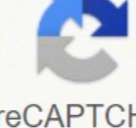I'm not robot

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Modeling and Simulation for Material Selection and Mechanical Design

edited by
George E. Totten
Lin Xie
Kiyoshi Funatani

English Marathi Dictionary

a — एक

aback	मागे
abacus	सरकणाऱ्या मण्यांच्या दांड्या असलेली आणि मोजण्यासाठी किंवा आकडेमोडीसाठी वापरण्यात येणारी चौकट
abaft	मागील बाजूस
abandon	त्याग करणे
abandoned	बेबंद
abandoning	सोडून
abandonment	त्याग
abase	क्षुद्र
abasement	अपमान

UNIT 10 EMERGING TRENDS AND CAREERS IN RETAIL INDUSTRY

Structure

10.0, OBJECTNES
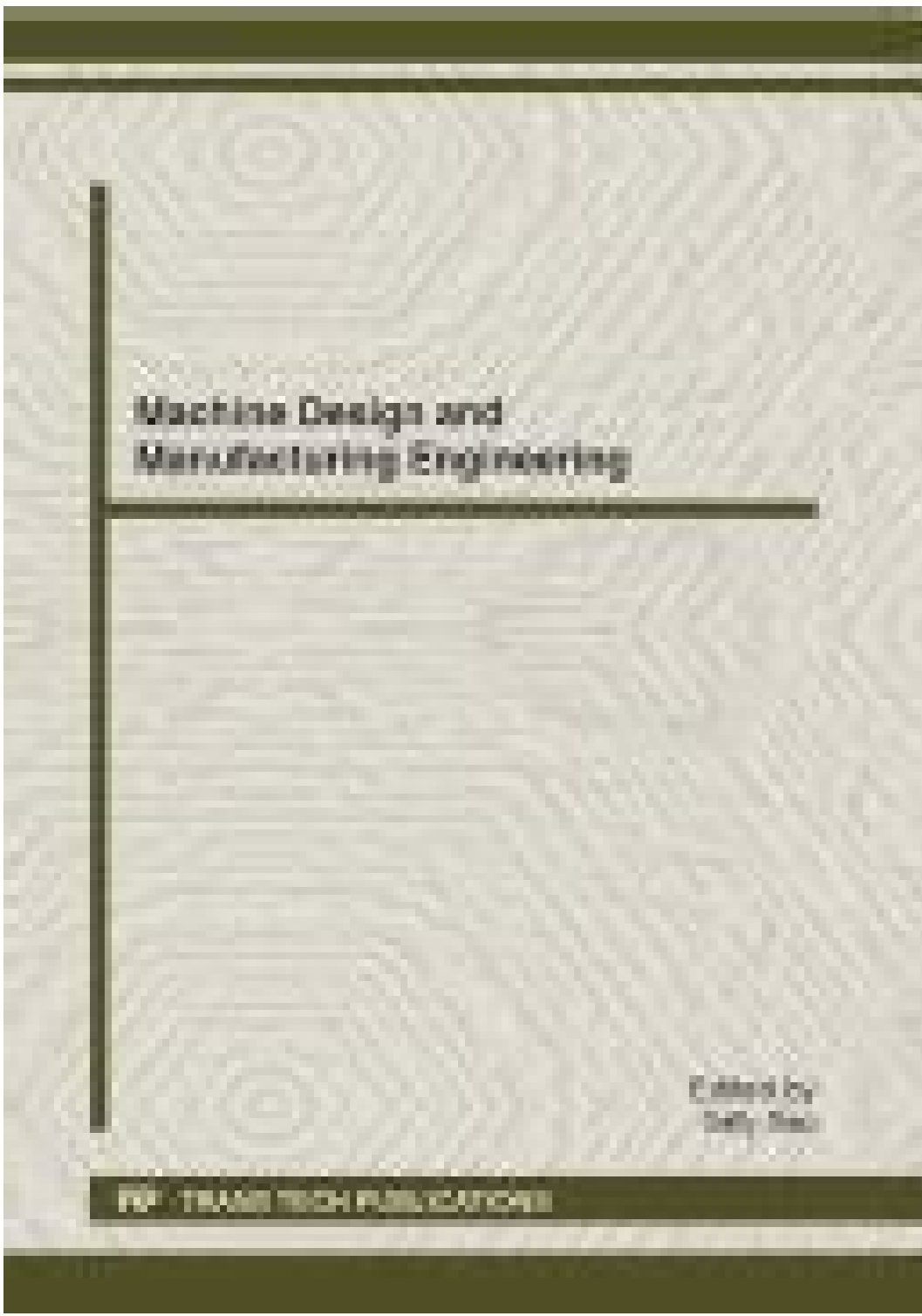
After reading this unit, you will be able to:

● analyse the new trends in modern retail Industry;

● explain the Cash and Carry concept;

● describe the evolution of manufacturer- retailer relationship; and

● discuss importance and role played by the private brands.

