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Chapter 1 : Audit of the Administration of the Internet of Things | theinnatdunvilla.com

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Noted below are some of the key areas of impact: Telecommunications provides a technological foundation for societal communications. Communication plays a central role in the fundamental operations of a societyâ€”from business to government to families. In fact, communication among people is the essence of what distinguishes an organization, community, or society from a collection of individuals. Communicationâ€”from Web browsing to cell phone calling to instant messagingâ€”has become increasingly integrated into how we work, play, and live. Telecommunications enables participation and development. Telecommunications plays an increasingly vital role in enabling the participation and development of people in communities and nations disadvantaged by geography, whether in rural areas in the United States or in developing nations in the global society and economy. Telecommunications provides vital infrastructure for national security. From natural disaster recovery, to homeland security, to communication of vital intelligence, to continued military superiority, telecommunications plays a pivotal role. When the issue is countering an adversary, it is essential not only to preserve telecommunications capability, but also to have a superior capability. There are potential risks associated with a reliance on overseas sources for innovation, technologies, applications, and services. It is difficult to predict the future impact of telecommunications technologies, services, and applications that have not yet been invented. Telecommunications and the U. Economy The telecommunications industry is a major direct contributor to U. Census Bureau estimates that just over 3 percent of the U. At 3 percent, telecommunications thus represented more than a third of the total fraction of GDI spent on information technology IT; 7. In fact, the fraction attributable to telecommunications is probably larger relative to that of IT than these figures suggest, given that much of the GDI from IT hardware particularly semiconductors could apply to any of several industries computing, telecommunications, media, and electronics, for example. The National Academies Press. Telecommunications is a growth business. Although markedly reduced investment in some parts of the sector following the bubble years of the late s may have given an impression of low growth in the long run, a longer-term view taking into account the need for humans and machines to communicate suggests that telecommunications will continue to grow apace, as evidenced by the ongoing expansion of wireless and broadband access services throughout the world. Telecommunications is also a key enabler of productivity across the U. In the s the U. GDP grew rapidly, and the U. It is widely believed that the Internet economy played a significant role in this success. For the United States to compete in the global marketplaceâ€”across industriesâ€”it needs the productivity that comes from enhancements in telecommunications. If the telecommunications infrastructure in the United States were to fall significantly behind that of the rest of the world, the global competitiveness of all other U. Conversely, the growth in U. Telecommunications has been and likely will continue to be an important foundation for innovative new industries arising in the United States that use telecommunications as a primary technological enabler and foundation. Recent examples of innovative new businesses leveraging telecommunications include Yahoo! Telecom- 4 GDI estimates for from U. Jorgenson and Kevin J. Page 10 Share Cite Suggested Citation: Finally, telecommunications is an important component of the broader IT industry, which is sometimes viewed as having three technology legs: The boundaries between these areas are not very distinct, but this decomposition helps illustrate the breadth of IT and the role that telecommunications plays. Increasingly IT systems must incorporate all three elements to different degrees, 8 and it is increasingly common for companies in any sector of IT to offer products with a communications component, and often with a communications emphasis. Increasing numbers of businesses compete globally. Every company and every industry must assess the segments and niches in which it operates

