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Midterm Examination

Instructions:

1) Answer all questions. Write Q's 1 & 2 in one bluebook and write Q's 3 and 4 in a second bluebook. Indicate on the cover of each bluebook which answers it contains.

1) (25 points) Consider these three points:

- In his 1960 essay, Herbert Simon argued that computers would have a very hard time substituting for humans' sensory abilities including vision, smell, speech recognition, etc.

- Today, many economists would argue that computers drive skill-biased technical change. That is, computers shift the demand for labor in directions that favor more educated workers and work against less educated workers.

- We know that the lowest paid less educated workers are in service occupations like janitors, cafeteria helpers, security guards, etc. - jobs rely heavily on vision, speech recognition, touch and the other senses that Simon said would be hard to computerize.

Use your knowledge of skill and changes in the occupational distribution to explain whether or not it is possible to reconcile Simon's position and the economists' position.

Answer: While computers can't eliminate the lowest paid jobs, they can eliminate clerical, production and other fairly low paying jobs. This reduction in demand has the effect of increasing the rate of return to education which is consistent with the economists' story.

Simon's prediction that computers would have a hard time replacing sensory abilities turned out to be correct. This is why the service sector has not lost jobs. In fact, service sector jobs have expanded because other occupations that involve more routinized tasks, such as clerical and production workers, can be more easily and profitably replaced by computers so people in these occupations switch to the service sector. When economists talk about SBTC, the definition of skill they use is NOT "whether the task can be replaced by a computer" (this would make janitors quite skilled) but, rather, how educated or well-trained a person is. Since computers tend to complement jobs with high levels of education and training (e.g. doctors, engineers, etc.)—and, hence, make them more productive—people with this training are in high demand and without it are in low

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demand and compensated accordingly. Thus, service sector workers, who do not have the type of skill that is complemented by computers are paid less.

2) (25 points) You are brought in as a consultant for a firm that handles a large amount of call center work. The executives there are considering three options: having call centers in the U.S.; having call centers in India; or substituting voice recognition software for all human call center operators.

(a) (20 points) Using what we have discussed about pattern recognition, context, and the organization of work, make an argument for the company to adopt a policy that splits the call center work among these three options. In particular, describe why such a split might be desirable, what sort of calls each segment of the reorganized business would handle, and how this might change incentives within the firm.

Answer: Software can handle the calls that are extremely routinized – i.e. where each interaction involves only a limited and predictable range of vocal responses and that is enough to handle every contingency. This is desirable if the company receives a majority of calls about routine things and can thus replace all of the operators who repeatedly answer the same questions with the voice-recognition technology. (Think of the ATT example.)

Foreign call centers can handle work that requires more flexible human response but is still routine enough that all relevant information can be encoded in scripts. This could include instructions, applications, etc. This is still routine work but requires a lot of words to be known. This could be desirable because of lower wages in India.

U.S. call centers would be required to handle calls where answers require significant amounts of contextual knowledge about the U.S. – knowledge that U.S. residents typically have but that is too dense to include in easily accessible scripts.

This could change incentives within the firm if the U.S. workers could now benefit from sharing information with one another. For example, since most of the routine work is now done via computer or in India, the questions that should be coming to the U.S. call center are more complex and it would save the company money if workers shared their knowledge (by reducing time spent per question, improving quality, etc.). The firm may have to set up some kind of incentive scheme to get the company to report problems and solutions in a database (e.g. giving people credit in terms of a bonus).

b) (5 points) The boss takes issue with your explanations about the importance of context. "I flew down to Philadelphia last week. At the airport, they had me use one of those computerized kiosks to get my boarding pass and I guarantee you the kiosk screen never asked me any questions about context," he insists. Has your boss produced a good counter example to the ideas discussed in class? Explain.

Answer: This isn't a counter example. The context is pre-determined by the situation such that the kiosk expects a credit card number which it will process by matching it up

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with a reservation data base. If you fed the kiosk a different piece of information – say your MIT Card to top off your account – the kiosk wouldn't know what to do with it. This gets back to Simon's point about controlling the environment in order for computers to function well and increase productivity.

