules Technology managers are trained in information technology management philosophy, system development, and business strategy. A technology manager helps businesses to utilize available technology and determine technological strategies that suit the needs of the business. Additionally, a technology manager oversees the work of technical professionals to ensure a reliable, productive work environment for clients and employers. Increasingly, the options and methods for studying technology management are expanding to include distance learning. The development of online technology management degree programs has enabled more students to learn more about this field without having to relocate to a physical campus. Thus, online technology management programs have opened doors for many future executives, as well as seasoned technology management professionals, hoping to advance their careers using distance education. Because the demand for better technological systems increases as rapidly as the development of new technologies, it is common for technology management professionals to rely on distance learning to continually increase their technical skills and managerial training. Online education makes it possible for students to maintain commitments to full-time jobs while completing the requirements necessary to earn a degree. Studying technology management also opens up doors to many other related positions including computer programming, information systems managers, computer software engineers, computer support technicians, and computer systems analysts. Types of Technology Management Degrees Technical innovation and invention impacts our everyday lives. Influencing the most basic human tasks to the most sophisticated, complex procedures, the need for managers to focus and lead the efforts of technical professionals is apparent. As this need for qualified, well-trained technology management professionals increases, more schools develop training and academic degree programs to meet this demand. Additionally, as technology continues to advance, more technology management schools offer such degree programs online. Students participate in online sessions, web seminars, and interactive tutorials virtually. Students who enroll in distance learning degree programs enjoy a unique opportunity to tailor their own academic schedule and course load to complement existing commitments. Certificates in Technology Management Technology management certificate programs offer good options to current technology and computer professionals who hope to develop the skills necessary to obtain managerial positions. Online certificate programs encourage students to learn and develop a working knowledge of management issues, technical advancement, business strategy, and other related skills. Browse certificate programs in technology management. Majors in technology management should be ready to commit to approximately four years of academic study. Online degree programs in technology management are also available. Computer Systems Analyst Technology professionals serving as computer systems analysts are responsible for solving computer problems, identifying potentially beneficial new computer technologies, and applying computer technology to fit the needs and goals of an organization. Additionally, systems analysts guide an organization to get the most out of investing in computer equipment, technology, and personnel. It is common for a systems analyst to specialize in a particular type of computer system, including business, accounting, or financial systems, or scientific and engineering systems. Working as a computer systems analyst is a viable catalyst to a career in technology management. Technology professionals with analyst experience develop both the technical and communications skills necessary to be effective as a technology manager. Combining this practical experience with advanced education is a solid example of a professional path that can lead to a position as a technology manager. Management Information Systems Directors A management information systems director usually oversees the information systems used by an entire organization. Technology management training and education is often a prerequisite for securing a position as a management information systems director. Students interested in directing the management of corporate and public information systems would benefit

from pursuing graduate level coursework in addition to obtaining multiple years of work experience as a technical professional. Computer Support Specialist Many non-technical professionals are not computer experts and are often confronted with computer issues that they cannot correct and address on their own. Computer support specialists offer support, assistance and advice to customers and clients experiencing computer-related issues. A computer support specialist may provide assistance over the phone, work on a site as a consultant, or work full-time for an organization providing troubleshooting, or work as a contractor at a help-desk, support services firm. It is also common for computer support specialists to assist clients with the selection, upgrade, and installation of a computer security system; choose new technologies to increase production capabilities; and offer support for managing computer technologies. Computer Software Engineers Computer software engineers build, test and design software that enables consumers, businesses, and other organizations to utilize technology to perform tasks and solve problems. Students interested in pursuing this path to technology management career opportunities should first earn an engineering and computer science degree. Computer Programmer The work of a computer programmer involves writing, applying, and testing various instructions that computers must follow to perform appropriately. Professionals in this field have a strong background in computer science and information systems. Computer programmers develop solutions and enable computers to function optimally through use and understanding of various programming languages. Computer programming is definitely a field that requires continuously updating and building new skills and capabilities. Professionals in this field are often the first to adopt and master the application of new technology. If a computer programmer is inclined to fuse his technical prowess with management training and communications skills, computer programming is a solid lead into technology management positions. Technology Management Licensing, Certification and Associations While most states do not require technology managers to obtain a license, many professionals in this field choose to fulfill the requirements necessary to earn technology certifications. In any profession, certifications designate commitment, ties to the field, and a level of achievement, education, and skill mastery. There are multiple technology related certifications, and students pursuing careers in a focused area of technology can find specific associations and certification bodies specializing in smaller facets of technology. Usually, advanced training and education is substituted for required licensure and technology management certification. Thus, students hoping to earn employment in technology managerial roles should combine available certifications in their respective, entry-level computer programming, computer systems analyst, information systems, and computer support careers with graduate level managerial training and coursework to optimize their career options. Professional Associations and Related Certification Bodies.