to remain globally competitive. Both Asian and European nations are continuing to pursue strategies that exploit perceived U. Leapfrogging the United States in telecommunications has, in the opinion of the committee, been an explicit and stated strategy for a number of Asian in broadband and wireless and European in wireless nations for the past decade, with notable success. These efforts have aimed to stimulate the rapid penetration of physical-layer technologies for residential access broadband access, especially in Asia and wireless and mobile access cellular networks, especially in Europe. What Are the Implications Today? Page 11 Share Cite Suggested Citation: The picture is, to be sure, simplifiedâ€"the interactions between the different elements are more complex than can be reasonably characterized by the diagramâ€" but Figure 1. Shown at the top of Figure 1. Level 1 shows the direct results: Researchers conduct exploratory studies, achieving technical breakthroughs and developing their expertise and their basic understanding of the areas studied. Talent is thus nurtured that will be expressed in the future in industry and academia. None of these results of research can be characterized as end benefits. Rather, the development of talent and the achievement of breakthroughs build a capability for later revolutionary advances. At Level 2 the benefits of research begin to become evident. Researchers collaborate, and individual insights and results begin to fit together. The university talent generated in Level 1 develops competenceâ€"not simply low-level job skills that can be easily transported anywhere, but rather the next-generation expertise needed to ensure a skilled U. The United States has access to this skilled workforce first and can thus benefit directly from the talent and knowledge base generated in Level 1 that are fundamental to continuing technological advances and being able to perform in the best future jobs. Also at Level 2 comes the maturing of fundamental breakthroughs and their transition to usable, deployable technology for next-generation telecommunication systems and the development of roadmaps to help guide research investments. Page 12 Share Cite Suggested Citation: Skilled workers, a competence to understand the new technology, the availability of the technology, and shared goals are the ingredients required to create a healthy telecommunications industry and, more broadly, a capable telecommunications infrastructure. Interestingly, not all of the research performed affects telecommunications alone. Because telecommunications touches multiple industries, the technology base it provides also often enables the creation of entirely new industries. The success of the iPod and other portable digital music players, for example, rests in part on earlier telecommunications-inspired work on how to compress audio for efficient transmission over limited-bandwidth channels. At Level 4, an indirect benefit of research is a telecommunications infrastructure that provides advantages to all industries that use telecommunications. There are also end-user or consumer benefits that accrue to having an outstanding infrastructure, such as enhanced education, entertainment, and personal convenience. Finally, new companies also emerge from these new industries. Level 5 aggregates the key benefits of research in broad areas of national concern. Concerning economic impact, the strong telecommunications industry, new spin-off industries, and more competitive industries across the board result in a higher GDP for the country, as well as job creation. Technological leadership and economic strength also help ensure strong leadership and capability in national defense and homeland security. The full benefits of the process depicted in Figure 1. Each step takes time: Investments by both government and industry in research by academia and industry lead to both short- and long-term contributions. Over the years, CSTB studies have documented this phenomenon across multiple areas of information technology and telecommunications research. In closing, it is worth noting the perils of losing leadership in telecommunications. Because of the time lag, the nation may continue to exhibit leadership at Levels 4 and 5 and possibly Level 3 even as it is failing to renew capability at Levels 1 and 2. Since Levels 3 through 5 are most visible to policy makers and the public, there is a potential to perceive the situation as less dire than it really is. If Levels 1 and 2 are left to atrophy, serious problems will occur at Levels 3 through 5. If that happens, then recovery will take a long timeâ€"or even prove impossible. Page 4 Share Cite Suggested Citation:

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Chapter 2 : Telecommunication Indicators Handbook

Improve the energy efficiency of communication networks and systems, energy efficient core networks, content distribution networks, data centre networks, virtualised networks, 5G networks and IoT.

Detailed summaries of audit savings are always visible via the ExpenseSmart portal. Additionally, clients meet with their assigned account manager to regularly review telecom cost reductions â€" from both audit savings and optimization recommendations. The Two Types of Telecom Audit Companies Pure telecom auditors that come in and perform a historical audit of previous invoices to look for errors. These firms will procure telecom services or will be looped into any provisioning performed by the client. On an ongoing basis, invoices are sent directly to the service provider. Using telecom audit software, they audit invoices against a continuously maintained telecom inventory. They also provide service optimization recommendations to right-size wireless plans and other usage packages. Additionally, a full-service firm will make payments on behalf of the client, and will eliminate late fees. This provider gets involved to handle misapplied payments and negotiates credits directly with the carriers. Cass is this type of service provider. Their Telecom Auditing Process vs. Cass audits every line item of every invoice, rather than sample data. More on that below: Telecom Auditing Basics Large enterprises should understand the basics of telecom auditing. When it comes to a telecom audit, you must distinguish between: Data-rich or data-poor â€" How much invoice data is subject to the audit? Are you auditing data samples or some percentage of invoice information? Are you auditing every line-item charge of every invoice, every month? Is there an experienced staff reviewing system-generated reports? Who analyzes the data, reviews audit findings and manages disputes? The Cass automated telecom audit process seeks to include every possible line-item charge. This goal is accomplished when the Cass team works with your carriers to convert your invoices to an industry-specific, electronic standard â€" EDI ANSI When invoices are received via EDI ANSI , the most granular level of expense detail can be captured by the Cass TEM software application, facilitating robust, automated audits of each charge item on every invoice, every month. Such audits ensure the elimination of recurring invoice errors, which are commonplace in the telecom industry. In contrast, an event-driven audit occurs when an organization brings in auditors to examine a sampling of paid invoices to detect errors. The problem with these audits is that they are non-systematic and non-recurring. Errors and over-charges can creep back into the process at any time. These often small, but repetitive overcharges can significantly increase costs when not addressed. The way to find these issues is through granular audits enabled by ANSI invoice receipt. If you are keying data from paper invoices or scanned images, you are processing at the summary level. Some TEM providers take short cuts. Cass has experienced telecom professionals that expertly review billing records, contracts, tariffs and inventories by location. Enabled by preset reports, this team also identifies services that are no longer in use but still being billed. Pre-Payment Invoice Analysis Prior to invoice payment, Cass validates telecom invoices on a high level in order to approve them for payment. Confirm accounts belong to customer Match billing against inventory records Confirm that cost allocations are complete and accurate Confirm charges or variances are within pre-established tolerance levels. Bill Review Some of the telecom audit activities analysts perform during this telecom invoice review include: Researching unnecessary features such as call forwarding, verify busy, caller ID, call waiting, speed dialing, repeat dialing, three-way calling, call return, wire maintenance, call tracing, etc. With this experience, we can resolve billing errors, credits, refunds and cost reduction opportunities credit and recovery issues in a very timely manner. Contact Us For more information about how clients have achieved results â€" including audit savings â€" using Cass for telecom expense management services, please view our TEM case studies. Would you like to ensure that every line-item charge on every telecom invoice you receive gets audited every month? Would you like a team of professionals to manage these issues with carriers and recover overcharges on your behalf and track your savings? Contact us for more information about telecom auditing. Or if you are considering a change in providers: Some of the largest