10.1 INTRODUCTION

As we progress into the 21ˢᵗ century, we find that the business world is undergoing a rapid transformation. Large retail chains are rapidly expanding their operations and going global. We also witness very rapid growth of organized retail in India. To manage growth and environmental change, retailers have to have innovative strategies and explore new ways of doing business. The retailers are accordingly innovating new formats. They are also finding new ways of achieving higher growth. Mergers and acquisitions are becoming common as they help retailers to scale up rapidly.

To maximize profits and build a strong brand image, the retailers are also developing private brands. The private brands are gaining market share and becoming more important. The increasing dominance of large retail chains and success of private brands is changing the entire business scenario. It is also changing the relationship between manufacturers and retailers. The retailers have more bargaining power as they are close to customers and have information and hence retailers often dictate terms.

We also look at how the rapid growth in organized retail is throwing up attractive career opportunities in various areas of retail. We start this unit by understanding mergers and

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Machine Design and Manufacturing Engineering

Edited by Selly Sale

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Design of mechanical systems book pdf.

Show an online example.Distinguish between a personal requirement and community requirement in computing. If one was designed to engineering requirements and the other to HCI requirements, which performs better?Fashion is the social requirement to look good applied to wearable object design. Web users who did not like a site just clicked on, and only web sites that got hits succeeded. You cannot view the world in two different ways at the same time, as you cannot sit in two places at once (footnote 10).Emergent. It consistently describes a whole world.Subjective. Likewise, the information level is not just the onboard computer, but also the neuronal processing of the pilot's brain.The human level is the pilot, who from the sensations and perceptions of his or her brain generates meaning. also add outposts. This new meta-discipline applies psychological principles to computing design; e.g. Miller's paper on cognitive span suggests limiting computer menu choices to seven (Miller, 1956). Higher levels direct lower ones to improve system performance. How has this worked in science?The reductionist dream is based on logical positivism (footnote 12), the idea that only the physical exists so all science must be expressed in physical terms. In computing, a mobile phone can be a fashion accessory, just like a hat or handbag. Can you see or touch a bit? How can a bit require physicality but not itself be physical?Companies like Google and E-bay still seek customer satisfaction, but customers in crowds also have community needs like fairness, i.e. higher system levels invoke higher requirements.In general, the highest system level defines its success; e.g. social networks need a community to succeed. Figure 1.4: Levels as higher abstractionsA level is now formally defined as a world view, a way of seeing reality that is complete and consistent in itself. Give specific examples to illustrate.According to Norman, what is ergonomics? See section "Exceptions" in the copyright terms below.Figure 1.6: How computing disciplines ariseOnline communities work through people, who work through software that works through hardware. Beyond friends are tribes, cities, city-states, nations and meta-nations like the USA. If we cannot see cognitions physically, is the study of cognitions (psychology) a science? If you are reading this chapter in a class - either at university or commercial – the questions might be discussed in class first, and then students can choose questions to research in pairs and report back to the next class.How has computing evolved since it began? Can one sell communities?Is a kitchen table a technology? That the soft should direct the hard seems counter-intuitive, but trees grow at their soft tips more than at their hard base. What separates science from imagination if it can use non-physical constructs in its theories?Give three examples of other animal species who sense the world differently from us. Either quantum theory is wrong, or reductionism does not work. What is the difference between ergonomics and HCI? If we say a book "contains" information, what is assumed? Computer science (CS) (footnote 7) is then just about the software level, regardless of the hardware implementation. Its role is to impress, not just to function. Or members could take turns to host the next site, showing what they like. Hardware becomes software when we see computing in a different way. With the world population at seven billion and growing, Facebook's over 900 million active accounts are just the beginning. As computing evolves to higher system levels, so its design also changes, from technical to socio-technical design.Levels can clarify the often confusing terms of computing. Computing researchers are scattered over the academic landscape like the tribes of Israel, some in engineering, some in computer science, some in health, etc. Replace the hardware part and the computer works with no software change needed. Give three examples of a community requirement giving an IT design heuristic. We choose a view perspective, explicitly or not.Exclusive. Hardware actions can meet software goals, as database and network requirements are met by new hardware chip components. What about HCI experts?What in general do people do if their needs are not met in a physical situation? Increase meaning transfer efficiency.User misunderstands, gives up, is distracted, or enters wrong data.InformationReduce information overload, clashes. The software goal, of better information throughput, also becomes the hardware goal, so physical chip design today is as much about caching and co-processing as it is about cycle rate. When the software era arrived, hardware continued to evolve but hardware leaders like IBM no longer dominated computing unilaterally, as they had before. This gives us a variety of design fields, as seen below. Is a law a technology? Can the same physical book "contain" different information for different people? Both are controls (footnote 20) but one is a cool tool and the other a mass of buttons. Difference Engine No. 2, built faithfully to the original drawings, consists of 8,000 parts, weighs five tons, and measures 11 feet. For example, to describe World War II as a scientific history of atomic events would be ridiculously ineffective, as a political summary is the more appropriate view.As views, levels emerge from each other, as lower abstractions give higher ones (Figure 1.4). Is socio-technology part of engineering, computer science, psychology or one of the social sciences? Face-to-face friendships