Chapter 2 : Technology Management Major | Degrees, Jobs and Careers

IEEE ENGINEERING MANAGEMENT REVIEW, VOL. 35, NO. 1, FIRST QUARTER 67 Managing Technology Development Projects Overview Technology development projects are the foundation or platform for new products and new processes.

The four phases of the technology life-cycle[edit] The TLC may be seen as composed of four phases: The shape of the technology lifecycle is often referred to as S-curve. Because of the logistic curve nature of technology adoption, it is difficult to see in the early stages whether the hype is excessive. The technology adoption life cycle typically occurs in an S curve, as modelled in diffusion of innovations theory. This is because customers respond to new products in different ways. Diffusion of innovations theory, pioneered by Everett Rogers , posits that people have different levels of readiness for adopting new innovations and that the characteristics of a product affect overall adoption. Rogers classified individuals into five groups: In terms of the S curve, innovators occupy 2. The four stages of technology life cycle are as follows: Depending on the resource allocation and also the change element, the time taken in the innovation stage as well as in the subsequent stages varies widely. This stage represents the demonstration and commercialisation of a new technology, such as, product, material or process with potential for immediate utilisation. Only a very small percentage of these are commercialised. Commercialisation of research outcomes depends on technical as well non-technical, mostly economic factors. This represents the market penetration of a new technology through acceptance of the innovation, by potential users of the technology. But supply and demand side factors jointly influence the rate of diffusion. This last stage represents the decline in the use and eventual extension of a technology, due to replacement by another technology. Many technical and non-technical factors influence the rate of substitution. The time taken in the substitution stage depends on the market dynamics. Licensing options[edit] Large corporations develop technology for their own benefit and not with the objective of licensing. The tendency to license out technology only appears when there is a threat to the life of the TLC business gain as discussed later. By sharing incipient technology under certain conditions, substantial risk financing can come from third parties. This is a form of quasi-licensing which takes different formats. Even large corporates may not wish to bear all costs of development in areas of significant and high risk e. In the case of small and medium firms, entities such as venture capitalists or business angels, can enter the scene and help to materialize technologies. Apart from finance, they may provide networking, management and marketing support. Venture capital connotes financial as well as human capital. Such vehicles are called strategic alliances â€” strategic partnerships. With both venture capital funding and strategic research alliances, when business gains begin to neutralize development costs the TLC crosses the X-axis , the ownership of the technology starts to undergo change. In the case of smaller firms, venture capitalists help clients enter the stock market for obtaining substantially larger funds for development, maturation of technology, product promotion and to meet marketing costs. A major route is through initial public offering IPO which invites risk funding by the public for potential high gain. At the same time, the IPOs enable venture capitalists to attempt to recover expenditures already incurred by them through part sale of the stock pre-allotted to them subsequent to the listing of the stock on the stock exchange. When the IPO is fully subscribed, the assisted enterprise becomes a corporation and can more easily obtain bank loans, etc. Generally, contractual provisions among the members of the consortium allow a member to exercise the option of independent pursuit after joint consultation; in which case the optee owns all subsequent development. The ascent is the strongest phase of the TLC because it is here that the technology is superior to alternatives and can command premium profit or gain. The slope and duration of the ascent depends on competing technologies entering the domain, although they may not be as successful in that period. Strongly patented technology extends the duration period. The TLC begins to flatten out the region shown as M when equivalent or challenging technologies come into the competitive space and begin to eat away marketshare. Till this stage is reached, the technology-owning firm would tend to exclusively enjoy its profitability, preferring not to license it. If an overseas opportunity does present itself, the firm would prefer to set up a

controlled subsidiary rather than license a third party. However, there may be a tendency to license out the technology to third parties during this stage to lower risk of decline in profitability or competitivity and to expand financial opportunity. The exercise of this option is, generally, inferior to seeking participatory exploitation; in other words, engagement in joint venture , typically in regions where the technology would be in the ascent phase,as say, a developing country. In addition to providing financial opportunity it allows the technology-owner a degree of control over its use. Gain flows from the two streams of investment-based and royalty incomes. Further, the vital life of the technology is enhanced in such strategy. Licensing in the decline phase[edit] After reaching a point such as D in the above diagram, the earnings from the technology begin to decline rather rapidly. To prolong the life cycle, owners of technology might try to license it out at some point L when it can still be attractive to firms in other markets. Further, since the decline is the result of competing rising technologies in this space, licenses may be attracted to the general lower cost of the older technology than what prevailed during its vital life. They are free of direct control from the owner of the technology as would otherwise apply, say, in the case of a joint-venture. Further, there may be fewer restrictions placed on the licensee in the employment of the technology. For instance, should the key patent on the technology have expired, or would expire in a short while, the residual viability of the technology may be limited, although balance life may be governed by other criteria such as knowhow which could have a longer life if properly protected. It is important to note that the license has no way of knowing the stage at which the prime, and competing technologies, are on their TLCs. It would, of course, be evident to competing licensor firms, and to the originator, from the growth, saturation or decline of the profitability of their operations. The license may, however, be able to approximate the stage by vigorously negotiating with the licensor and competitors to determine costs and licensing terms. A lower cost, or easier terms, may imply a declining technology. In any case, access to technology in the decline phase is a large risk that the licensee accepts. In a joint-venture this risk is substantially reduced by licensor sharing it. Sometimes, financial guarantees from the licensor may work to reduce such risk and can be negotiated. There are instances when, even though the technology declines to becoming a technique, it may still contain important knowledge or experience which the licensee firm cannot learn of without help from the originator. This is often the form that technical service and technical assistance contracts take encountered often in developing country contracts. Alternatively, consulting agencies may fill this role. Technology development cycle[edit] According to the Encyclopedia of Earth , "In the simplest formulation, innovation can be thought of as being composed of research, development, demonstration, and deployment.