companies in the world trust Cass to deliver accurate insights into their costs for freight, utilities, telecom, mobility, waste, recycling and other expenses. Founded in , Cass Commercial Bank is a wholly owned subsidiary and a Federal Reserve member bank that provides Cass and its clients with secure payment controls. Cass Information Systems, Inc.

Chapter 3 : Telecommunications Industry Outlook | Deloitte US

Navigant Research estimates that telecom networks worldwide will consume , GWh of energy in Telecom networks are increasingly providing services considered essential to consumers and thus need to be reliably provided, especially in cases of disaster or emergency.

National telegrams The number of charged telegrams which both originate and terminate within the same country. Should be measured as the number of telegrams rather than the number of words. International outgoing telegrams The number of charged outgoing full rate telegrams originating in a given country with a destination outside the country. National telex traffic All the telex traffic which both originates and terminates within the same country. Should be provided as number of messages and minutes. International telex traffic All the outgoing telex traffic originating in a given country with a destination outside the country. If available, the total incoming telex traffic terminating in a given country should also be reported. Tariffs All tariffs should be expressed in local currency at current prices. A separate statement should be made concerning tax rates e. Telephone service installation charge Installation refers to one-off charges involved in applying for basic telephone service. Where there are different charges for different exchange areas the charge for the largest urban area should be used and specified in a note. Where there are different installation charges for residential and business consumers or for first and subsequent lines, these should be stated separately. Telephone service monthly subscription charge Monthly subscription refers to the recurring fixed charge for subscribing to the PSTN. The charge should cover the rental of the line but not the rental of the terminal e. Separate charges should be stated where appropriate, for residential and business subscribers or for first and subsequent lines. If the rental charge includes any allowance for free or reduced rate call units this should be indicated. If there are different charges for different exchange areas, the largest urban area should be used and specified in a note. Telephone service national call charges National call charges can be separated by local and long distance calls. In addition the costs of a local call from a public pay telephone should be provided. See Table A-1 for an example of how long-distance calls within the country might be provided. Telephone service international call charges This is the cost of a 3-minute direct dialled i. The rate should be supplied for peak rate time calls and off-peak discount rate calls if applicable. The cost should be reported in national currency, with a statement on what taxes are applied. See Table A-2 for an example of how this data might be provided. Separate information should be provided for analogue e. Leased line charges Connection charge and monthly rental charge. Costs should be specified for different speeds e. Packet-switched data communications network charges Connection, monthly rental charge and call set-up charges for packet-switched data communication see Table A Total full-time staff in telecommunications services Full-time staff employed by telecommunication network operators in the country for the provision of public telecommunication services. Part-time staff should be expressed in terms of full-time staff equivalents. As far as possible, staff not working principally for the provision of telecommunications services e. An indication of the percentage of functions carried out by contractors could be specified in a footnote. Revenue and expenses All items in this section should be reported in national currency at current prices. Total revenues from all telecommunications services This is the total revenue earned and is the sum of items This should exclude revenues from non-telecommunications services. Revenue turnover consists of telecommunications service earnings during the financial year under review. Revenues from telephone connection charges Revenue received for connection installation of telephone service. This may include charges for transfer or cessation of service. Revenues from telephone subscription charges Revenues from recurring charges for subscription to PSTN including equipment rentals. Revenues from local and national calls Revenues from local and national long distance telephone calls. Revenues from international calls Revenues for international telephone calls. This should include charges received from subscribers for placing outgoing calls after deduction of the share of this income to be paid to other organizations for outgoing telecommunication traffic operators of the incoming and