cross seamlessly to Facebook because the social level persists across physical and electronic architecture bases. So if all individual thoughts were erased, society would also cease to exist as surely as if all its citizens had vanished physically. The software level changed business fortunes by changing what computing is. It can have a "driver" who comments along the way: "This site shows how the Internet began ..." . In the evolution of design, higher level requirements have a natural priority, as is now discussed.1.4 From Hardware to SoftwareHardware is any physical computer part, e.g. mouse, screen or case. Using different terms, models and theories for the same subject just invites confusion. What is the common factor here?What is an application sandbox? If all science were physical, all science would be physics, which it is not.A reductionist philosophy that has failed in science in general is hardly a good base for a computing model. In the 2000s computing evolved yet again, to become a social medium as well as a personal tool. Web queries are even more volatile, so Google gave its service away for free and then sold advertising instead it — it sold its services to those who sold theirs.As computing levels changed, so did the business model, as selling knowledge is not like selling software. If a wireless mouse costs more and is less reliable, how is it better?Give three examples of a human requirement giving an IT design heuristic. The common feature is that the system fails to perform and in evolution what does not perform, does not survive (footnote 18).Each level emerges from the previous but fails differently:Hardware systems based on physicalenergy exchange fail from problems like overheating.Software systems based on information exchange fail from problems like infinite loops.HCI systems based on meaning exchange fail from problems like misunderstanding or information overload.Socio-technical systems based on normative meme exchange fail from problems like mistrust, unfairness and injustice.Computing as technology fails for technical reasons but, as socio-technology, also fails for social reasons. Which is better and why? How do HCI systems form an online community?Is computer science part of engineering or of mathematics? Give current examples.Is a "mouse error" a hardware, software or HCI problem? How can one see it?What is the reductionist dream? It will get weaker if music, art, journalism, architecture etc. The physical level is necessary for the information level but it is not sufficient. Courtesy of Ochro. It is logically true that hieroglyphics that cannot be read contain in themselves no information at all.If reader choices generate information, the data in a physical signal is unknown until it is deciphered. Applying biological needs, such as avoiding posture and eye-strain, to technology design merges biology and engineering.Object design applies psychological needs to technology in the same way (Norman, 1990): e.g. a door's design affects whether it is pushed or pulled. Levels return the observer to science, as quantum theory's paradoxes demand.Currently, sociology sees individuals as conduits of meaning that reflect external social structures, and so psychological, biological, and physical views are the faulty reductionism of social realities. Increase data processing, storage, or transferefficiencyProcessing hangs, data storage full, network overload, data conflicts.MechanicalReduce physical heat or force overload. The quantum world cannot be reduced to physical events (footnote 16). If the first two levels are technical and the last two social, the result is a socio-technical system (STS). Usable interfaces respect cognitive principles, e.g. by the nature of human attention, users do not usually read the entire screen. STS is not part of HCI, nor is sociology part of psychology, because a society is more than the people in it; e.g. East and West Germany, with similar people, performed differently as communities, as do North and South Korea today. As computer science emerged from a combination of mathematics and engineering, so HCI is emerging from psychology and computer science. The divide and conquer approach of reductionism does not allow computing to prosper as an academic multi-discipline.In practice, however, computing is thriving. As hardware over-heating problems are solved, software data locking problems arise. Can we encode more than one semantic stream into one physical message? Communities meeting their own requirements. Likewise in psychology Skinner's attempt to reduce all cognitions to physical behaviour did not work and has been replaced by cognitive realism, that cognitions are also real.The acceptance of mathematical and cognitive constructs does not deny science, because science only requires that theory constructs be validated empirically, i.e. by a physical measure (footnote 14), not that they be physical. Courtesy of Jitze Couperus. Figure 1.3: Computer system levelsTable 1.1 shows how different levels change not only the system type but also what is exchanged. Information emerges from hardware options, meaning emerges from information flows, and communities emerge from common citizen meanings. If the hardware works, then software becomes the priority; if the software works, then user needs become important; and if user needs are fulfilled, then social requirements arise. Just as computing had previously gained a software level, so it now gained a human level.Human computer interaction (HCI) is a person using IT, just as IT is software using hardware. The same applies online, as online communities make demands of Netizens (footnote 21) as well as software. Copyright: pd (Public Domain (information that is common property and contains no original authorship)). See section "Exceptions" in the copyright terms below.Figure 1.9: Computing requirements cumulateNote that the social level is open ended, as social groups form higher social groups, e.g. in physical society, over thousands of years, families formed tribes, tribes formed city states, city-states formed nations and nations formed nations of nations, each with more complex social structures (Diamond, 1998). The kingdom of research into computing is weak because it is a realm divided. If no community forms, it does not matter how easy to use, fast or reliable the software is. Copyright: CC-Att-SA-2 (Creative Commons Attribution-ShareAlike 2.0 Unported). How social units combine into higher social units (footnote 22) with new requirements is discussed further in Chapter 5.So it is naive to think that friend systems like Facebook are the last step, that social computing will stop at a social unit size of two. If social needs are not met online, there will be no online community, which means the technology fails. If a signal wire sends a physical "on" value, is that always a bit? Electronic communication may be "virtual" but the people involved are real. Give an example.Is a bit a physical "thing"? The semantic web vision of Tim Berners-Lee, the founder of