3) (25 points) In the book *Workplace Knowhow: The Important Working Knowledge of Unskilled Workers,* Kusterer describes an interview he held with an "unskilled" woman machine operator as follows:

> "I don't know why you want to interview me. You don't have to know anything to do my job." Three hours later, too exhausted to keep writing down all she knew, I brought the interview to a close. As I was preparing to leave, she told me something entirely different… "This was real interesting. You don't get to stop and think about things like this, usually…."

a) (10 points) From the perspective of cognitive theory, how do you reconcile the fact that "you don't have to know anything" to do the woman's job with the fact that it took three hours to write down what she knew?

Answer: Cognitive theory says that the majority of our information processing is unconscious. Thus it may have initially taken substantial conscious thought to learn how to run the machines but it now can all be done without conscious consideration – i.e. she doesn't have to think about it now. It could also take three hours to write down how we walk through a room and pick up an apple (e.g. specifying what would happen in each possible contingency) but "you don't need to know anything to do it." Some of these actions are automatic and we learn them just through living, but everyone can do them. Others are not automatic at first (like machine operation), but become so.

You can also think about category formation in this context (e.g. the infants looking at pictures of cats and dogs). When we first encounter a certain type of object, it could take awhile to think about what type of characteristics it has, what function it serves, etc. Once we form a category for it (and, e.g. that category is part of some larger category) we can identify and classify the object more quickly. We see this in the decreasing amount of attention that the infants paid to different pictures of the cats.

b) (15) Does the fact that it took three hours to write down the woman's knowledge mean that computers would be unable to do her job? Explain your reasoning. If the question does not have a simple yes or no answer, explain on what the answer depends.

Answer: It depends. If everything that she does can be expressed in inductive and/or deductive rules, it can be done by a computer. If it is too complex for rules, either because we can't digitize the information she uses or we can't figure out the rules, then a computer can't do it. Note that being unable to figure out the rules could be caused both

from the inability to articulate or piece apart what we are thinking about when we are doing the job, or from the fact that the contingencies we would need to plan for are infinite. Further, even if it is too complex to figure out what rules are being used, we may be able to control the environment in a way that makes these rules more transparent and easily written down. For example, if we limit the number of possible contingencies, it will be easier to write down the rules.

4) (a) (10 points) Dell computer has emerged as the leader of the direct to market computer industry. According to the class reading, what feature of the pre-Dell computer market was key to Dell's success? Why does Michael Dell claim he was better off starting a direct computer seller than say becoming a graphics chip developer?

(We have not yet covered these ideas but here is the answer). The key to the pre-Dell computer market was that PC's used open architecture so that Dell could focus on being an assembler rather than building machines from scratch. This was a sharp departure from mainframes where everyone had proprietary technology and developed all of their own components. Dell felt there were plenty of other people doing chip development, etc. and the best place to make money was to focus on assembly of other people's components and marketing.

(b) (15 points) As you finish purchasing a product from a web site like Amazon.com or LandsEnd.com, you often receive the following message:

   "***People who bought (***what you have just bought***) may find they enjoy the following additional products: (***followed by a list of five or six products***).***

   Consider three approaches to creating list of other products:

- Insert a list derived from a neural net algorithm

- Insert a list derived from rules-based algorithm

- Insert a list based on items that the company wants to sell this week

Explain which one of the three approaches you would use and why you wouldn't use the other two approaches. Then, using as much detail as possible, explain how you would implement your chosen approach. If implementation of your approach requires data, explain where you would get the data.

Answer: This is a case for a neural net to distinguish patterns – i.e. clusters of purchases that people make (the neural net could take customer characteristics into account as well, such as where the person lives). Searching out those clusters using deductive (i.e. prespecified) rules would be too cumbersome (i.e. the rules required would be infinite

since the combinations of purchases and customer characteristics are nearly infinite) while a list of items that the company wanted to sell would soon begin to be ignored once people found they didn't particularly like the recommendations – i.e. the recommendations didn't have much to do with their preferences.

To implement the neural net approach, we would need to train the system on previous data. One way to do this would be to specify input nodes (e.g. previous purchases), hidden nodes, and output nodes (what to recommend) and to begin with starting parameters for the weights and threshold values. Then, using previous customer purchases, you would have the system make recommendations and the system would be told it was correct if it recommended something that the customer purchased later on. The system would be ready when it recommended products that previous customers ultimately did purchase.

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