possibly transit countries and after inclusion of income received from foreign telephone operators for completing calls originating in a foreign country. Inpayments and outpayments to foreign telecommunication operators should be listed separately. Revenues from telegram and telex services Revenues for transmittal of telegraphic and telex messages, both national and international. Revenue from leased lines Revenues from the provision of leased lines circuits. Revenue from mobile communications services Revenues from the provision of mobile communications services such cellular, private trunked radio and radio paging. Revenue by each mobile service should be listed separately. Other revenues Any other revenues not accounted for elsewhere for the provision of telecommunication services. Responders should indicate in a note what are the main sources of other telecommunications revenues. Total current expenditure for all telecommunication services Current expenditure means expenditure other than investments; it consequently refers to the running of telecommunication services on an annual basis. It is further sub-divided see 42 to 46 below. Operational expenditure salaries, benefits, etc. These items should be listed separately. Interest Interest refers to the financial year for loans associated with fixed and current assets. The sum should be net, that is interest payable by the operator on debts minus the any income gained from investments. Interest received and paid should be listed separately. This item does not include pay-related e. Depreciation Depreciation covers the expected devaluation of capital assets insofar as this is regarded as an item of current expenditure. It covers the financial charges made in the year for the loss of value of installed equipment. It is normally calculated on hypotheses based on the useful life of the different categories of equipment. Other expenditures Any other expenditures not connected with operation, depreciation, interest or taxation. This might include for example, non-recurring charges such as restructuring charges or adjustments due to accounting changes. Investment The term investment means the expenditure associated with acquiring the ownership of property including intellectual and non-tangible property such as computer software and plant. These include expenditure on initial installations and on additions to existing installations where the usage is expected to be over an extended period of time. Also referred to as capital expenditure. Total annual investment in telecommunication including land and buildings The annual investment for acquiring property and plant. Total annual investment in telecommunication excluding land and buildings The annual investment for acquiring plant e. Annual investment in telephone switching equipment. The annual investment for telephone switching equipment such as local, national trunk and international exchanges. Indian Telecommunication Statistics Useful example of telecommunications indicator collection for large developing country. Statistics of Communications Common Carriers. Useful examples of aggregation of data from many operating agencies. Source of macro-economic data. Historical raw data of public telecommunication sector for most countries and territories. Detailed regional coverage with totals and averages. World Telecommunication Development Report. Training Indicators for TTC. Identification of telecommunication staff training indicators. Performance Indicators for Public Telecommunication Operators. Policy-oriented uses of performance indicators. Policy-oriented uses of performance indicators for OECD member countries. A Model Survey for the Telecommunication Sector. Monthly Bulletin of Statistics. Source of population, consumer price index and exchange rate data. Demographic and macro-economic data. Performance Indicators for Telecommunication Services. Telecommunication Technical Note 7.

Chapter 4 : Telecom Audit | Reduce Costs through Invoice Audits | Cass

Cass audits every line item of every invoice, rather than sample data. More on that below: Telecom Auditing Basics. Large enterprises should understand the basics of telecom auditing. When it comes to a telecom audit, you must distinguish between: 1.