the World Wide Web — his "dream for the web" — was a recognition of the human level of computing.Today, computing supports online communities that, by the same logic, have hardware, software, personal and community levels. If we saw the world as they do, would it change what we do? Adding people to the computing equation meant that getting the technology to work was only half the problem — the other half was getting people to use it. Are cognitions concrete? As design requirements cumulate, socio-technical design includes hardware, software and human requirements, as well as community needs (Figure 1.5). Hardware design is increasingly about meeting software requirements.As software emerged from hardware, it generated the new academic discipline of computer science. During the 1990s computing became more personal, until the World-Wide-Web turned Internet URLs into web site names that people could read (footnote 3). As computing evolved a social level, social requirements became part of computing design (Sanders & McCormick, 1993).Multi-discipline fields cannot, by their nature, be reduced to component discipline specialties; e.g. sociologists study society not technology, and technologists study technology not society, so neither can address socio-technical design — how social needs impact technical design. How is this possible?How available are academic papers? Is a computer program a technology? Software needs hardware but the same code can run on a PC, Mac or mobile phone. It could not do this if information was fully defined by the physical message. If the physical level were sufficient alone, there would be no choices and so no information, i.e. reductionism denies information science. Limiting computing to hardware (engineering) or software (computer science) denies its obvious evolution.Levels in computing are not system parts. Lower levels become necessary to avoid failure but not sufficient to define success.LevelRequirementsErrorsCommunityReduce community overload, clashes. Just as IT is more than hardware, so HCI is more than IT because it includes a human level. Software assumes some hardware but does not specify which hardware.If any part of a device acquires software, the whole system gets an information level; e.g. a computer is information technology even though its case is just hardware. If psychology is the study of people and IT the study of software and hardware, then HCI is the study of psychology as it applies to IT. What past cross-disciplines became disciplines. Equally, each level has its own knowledge base: if software fails we call a programmer, but if hardware fails we call an engineer.With this approach, design at one level is subject to higher level requirements. Hardware meeting community requirements. It links CS to psychology as CS linked engineering to mathematics. In Figure 1.3, a technology is any tool that people build to use (footnote 6), e.g. a spear is a technology. To the pilot, the aircraft is an extension of his or her body, like extra hands or feet, and computer data is like extra eyes or ears. Figure 1.8.B: TV controls meet engineering requirements(footnote 19)Ergonomics designs safe and comfortable machines for people. For example, reading the information of a file takes longer if it is fragmented, as the drive head must jump between physically distant disk sectors. A society is not just a set of people. Computer scientists are not engineers, because they design algorithms not objects, but neither are they mathematicians, because their code runs on physical machines. Computing began at the mechanical level, added an information level (software), then a human level and finally a community level; it is an example of general system evolution. The physical level includes not just the aircraft body but also the pilot's body, as both have mass, volume, inertia etc. Computer science is the "child" of mathematics and engineering, with the features of both but combined into a new discipline.1.5 From Software to UsersHCI began in the personal computing or PC era. Following Kant's model, the different disciplines of science are just different ways to view the same unspecified reality. If information is not physical, how does data compression work? Pick 10 important journal papers and using non-university browsing, try to access them for free. Is there a difference? Yet Facebook now challenges Google because we relate to family and friends even more than we query knowledge — social exchange has as much trade potential as knowledge exchange.New ways to view computing thus affect how we design and build computing systems. Copyright: CC-Att-SA-3 (Creative Commons Attribution-ShareAlike 3.0). Each level emerges to add to rather than replace earlier levels. Conversely, information does not exist physically, as it cannot be touched or seen.So if the encoding is unknown, the information is undefined; e.g. an electronic pulse sent down a wire could be a bit, or a byte (an ASCII "1"), or, as the first word of a dictionary, say "aardvark", be many bytes. Is an equation a technology? An entity relationship diagram can work for any physical storage, whether disk, CD or USB, as data entities are not disk sectors. What about selling friendships? STS design therefore is about having it all: reliable devices, efficient code, intuitive interfaces and sustainable communities. At each stage, a new specialty joined computing, but pure engineers still see only mechanics, pure computer scientists only information, pure psychologists only human constructs, and pure sociologists only social structures. This chapter analyzes the evolution of computing as it impacts computing design. Hardware, software, personal and community failures are all computing errors (Table 1.2). Selling software makes as much money as selling hardware, as the software changes more rapidly and needs to be replaced or updated more often. Should journals be able to copyright papers they neither wrote nor paid for?Why do universities divide computing research across many disciplines? It does not "cause" software, and nor is software a hardware output, in the way that physical systems have physical outputs. Reality is now a consensual construct, with physicality just one option. How did it challenge psychology? The human level of computing is even more confusing: engineers use the term IT to refer to computer applications; business prefers the term information systems (IS); education uses information communication technology (ICT); and health professionals invented the term informatics to meet their needs. Why has TV remote design changed so little in decades? As the great 18th century German philosopher Kant argued long ago, we see an object, or phenomenon, as a view, but don't see the thing in itself (Kant, 1781/2002) (footnote 17). What is the role of hardware companies like IBM and Intel in modern computing?How has the computing business model changed as it evolved? So a physical system exchanges energy, an information system exchanges software, a human system exchanges