Chapter 3 : Managing technological development : IKEA, the environment and technology - EconBiz

Working on a book that deals with all the problems companies face during technological development often triggers a smile of recognition. Whether you are running a technical development project or a research project, a certain mix of stubbornness and an interest in experimenting with new combinations seems to be a necessary attribute.

The goal of strategic technology management is to contribute to the value of the enterprise by helping assure that the cash flow on which this value depends will be sustained and will continue to grow. Effective management of this kind can help a firm gain and sustain competitive advantages, ranging from incremental improvements in product quality or cost to major breakthroughs that create new market opportunities. Does the company have a clear product and market strategy? What markets does it want to attack? What markets does it intend to defend? What product and service attributes will accomplish these goals? What technologies support the product and market strategy? Which ones produce competitive advantage in existing markets by adding value or lowering costs? Which ones promise to support new market initiatives or to define a new plateau of product performance? What technological successes can the company support or exploit? Are options for technology acquisition in-house development, licensing, academic support, etc. Does the company have the means to answer, and keep reviewing the answers to, these questions? These questions cannot be answered in a facile or casual way. Answering them requires work, understanding, and realism. Approaches to Managing Technology The meaning of technology is straightforward: In fact, a modern manufacturing business must have a substantial portfolio of individual technologies. Technology management for strategic advantage is difficult and often frustrating. The central issue is the need to reconcile the unpredictability of discovery with the desire to fit technical programs into orderly management of the business. The traditional approach to managing technology has been largely intuitive. Research and development is treated as an overhead item, with budgets set in relation to some business measure for example, sales and at a level deemed reasonable by industry practice. Budgets may be projected several years ahead, but are usually set annually. In response to this unsatisfactory situation, many firms have become somewhat more sophisticated. Managers outside the technology area participate in suggesting or reviewing projects, but the connection to company strategy is still casual or haphazard. Arguing that research and development projects are investmentsâ€”as in a sense they areâ€”corporate management seeks justification based on rate of return or payout. As a result, the program may be pushed toward conservative, incremental projects; the results will be more predictable, but the program will have limited strategic impact. Interest in a better approach has been stimulated by various developments. First, many corporate leaders have moved beyond the financially driven planning characteristic of the s. Second, the success of entrepreneurial, high-technology companies has excited interest in the potential of technology to build company value. Third, firms have seen that industry leaders give high priority to technology management. Fourth, quality and manufacturing capability are now considered strategic business weapons. Together these developments have helped to create a desire to manage technology in a way that is congruent with business strategy. Think for a moment about managing financial investments. The effective investment manager must first help the client think through appropriate investment goals, such as a stable income, security, or accumulation of wealth. The investment manager then selects a portfolio of investments with the best chance of accomplishing those goals in the face of future uncertainties. The manager seeks balance among such characteristics as current yield, growth in value or yield, and safety, and tries to manage risk through diversity. The investment manager can be judged on two bases. Second, is the program well executed with respect to the particular choices made, including the changes in the portfolio, and the results achieved? The management of technology is analogous to the management of investment. The development and use of technology must be guided explicitly by the business strategy of the firm; at the same time, technological developments should help define the opportunities and threats to which the strategy should then respond. Thus, the strategic management of technology involves a dialogueâ€”a process through which both the strategic targets of the enterprise and the goals of its technology program are regularly reviewed and revised. In looking more thoroughly at that process, it is important to clarify what "management of