History[edit] NASA mission control computer room circa Data centers have their roots in the huge computer rooms of the s, typified by ENIAC , one of the earliest examples of a data center. Many cables were necessary to connect all the components, and methods to accommodate and organize these were devised such as standard racks to mount equipment, raised floors , and cable trays installed overhead or under the elevated floor. A single mainframe required a great deal of power, and had to be cooled to avoid overheating. During the boom of the microcomputer industry, and especially during the s, users started to deploy computers everywhere, in many cases with little or no care about operating requirements. However, as information technology IT operations started to grow in complexity, organizations grew aware of the need to control IT resources. The advent of Unix from the early s led to the subsequent proliferation of freely available Linux -compatible PC operating-systems during the s. These were called " servers ", as timesharing operating systems like Unix rely heavily on the client-server model to facilitate sharing unique resources between multiple users. The availability of inexpensive networking equipment, coupled with new standards for network structured cabling , made it possible to use a hierarchical design that put the servers in a specific room inside the company. The use of the term "data center", as applied to specially designed computer rooms, started to gain popular recognition about this time. Installing such equipment was not viable for many smaller companies. Many companies started building very large facilities, called Internet data centers IDCs , which provide commercial clients with a range of solutions for systems deployment and operation. New technologies and practices were designed to handle the scale and the operational requirements of such large-scale operations. These practices eventually migrated toward the private data centers, and were adopted largely because of their practical results. Data centers for cloud computing are called cloud data centers CDCs. But nowadays, the division of these terms has almost disappeared and they are being integrated into the term "data center". With an increase in the uptake of cloud computing , business and government organizations scrutinize data centers to a higher degree in areas such as security, availability, environmental impact and adherence to standards. Standards documents from accredited professional groups, such as the Telecommunications Industry Association , specify the requirements for data-center design. Well-known operational metrics for data-center availability can serve to evaluate the commercial impact of a disruption. Development continues in operational practice, and also in environmentally-friendly data-center design. Data centers typically cost a lot to build and to maintain. One of the main concerns is business continuity ; companies rely on their information systems to run their operations. If a system becomes unavailable, company operations may be impaired or stopped completely. It is necessary to provide a reliable infrastructure for IT operations, in order to minimize any chance of disruption. Information security is also a concern, and for this reason a data center has to offer a secure environment which minimizes the chances of a security breach. A data center must therefore keep high standards for assuring the integrity and functionality of its hosted computer environment. This is accomplished through redundancy of mechanical cooling and power systems including emergency backup power generators serving the data center along with fiber optic cables. The topology proposed in this document is intended to be applicable to any size data center. These criteria were developed jointly by Telcordia and industry representatives. They may be applied to data center spaces housing data processing or Information Technology IT equipment. The equipment may be used to: The first step is to establish a baseline facility environment suitable for equipment installation. Standardization and modularity can yield savings and efficiencies in the design and construction of telecommunications data centers, both for now and for later. Organizations are experiencing rapid IT growth but their data centers are aging. In May , data center research organization

Uptime Institute reported that 36 percent of the large companies it surveyed expect to exhaust IT capacity within the next 18 months. This differs from a traditional method of data center upgrades that takes a serial and siloed approach. Reducing the number of data centers [21] [22] and avoiding server sprawl [23] both physical and virtual [24] often includes replacing aging data center equipment, [25] and is aided by standardization. IT virtualization technologies help to lower capital and operational expenses, [27] and reduce energy consumption. Gartner views virtualization as a catalyst for modernization. Automating tasks such as provisioning , configuration, patching , release management and compliance is needed, not just when facing fewer skilled IT workers. Protection of virtual systems is integrated with existing security of physical infrastructures. Air conditioning is most important in the machine room. Because of the lack of need for staff to enter the data center, it can be operated without lighting. All of the devices are accessed and managed by remote systems, with automation programs used to perform unattended operations. In addition to the energy savings, reduction in staffing costs and the ability to locate the site further from population centers, implementing a lights-out data center reduces the threat of malicious attacks upon the infrastructure. Telecommunications Industry Association[edit] Main article: The simplest requirements for the data center infrastructure is a Level 1 data center, which is basically a server room , following basic guidelines for the installation of computer systems. The most stringent level is a Level 4 data center, which is designed to host the most mission critical computer systems, with fully redundant subsystems, the ability to continuously operate for an indefinite period of time during primary power outages. Data availability[edit] Data availability [47] is a term used by computer storage manufacturers and storage service providers SSPs to describe products and services that ensure that data continues to be available at a required level of performance in situations ranging from normal through "disastrous. The time it takes to recover, known as the mean time to recover MTR , could be minutes, hours or days. Major data centers did not appear in India until the late s. Some of the considerations in the design of data centers are: A typical server rack, commonly seen in colocation size - one room of a building, one or more floors, or an entire building, and can hold 1, or more servers [52] space, power, cooling, and costs in the data center. Cost of avoiding downtime should not exceed the cost of downtime itself [56] Site selection[edit] Location factors include proximity to power grids, telecommunications infrastructure, networking services, transportation lines and emergency services. Others are flight paths, neighbouring uses, geological risks and climate which costs associated with cooling. Modularity and flexibility[edit] Main article: Modular data center Modularity and flexibility are key elements in allowing for a data center to grow and change over time. Data center modules are pre-engineered, standardized building blocks that can be easily configured and moved as needed. Data center environmental control The physical environment of a data center is rigorously controlled. Air conditioning is used to control the temperature and humidity in the data center. Unless the heat is removed, the ambient temperature will rise, resulting in electronic equipment malfunction. Air conditioning systems help control humidity by cooling the return space air below the dew point. Too much humidity, and water may begin to condense on internal components. In case of a dry atmosphere, ancillary humidification systems may add water vapor if the humidity is too low, which can result in static electricity discharge problems which may damage components. Subterranean data centers may keep computer equipment cool while expending less energy than conventional designs. Modern data centers try to use economizer cooling, where they use outside air to keep the data center cool. At least one data center located in Upstate New York will cool servers using outside air during the winter. Many newly constructed data centers are also using Indirect Evaporative Cooling IDEC units as well as other environmental features such as sea water to minimize the amount of energy needed to cool the space. There are many types of commercially available floors that offer a wide range of structural strength and loading capabilities, depending on component construction and the materials used. The general types of raised floors include stringer, stringerless, and structural platforms, all of which are discussed in detail in GR This design permits equipment to be fastened directly to the platform without the need for toggle bars or supplemental bracing. Structural platforms may or may not contain panels or stringers. These provide a