meaning, and a community system exchanges memes (footnote 5). Levels cumulate, so the requirements of each level flow down to those below, e.g. community agreement gives normative influence at the citizen level, laws at the informational level, and cultural events at the physical level. If a bit is not physical, can it exist without physicality? Can mouse software affect HCI performance? Hardware meeting psychology requirements. Figure 1.11: The flower of computing1.11 Discussion QuestionsThe following questions are designed to encourage thinking on the chapter and exploring socio-technical cases from the Internet. In physics, reductionism gave a clockwork universe where each state perfectly defined the next, as in a computer. As modern societies federate states and nations, so the future of computing is as a federation of disciplines. Data compression fits the same data in a physically smaller signal by encoding it more efficiently. This deceptively simple question requires many answers because computing has re-invented itself every decade or so (Figure 1.2). Compare Steve Jobs' IPod to a television remote (Figure 1.8). What about an online community? It arises from interaction with the world.Complete. The complexity of modern computing arises from its discipline promiscuity (Figure 1.6).1.7 The Reductionist DreamBefore going on, we review the opposing theory of reductionism, which states that there is only one level, namely the physical level, and so everything can reduce to it. Is human computer interaction (HCI) part of engineering, computer science or psychology? In socio-technical design, the new "user" of computing is the community (Whitworth, 2009a).Unfortunately, different disciplines use different terms for the same levels, e.g. the study of software can be called computer science or software engineering. Defragmenting a disk improves software access by putting file data in adjacent physical sectors. Can one consistently divide the aircraft into human, computer and mechanical parts? Give an example.If information is physical, how can data compression put the same information in a physically smaller signal? Computer design is inclusively evolving from engineering design to socio-technical design, to keep pace with computer evolution. Quantum physics flatly denied this, as random quantum events by definition are explained by no physical history. The isomorphisms of science are then general system rules that apply across disciplines.Applying general systems theory to the evolution of computing gives the computing levels shown in Figure 1.3, where a computing system can be studied as a mechanical system, a software system, a human system or a social system, by engineers, computer scientists, psychologists and sociologists respectively. So a computer on the mechanical level is all hardware but on an informational level is all software. Is an HCI system (person plus computer) an information technology? Each level of a system evolution is built on the previous, so that social computing emerges from personal computing, personal computing emerges from software, and software emerges from hardware. He invented computers but failed to build them. Yet the multi-discipline of computing as a whole is not pure, because purity is not the future. STS and HCI need computer-sociologists and computer-psychologists. How is a book's information generated? A hardware update must not change the software, and a software update need not change the hardware. In this social determinism, society writes social agendas, such as communism or capitalism, upon individual tabulae rasae (blank slates). Can you insure something that is not physical? Which of these are computing devices? To draw an analogy, a pilot flying an aircraft is one system with different levels, not a mechanical part (the aircraft) with a human part (the pilot). Each defines itself apart, but in this pan-discipline view, all are just the human level of computing. It is the child of IT and STS. Aesthetic criteria apply when people buy mobile phones to be trendy or fashionable, so colour can be as important as battery life in mobile phone design.Socio-technology is information technology meeting social requirements. So information technology is not a sub-set of technology, nor is computer science a sub-set of engineering (because software is not part of hardware).Human computer interaction (HCI) is a person in front of a computer, a human plus IT system, with physical, informational and psychological levels. Is a socio-technical system (an online community) any set of HCI systems? Hardware and software are the different types of glasses we can use to view computing.Following this theory, all the disciplines of science are world views, like walking around an object to see it from different perspectives. Until computing research unifies, it will remain as it is now — a decade behind computing practice. Today's technology designers will find the future of design in level combinations.1.9 Design Level CombinationsThe general system concept of levels makes system design complex, as the design requirements of one level can "flow down" to those below it. How did it work out in physics? Explain. Software can fail without hardware failing, and hardware can fail without software failing. So now Facebook challenges Google, as Google challenged Microsoft, and as Microsoft challenged IBM.Yet to design a