technology" really entails. The management of technology encompasses the management of research, product and process development, and manufacturing engineering. Engineering translates technology into products that are useful or desirable to customers. It is important, however, to think of these functions as forming a spectrum. In fact, one pitfall in managing technology is to see these as separate functions to be managed in a compartmental fashion. Many Japanese companies have shown the power of integrating all phases of the product creation process. By contrast, some U. Effective management requires integrating these phases of the product creation process. One way of thinking about such a strategy is suggested by the matrix shown in Table 1. The words in each cell characterize the appropriate technology focus for that product-market mix. At the same time, the findings from the technical programs will suggest which product and market possibilities show promise. The strategic focus in sector A is to achieve incremental improvements in valueâ€"quality and performanceâ€"and cost. Allied-Signal, for example, says one element of its strategy is to be the high-value, low-cost producer in its markets. Both objectives help sustain market share and margins, and thus cash flow, in a particular competitive context. A sector B strategy could be implemented by either a new product whose function is already filled by an existing product, or a new product that complements existing products. The first could substantially improve functionality, lower cost, or both. Examples include the substitution of the electronic typewriter for the electric typewriter, radial tires for bias-ply tires, and slow release antihistamine tablets for conventional pills. A sector C strategy is one that adapts existing products or the technologies that support them to the needs of new markets. Together with technological development, this focus of strategy requires understanding the idiosyncrasies and needs of new target customers and the distribution channels needed to reach them. Sector D must be approached with great caution; it can be a strategic trap baited by technological hubris. A new technology, perhaps in composite materials or genetically engineered drugs, shows exciting promise of yielding new products. For some firms, pursuing such technologies makes sense; these may become their pacing technologies, as explained in the next section. Other firms, however, will respond to the enthusiasm of the moment. Moreover, these programs, once started, are hard to stop; they become "sacred cows. The first step in the strategic management of technology is to answer this question: For our firm, what mix of products and markets will best sustain and enhance our cash flow? The next two sections look at that question. These are technologies that a firm must master to be an effective competitor in its chosen product-market mix. They are necessary, but not sufficient, to achieve competitive advantage. These technologies are widely known and readily available. Electronic ignition technology for automobiles is an example. The danger is that inertia will sustain programs in these technologies longer and at greater scale than they deserve, perhaps because these are the traditional areas where the research and development organization feels at home. These technologies provide competitive advantage. They may permit the producer to embed differentiating features or functions in the product or to attain greater efficiencies in the production process. An example is food-packaging technology that enables the purchaser to use microwave cooking. Unwilling to invest in key process technologies in the s and s, the U. Not every participant in an industry can afford to invest in pacing technologies; this is typically what differentiates the leaders who do from the followers who do not. The critical issue in technology management is balancing support of key technologies to sustain current competitive position and support of pacing technologies to create future vitality. Commitments to pacing technologies or potential breakthroughs are hard to justify in conventional, return-on-investment terms. Indeed, these commitments can be thought of more accurately as buying options on opportunity. Relatively modest commitmentsâ€"and thus, modest downside riskâ€"can give the potential for large upside advantage. Realizing that potential depends on still-unresolved technical and market contingencies. If the option is not pursued, the potential does not exist. Receptor modeling technology is now a recognized key technology in pharmaceuticals. An effective research and development program must include some investment to build a core of competence in pacing technologies and some effort to gain intelligence from sources such as customers, universities, and scientific literature to help identify and evaluate these technologies. At the same time, disciplined judgments about commitments to pacing technologies are necessary; enthusiastic overspending on advanced technology can undercut essential support of key technologies. Exploiting Mature Technologies Technologies mature, just as industries and product lines do. The younger the technology, the

greater the potential for further development, but the less certain the benefits. However, a mature technology can often be a key technology. Many Japanese firms use mature technologies as a major competitive weapon. The Sony Walkman, for example, was a wildly successful new product based on comparatively mature technologies. Sony engineers were trying to make a miniature stereo tape player-recorder, but they could not fit the recording mechanism into the target package size. A senior officer realized that combining headphones with a non-recording tape "player" would eliminate the need for speakers, reduce battery requirements, and result in a small stereo tape player with outstanding sound. Empire Pencil gained a major cost and quality advantage by using mature plastic extrusion technology as the basis of a new way to manufacture lead pencils. Conventional lead pencil manufacturing requires the use of fine-grained, high-quality wood, such as cedar, and a good deal of hand labor for assembly. Materials are becoming more expensive, and damage to the graphite core during the assembly process causes quality problems. A development team was confronted with this question: How can we improve quality and cut costs? The team realized that wood powder in a plastic binder could simulate the fine-grained wood.

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Focusing on the interactive aspects of commercial and technological development, they examine how new solutions are developed and shaped in relation to the different companies and organizations involved.

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Chapter 6 : Managing Technology as a Business Strategy

About the author HÃ¥kan HÃ¥kansson is an internationally recognised researcher within the business-to-business field. He has published a number of books and articles within industrial marketing, purchasing and technological development, and is one of the founding members of IMP.

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