plenum for air to circulate below the floor, as part of the air conditioning system, as well as providing space for power cabling. Metal whiskers[edit] Raised floors and other metal structures such as cable trays and ventilation ducts have caused many problems with zinc whiskers in the past, and likely are still present in many data centers. This happens when microscopic metallic filaments form on metals such as zinc or tin that protect many metal structures and electronic components from corrosion. Maintenance on a raised floor or installing of cable etc. This phenomenon is not unique to data centers, and has also caused catastrophic failures of satellites and military hardware. Static transfer switches are sometimes used to ensure instantaneous switchover from one supply to the other in the event of a power failure. Low-voltage cable routing[edit] Data cabling is typically routed through overhead cable trays in modern data centers. Computer cabinets are often organized into a hot aisle arrangement to maximize airflow efficiency. Fire protection[edit] FM Fire Suppression Tanks Data centers feature fire protection systems, including passive and Active Design elements, as well as implementation of fire prevention programs in operations. Smoke detectors are usually installed to provide early warning of a fire at its incipient stage. Two water-based options are [68].

Chapter 5 : Energy, Resources & Industrials â€“ Perspectives, Insights, and Analysis | Deloitte US

The wireless communication networks of the future are envisioned to have a significantly higher energy efficiency in terms of energy consumption per transmitted bit of data.

This section does not cite any sources. Please help improve this section by adding citations to reliable sources. Unsourced material may be challenged and removed. January Learn how and when to remove this template message An IT audit is different from a financial statement audit. This includes, but is not limited to, efficiency and security protocols, development processes, and IT governance or oversight. Installing controls are necessary but not sufficient to provide adequate security. People responsible for security must consider if the controls are installed as intended, if they are effective, or if any breach in security has occurred and if so, what actions can be done to prevent future breaches. These inquiries must be answered by independent and unbiased observers. These observers are performing the task of information systems auditing. In an Information Systems IS environment, an audit is an examination of information systems, their inputs, outputs, and processing. The IT audit aims to evaluate the following: Types of IT audits[edit] Various authorities have created differing taxonomies to distinguish the various types of IT audits. This audit constructs a risk profile for existing and new projects. This audit is an analysis of the innovative abilities of the company being audited, in comparison to its competitors. This audit reviews the technologies that the business currently has and that it needs to add. Technologies are characterized as being either "base", "key", "pacing" or "emerging". Others describe the spectrum of IT audits with five categories of audits: System and process assurance audits form a subtype, focussing on business process-centric business IT systems. Such audits have the objective to assist financial auditors. An audit to verify that the processing facility is controlled to ensure timely, accurate, and efficient processing of applications under normal and potentially disruptive conditions. An audit to verify that the systems under development meet the objectives of the organization, and to ensure that the systems are developed in accordance with generally accepted standards for systems development. Management of IT and Enterprise Architecture: An audit to verify that IT management has developed an organizational structure and procedures to ensure a controlled and efficient environment for information processing. An audit to verify that telecommunications controls are in place on the client computer receiving services , server, and on the network connecting the clients and servers. And some lump all IT audits as being one of only two type: A number of IT Audit professionals from the Information Assurance realm consider there to be three fundamental types of controls regardless of the type of audit to be performed, especially in the IT realm. At a more fundamental level, these controls can be shown to consist of three types of fundamental controls: In an IS, there are two types of auditors and audits: IS auditing is usually a part of accounting internal auditing, and is frequently performed by corporate internal auditors. An external auditor reviews the findings of the internal audit as well as the inputs, processing and outputs of information systems. The external audit of information systems is frequently a part of the overall external auditing performed by a Certified Public Accountant CPA firm. It focuses on issues like operations, data, integrity, software applications, security, privacy, budgets and expenditures, cost control, and productivity. Guidelines are available to assist auditors in their jobs, such as those from Information Systems Audit and Control Association.