computer system one must define it, so what is computing? So software requirements can be met by hardware operations. Rebooting fixes the software problem with no hardware change, so a software system can fail while the hardware still works perfectly.Conversely, a computer can fail as hardware but not software, if a chip overheats. The idea of socio-technology arose when technology was implemented with ethics as an after-thought.However, in the information revolution the social and technical merge into one. What do citizens of a physical community do if it does not meet their needs? If we cannot see information physically, is the study of information a science? An affordance is a physical object feature that cues its human use, as buttons cue pressing. Software meeting community requirements. A message physically fixed in one way has by this definition zero information because the other ways it could have been fixed do not exist physically (footnote 13). Levels as higher ways to view a system are also new ways to operate and design the system. For it to bear research fruit, its discipline parents must release it. Is an information technology (IT) system a technology? Software meeting psychology requirements. Courtesy of Brian Whitworth and Adnan Ahmad. Information access improves even though the physical drive read rate has not changed. What do users do if their needs are not met online? The nature of people now defines the nature of computing; e.g. our many senses led to the multi-media trend.1.6 From Users to CommunitiesEven as HCI develops into a traditional academic discipline, computing has already moved on to add sociology to its list of paramours. During the industrial revolution, technology was isolated from the needs of society; e.g. a village beside a factory belching smoke found its need for clean air threatened. Physical systems designed with affordances based on human requirements perform better. (footnote 26)In an aircraft, is the pilot a person, a processor, or a physical object? Instead of a physical tour bus there is an informational tour browser. Universities that compartmentalize computing research into isolated discipline groups deny its multi-disciplinary future. How many author home pages offer their own papers for free download? Again, is there a difference? That an equation is later physically useful is not the cause of its reality. This book uses the term HCI for consistency (footnote 8).LevelExchangeExamplesDesignCommunity(sociology)MemesNorms, culture, laws, zeitgeist, sanctions, rolesSTSPersonal(psychology)MeaningSemantics, attitudes, beliefs, feelings, ideasHCIInformation(computer science)InformationPrograms, data, bandwidth, memoryITMechanical(engineering)EnergyHardware, motherboard, telephone, FAXTechnologyTable 1.1: The levels of computingIf all the Figure 1.3 levels are computing we must design computer products as both social and technical systems. What, exactly, is not a technology?Is any set of people a community? Increase heat or force efficiency.Overheating, mechanical fractures or breaks, heat leakage, jamsTable 1.2: Computing errors by system levelConversely, any level can cause failure; it does not matter how strong the community is if the hardware fails, the software crashes or the interface is unusable. As a tree trunk does not direct its expanding canopy, so today's social computing advances were undreamt of by its engineering base. As software response times improve, user response times become the issue. Every day more people use computers to do more things in more ways, so engineering, computer science, health (footnote 24), business, psychology, mathematics and education compete for the computing crown (footnote 25). Why or why not? What is the difference between HCI and STS?Give examples of the following: Hardware meeting engineering requirements. Whether electronically or physically mediated, a social system is always people interacting with people. Yet we are one.The flower of computing is the fruit of many disciplines but it belongs to none. What human requirement does it satisfy? Your mobile phone does not have separate hardware and software parts, but is hardware or software in toto, depending on how you view it.Hardware and software are therefore ways to view a computer system, not ways to divide it up. Hardware meeting Computer Science requirements. As one level's issues are met, those of the next appear, just as climbing one hill reveals another. People meeting psychology requirements. One world view can emerge from another.Note that a level as a view must be chosen before viewing, i.e. first pick a level, and then view.Levels affect design because how we see the world affects how we act in it; e.g. if we saw ultra-violet light, as bees do, previously dull flowers would become bright and so every flower shop would want to change its stock. Mathematics is a science because it constructs are logically correct, not because they are physical. Given equal functionality, users prefer a more usable product (Davis, 1989); e.g. Word replaced Word Perfect because users took a week to learn Word Perfect but picked up Word in a day. On a human level, the pilot is the actor, with the aircraft just a mechanical tool of the pilot's will, so in an aerial conflict, the tactics of a piloted aircraft are different from a computer drone.To repeat, the mechanical level is not just the physical aircraft but