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Chapter 6 : TechKnowledge - Corporate and Business Technology Consulting

The telecommunications sector continues to be a critical force for growth, innovation, and disruption across multiple industries. While the rollout of 5G will be a multiyear journey, the foundations will begin in One of the most anticipated mobile technology platforms, 5G will be the.

The circuit switching technique is employed in a telephone network. Communication links are connected to switching centers, which connect to one node to another on demand. The circuit is established for the entire duration of the communication 4. Circuit switching is suitable for file transfers and similar longer transmissions Packet Switching: Packet switching is of particular importance for data communication owing to its speed and its superior utilization of communication links when handling Abursty, intermittent, traffic. Indeed, data transmission involves short bursts of activity by a computer or a terminal when the data are sent, followed by long periods when there is no transmission. Packet switching offers flexibility in connecting to a network. It is used by most of the public data networks provided by value-added carriers. In packet switching, messages are divided at the source into fixed-length chunks, called packets, that also include bits identifying the receiver. Typically, a packet contains bytes of data. Each packet, can be transmitted independently, with routing determined at each node the packet passes through as opposed to circuit switching, where the route is predetermined. Traditional packet switching checks each packet for errors at every node the packet passes through. Modern telecommunications equipment is far more noise-free than that for which packet switching was originally designed. To take advantage of this, two fast packet-switching technologies are being introduced: Fast packet switching that checks a packet for errors only at the entry and exit nodes of the telecommunications network, thus reducing transmission delay. Network Protocols [Figure 7. To ensure orderly communication over a network, all the nodes in the network must follow a set of rules called protocols. These rules are complex. They extend from the electric connection to the network and the format of the message, all the way to the interaction between application programs that run on different nodes. Explain to students that with the globalization of telecommunications, the International Standards Organization ISO has developed the OSI model in order to organizing protocols. The open system approach opens the field to a broad array of competing vendors, a situation that benefits users to ensure that they are not locked into a closed, proprietary protocol structure of a specific manufacturer. Gives both users and vendors flexibility in conforming to a standard. Users can select a protocol for any layer of the model, as long as the protocol performs the necessary services and provides the same interface to the adjacent layers. If a layer has to be changed, only the hardware or software implementing that layer need be modified. A protocol layer in one node interacts with the corresponding layer in another one. Layer and its Function 1. Physical Provides access to the telecommunications medium and ensures transmission of the bit stream over it 2. Data Link Ensures error-free transmission of frames blocks of data over a network link 3. Network Routes messages or packets from source to destination by selecting connecting links 4. Transport Provides reliable end-to-end connection between two communicating nodes. When packet switching is used this layer breaks a message into packets 5. Session Establishes, maintains, and terminates a connection session between two applications running on communicating nodes. A session lasts, for example, from a long-on to a specific application to a log-off. Issue requests for establishing and terminating a session to the session layer 7. Application Provides services to communicating application programs; examples include file transfer, running a remote program, allocating a remote peripheral, and ensuring integrity of remote databases. Two protocol sets have gained importance: TCP provides the higher-level services in connecting the communicating applications, while IP ensures the lower-level functions of routing and addressing, guiding the packets over the Internet. Interconnections among Networks As communication needs increase, network connectivity becomes a major issue as users want to access a remote computer. Gateways such as routers and bridges help solve the problem. Interconnection between two networks of the same type is accomplished by a relatively simple bridge, implemented in

hardware and software. A router is a device that accepts messages in the format produced by one of the networks and translates them into the format used by the other. Workplace for a Workgroup A LAN interconnects computers within a single site, such as an office building, a manufacturing plan, or a corporate or university campus. Characteristics of a LAN include: Its scope is commonly measured in feet 2. Communication speeds are very high 3. Used as a local means of computing and communication among users in larger firms 4. Are owned by the organization 5. Afford a sense of control and the flexibility to meet the demands of the end users A LAN gives its users the following capabilities: Users can share resources, such as a fast printer or a database 2. Users can collaborate by communicating over their LAN. This collaboration may be facilitated by groupware that runs on a LAN 3. Users can access other networks within a firm or outside of it via bridges and routers There are two principal LAN designs: Peer-to-peer - peripherals are located at terminals and system administration is largely left up to the users 2. Server-based networks - shared resources are placed a dedicated server that manage a given resource on behalf of user workstations sharing the resource file server, printer server, gateway, optical disk server. Most of the servers are dedicated to their task; using them as workstations degrades the performance of the net. Characteristics of a PBX: Gives a company control over the usage of its telephone system and offers a variety of features, such as call forwarding or voice messaging. Maybe employed as a switch for data communications 3. Many newer PBXs use digital technology, eliminating the need for modems, and perform conversions needed to ensure connectivity between various equipment and telecommunications links. Easy to connect a new workstation to the net. Speeds of PBX-based networks are limited 7. The processing of a given application is split up among a number of clients - serving individual users - and one or more servers - providing access to databases and doing most of the computing. Main objective of a client is to provide a graphical user interface to a user 3. Main objective of a server is to provide shared services to clients 4. Client performs presentation services. It displays the GUI and runs the program that determines what happens when the user selects a menu option. Server manages the accesses to the database 3. Clients send remote procedure calls to activate specific applications logic on a server Characteristics of Three-Tier Architecture: An application server runs most of the application logic, with the user workstation responsible for the display at the front end and the database server providing database servers at the back end. Is attractive in terms of their acquisition price as related to their performance 2. Is moving computing control out of the data centers and into the end-user areas 3. Software is complex, and is expensive to maintain 4. These long-distance telecommunications networks employ a variety of equipment so that the expensive links may be used effectively. The offerings of common carriers and of providers of value-added services may be combined with private networks to create an overall organizational network. The host runs a system program, called a telecommunications monitor, which processes incoming messages, passing them to the appropriate application programs, and accepts outgoing messages from the applications in order to transmit them into the network. Front-End Processor Relieves the host computer of most of the tasks involved in network control. Under the control of its own software, the front-end processor accepts messages coming from the network and routes outgoing messages to their destinations. It performs the necessary code conversions, encrypts and decrypts secure messages, and performs error checking so that the host deals with Aclean messages. Cluster Controller Manages several terminals, connecting them to a single telecommunications link, and performs communication tasks for them, such as screen formatting, code conversion, and error checking. A cluster controller may also allow the terminals to share a high-speed printer and may handle electronic mail among the cluster terminals. Multiplexor Combines the data that terminals send to it over local low-speed links into a single stream. This stream is then transmitted over a high-speed telecommunications channel and is split by another multiplexor on the opposite end of the channel. Concentrator Combines transmission from several slower terminals that operate in a burst mode into a single transmission stream that requires a link of lower speed than the sum of the speeds of all the terminals combined. A concentrator stores messages from terminals and forwards them when warranted. Switches Establishes connections between nodes that need to communicate. Access Terminals Include a variety of

dumb terminals, with no processing capacity and intelligent terminals with processing capacity, such as personal computers. Some network facilities are owned by user organizations, others can be leased by them, or simply used on a pay-as-you-go basis. Among the typical facilities owned by user firms are workstations, host computers, and front-end processors. The essential providers of telecommunications links and services are common carriers and the vendors of enhanced services on value-added networks. Providers of value-added networks 3. The vast majority of common carriers provide telephone service. These carriers offer the use of a wide-area telecommunications infrastructure, that is, facilities for the transmission of voice and data messages. Common carriers offer a service called virtual private network where a user firm can purchase guaranteed access to facilities with specified capabilities, such as transmission speed and access points. Providers of Value-Added Networks Value-added vendors lease facilities from the common carriers and provide telecommunications services to their own customers. These vendors add value to the basic infrastructure furnished by the common carrier. The value-added networks VAN provided by the vendors furnish services over and above those provided by common carriers. Private Lines and Private Networks Instead of using a service that has to be shared with others, a firm may lease its own private lines or entire networks from carriers. This can have economic advantages as compared with VAN use, as well as provide faster and more secure communications. Driven by the possibilities offered by the Internet and the Web, electronic commerce is expanding its reach.

Chapter 7 : Information technology audit - Wikipedia

6 Top 10 risks in telecommunications Also, as operators roll out LTE networks and customer demand for mobile data continues to increase, network capital expenditure.

Chapter 8 : Data center - Wikipedia

Before the emergence of the Internet and other data networks, telecommunications had a clear meaning: the telephone (and earlier the telegraph) was an application of technology that allowed people to communicate at a distance by voice (and earlier by encoded electronic signals), and telephone service was provided by the public switched telephone network (PSTN).

Chapter 9 : Telecommunications

Telecommunications Navigant Research is the premier market research and advisory firm that combines deep subject matter expertise with an extensive library of data and insights to help the telecommunications industry navigate the global energy transformation.