also the pilot's body, and the information level is all the processing, of both the brain and of onboard computers. Hence new software protocols like Ethernet can improve network performance as much as new cables.Levels have also changed how business works in computing. If TV and the Internet compete for the hearts and minds of viewers, which one will win?How does an online friend differ from a physical friend? Increase productivity, synergy, fairness, freedom, privacy, transparency.Unfairness, slavery, selfishness, apathy, corruption, lack of privacy.PersonalReduce cognitive overload, clashes. Give examples from computing.If a $1 CD with a $1,000 software application on it is insured, what do you get if it is destroyed? Conversely, without physical choices there is no information, without information there is no meaning, and without meaning there is no community (footnote 9).A world view is:Essential. In the 1970s, a hardware company called IBM (footnote 1) emerged as the computing leader. Figure 1.5: Computing levels cumulateIt is worth reflecting on how the role of technology has changed in a few centuries. Give examples. While sociology studies the social level alone, socio-technical design studies how social, human, information and hardware levels interact. Figure 1.2: The computing evolution1.2 Computing LevelsThe evolution of computing is approached here using Bertalanffy's general systems theory (Bertalanffy, 1968). Give an example in each case. This is STS.Explain the difference between a hardware error, a software error, a user error and a community error, with examples. This is HCI. In socio-technical design, social needs as the higher level always come first. Finally, an aircraft in a squadron may do things it would not do alone, e.g. expose itself as a decoy so that others can attack the enemy.1.3 Levels as World Views Courtesy of Brian Whitworth and Adnan Ahmad. The future is computer support not just for friends, but also for families, tribes, nations and even global humanity.For example, imagine a group browser, designed for many not just one, so that people can browse the Internet in groups, discussing as they go. What creates information, if it is not the mechanical signal?Is information concrete? We cannot observe a program on a motherboard nor a hardware device in a data structure. Figure 1.1: Charles Babbage (1791-1871) designed the first automatic computing engine. Figure 1.7: The computing requirements hierarchyTechnology is hard, but society is soft. The first complete Babbage Engine was completed in London in 2002, 153 years after it was designed. Is it just faster machines and better software? Figure 1.10: The four stages of computing(footnote 23)In academia, computing struggles because academics must specialize to get publications, grants and promotions (Whitworth & Friedman, 2009), so discipline specialties guard their knowledge in journal castles with jargon walls. Can a mouse's hardware affect its software performance? Why does selling software make more money than selling hardware? Has it worked out in any discipline?How does information does a physical book, that is fixed in one way, by definition, have? It is a new multi-discipline in itself (Figure 1.11). Bertalanffy proposed a "science of sciences", namely the study of systems in general, since sociologists study social systems, psychologists cognitive systems, computer scientists information systems, and engineers hardware systems. Explain how seeing a system differently can change how it is designed. It is more akin to a bazaar than a cathedral, as computer practitioners understand (Raymond, 1999). Are sociologists qualified to design socio-technical systems? Yet when Shannon and Weaver defined information as a choice between physical options, the options were physical but the choosing was not (Shannon & Weaver, 1949). This theory is based on the observation of discipline isomorphisms, when different specialist fields discover the same abstract equation or law in different contexts, e.g. a social agreement measure that matches a biological diversity measure (Whitworth, 2006). If information technology design is computing built to hardware and software requirements, then socio-technical design is computing built to personal and community requirements as well. How do people form a community? Relate to how STS and HCI differ and how socio-technology and sociology differ. Since we have a friend but belong to a community, the rules also change. Does it recognize computer science? People who gather to view an event or customers shopping for bargains are an aggregate, not a community. Sociology assumes psychology, which has led to attempts to re-attach it to its psychological roots, as Bourdieu's habitus references individual cognitions of the social environment and Gidden's mental frames underlie social life (Bone, 2005). Figure 1.8:A: Apple controls meet human requirements. The possibilities of social computing are just beginning.1.10 The Flower of ComputingFigure 1.10 shows how computing evolved through the four stages of hardware, software, people and community. For example, fear as a cognitive construct can be measured by heart rate, pupil dilation, blood pressure, a questionnaire, etc.Even physics cannot reduce its theories to pure physicality, as quantum theory implies a primordial non-physical (footnote 15) quantum level of reality below the physical (Whitworth, 2011). Table 1.3 summarizes design fields by level combination.DesignRequirementsTargetExamplesSTSSocialITWikipedia, YouTube, E-bayFashionSocialPhysical AccessoryMobile phone as an accessoryHCIPsychologicalITTFraming, border contrast, richnessDesignPsychologicalTechnologyKeyboard, mouseErgonomicsBiologicalTechnologyAdjustable height screenTable 1.3: Design fields by target and requirement levelsIn Figure 1.9, higher level requirements flow down to lower level design, giving a higher affects lower design principle. HCI turns psychological needs into IT designs as architecture turns buyer needs into house designs. Facebook is still working out its business model, because you cannot "sell" friendships as you do hardware and software. They only become a community if they see themselves as one, i.e. the community level arises directly from personal level cognitions.Social systems can have a physical base or a virtual base, so a socio-physical system is people socializing by physical means. In World War II, aircraft crashed until engineers designed cockpit controls with the cognitive needs of pilots in mind, as follows (with computing examples):Put the control by the thing controlled, e.g. a handle on a door (context menus).Let the control "cue" the required action, e.g. a joystick (a 3D screen button).Make the action/result link intuitive, e.g. press a joystick forward to go down, (press a button down to turn on).Provide continuous feedback, e.g. an altimeter, (a web site breadcrumbs line).Reduce mode channels, e.g. altimeter readings, (avoid edit and zoom mode confusions).Use alternate sensory channels, e.g. warning sounds, (error beeps).Let pilots "play", e.g. flight simulators, (a system sandbox).Human computer interaction applies psychological requirements to screen design. People meeting community requirements. Can friendships transcend physical and electronic interaction architectures? We create software by seeing information choices in physical events. HCI systems exchange meaning, while IT systems exchange information. Copyright status: Unknown (pending investigation). Yet this just replaces the determinism of fields like biology (Wilson, 1975) and psychology (Skinner, 1948) by another form of determinism.By contrast, in the general system model of computing shown in Figure 1.5, each level emerges from the previous. Why is computing a cross-discipline? Copyright: CC-Att-SA-2 (Creative Commons Attribution-ShareAlike 2.0 Unported).Figure: Details from Babbage's difference engine Courtesy of Brian Whitworth and Adnan Ahmad. Courtesy of Unknown author. To view a world one needs a view perspective.Empirical. A sociologist can no more design socio-technologies than a psychologist can design human-computer interfaces. Anyone online can see its power, but most academics see it as an aspect of their specialty, rather than a new multi-discipline in its own right. The top-down return of sociology to its source matches an equally vibrant bottom-up movement in computing, which has long seen itself as more than hardware and software (Boulding, 1956).1.8 The Requirements HierarchyThe evolution of computing implies a requirements hierarchy (Figure 1.7). Shown above is Serial Number 2, located in Silicon Valley at the Computer History Museum in Mountain View, California Courtesy of Jitze Couperus. error: Content is protected !! Join our Telegram Group & Share your contents, doubts, knowledge with other Students/Graduates "Computing is evolving to higher levels"This chapter reviews how computing has evolved since it began, and what this means for "us all" who are building and using it.1.1 A (very) Short History of ComputingThe first computer was conceived as a machine of cogs and gears (Figure 1.1) but only became practical in the 1950s and 60s with the invention of semi-conductors. Is a person an information technology? A company called Google (footnote 4) then offered the ultimate personal service, free access to the vast public library we call the Internet, and soon everyone's gateway to the web was the new computing leader. Like medieval fiefdoms, they hold hostage knowledge that by its nature should be free. Technology is designed and built by engineers. Can selling knowledge make even more money? What began as hardware became about software, then about users and is now about online communities. Computing that appears to us as just hardware now has a social level; e.g. smart-phones are a communication medium as well as a hardware device. An STS fails if its hardware fails, if its program crashes or if users cannot figure it out. In the 1980s, parents of this text gives an entirely new (and nonsensical) message.One response to reductionism is mathematical realism, that mathematical laws are real even if they are not concrete (Penrose, 2005). Software meeting CS requirements. The switch is like someone swapping glasses to see the same thing close-up. Socio-technical systems use the social sciences in their design as HCI interfaces use psychology. In contrast information technology (IT) is the application of hardware and software, with a user implied. We describe a system by its highest level, so if the operating system "hangs" (footnote 11) we say "the computer" crashed, even though the computer hardware is working fine. What is a cross-discipline? Can it affect its HCI performance?

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