國立中央大學工業管理研究所九十六學年度碩士在職進修專班入學考試試題卷

考試科目：工業管理實務　　共　頁，第　頁

考試時間：90 分鐘

第一題：50 分，可以用英文或中文回答。

1. (50 points) Tim 是一家大型超級市場的經營者，近幾年來由於同業的激烈競爭，讓 Tim 覺得他必須改善其超級市場的經營管理。他聽到「企業資源規劃系統（ERP System; Enterprise Resource Planning System）」在製造業非常流行，也有許多成功的例子。由其友人那邊，Tim 得知「企業資源規劃系統」其實也可應用在非製造業的領域。您是一位「企業資源規劃系統」專家，Tim 尋求您的協助，**請問您會如何幫忙 Tim 導入「企業資源規劃系統」於其超級市場呢？請說明。**註：（1）其他問題環境假設可自行增加，但不能因此而偏離本問題的主題，而且務必將假設列出，然後在您的問題環境下，提出解題方法。（2）請將所欲提出的方法之目的（或目標）加以說明。（3）也請將您將所欲提出的方法（或各種方法）之步驟，加以清楚說明，例如：您可繪製方法的流程圖，來幫助他人了解。

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第二題

供應商管理庫存 (VMI, Vendor Managed Inventory)是一個已經存在有超過 20 年歷史而且應用於實務中也得到相當良好的成效的方法。 供應商管理庫存的概念其實很簡單就是供應商必須負起維持顧客存貨水準的責任。 在庫存消耗殆盡之前，供應商必須及時地幫顧客補充存貨以避免缺貨的現象產生。 根據美國 2004 年的研究報告顯示，美國製造業與零售業運用供應商管理庫存可使庫存減少從 27%至 100%不等，平均而言減少 53% 而前置時間的改善從 30%到 50%不等。

A 公司為一家在世界上具有領先地位的筆記型電腦代工製造公司而其零件供應商有超過 300 個以上。 A 公司最為人所稱道的是其公司創新的能力與使用最新的科技如 ERP 系統來整合公司內部以達成最佳的效率。

A 公司的總裁 X 先生最近從報章雜誌中學習到供應商管理庫存的概念。 由於 A 公司的零件供應商為數眾多，他希望引進此概念至 A 公司與公司的 ERP 系統相結合。 請你以專業經理人的角度，敘述供應商管理庫存與 ERP 系統如何結合，系統必須要有的新功能與新報表。

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考試科目：經營管理個案分析　　共　頁，第　頁

考試時間：90 分鐘

第一題：請細讀下面個案後，回答個案後面的兩個子問題，作答時請標明子問題的題號，可以用英文或中文回答。共 50 分，每一子問題的配分列於題後。

Information is a valuable resource for today□ organizations, and information technology can tap its potential. Cannondale Corporation, the leading designer and manufacturer of high-performance aluminum bicycles and cycling accessories, believes in the strategic use of information technology. The company employs computer systems for everything from bicycle design, precision manufacturing, quality control, and inventory and sales management. Cannondale director of marketing and media relations, Tom Armstrong, says the goal of using information technology is to move faster than its competitors. e have tried to do that by innovating not only on the product front but in every other aspect as well. A lot of our own production engineering is about getting inside the development cycle of our competitors.?

Cannondale design engineers based in Connecticut use a computer-aided design (CAD) system called Pro/Engineer, a three-dimensional modeling program. With the program, designers can execute an idea and nearly instantly generate the measurements and parts needed for prototyping and mold making for manufacturing. They can also automatically create many different sizes in the same model style o fit cyclists of many different shapes and sizes. With more than 80 different bicycle models currently, the CAD system gives the company flexibility nd a competitive edge.

After a design is finalized, the CAD system relays the design electronically to the production engineers in the company Bedford, Pennsylvania factories. Production engineers can use the Pro/Engineer software to generate working prototypes of a bicycle that can actually be ridden. During manufacturing the company uses computer-guided lasers, which cut the frames? tubes to precise dimensions. Once a frame is complete, the coordinate measuring machine checks the frame measurements for accuracy.

Several years ago, the company saw the promise of Internet technology and harnessed it to track its manufacturing process. It installed an intranet in its Pennsylvania manufacturing plants to reduce the complexity and costs of the manufacturing system. The company application engineer installed Web browser software on personal computers on the factory floor and replaced the keyboards with bar-code scanners and mouses for ease of input. As employees on the assembly line finish a step, they swipe the scanner across a bar-code on each bicycle. The company managers can then capture information and track the manufacturing processes to ensure that parts and supplies are available when needed.

Cannondale also uses the Internet communications capability to relay product specifications to its subsidiaries in the Netherlands, Japan, and Australia, which do final product assembly and finishing for overseas products. Before the use of the Web, workers sent hard-copy drawings to the subsidiaries, and employees there placed them in binders, which had to be updated periodically. That process was time-consuming and unreliable. Now the company can instantly transmit its drawings electronically, complete with final paint colors. The result is consistency in product manufacturing, reduced time, and reduced costs.

Cannondale has focused most of its information technology system on personal computers running Windows software. This strategic decision simplifies the company hardware and software systems and allows employees in all divisions to share the information in word processing, spreadsheet, and other programs. Cannondale recently began working with AimNet Solutions to

handle its network infrastructure. AimNet will monitor the company network and ensure it performs reliably. Cannondale vice-president of information technology, Mike Dower, explains the strategic partnership this way: ur strategy at Cannondale has been the same since our inception. We strive to create innovative, differentiated, high-performance products. With our passion for growth, . . . we couldn afford to be distracted from that strategy. . . . We can stay focused on creating superior products? and let AimNet oversee the network infrastructure.

Cannondale has also reconstructed its inventory and sales management systems with information technology. With its new PC-based system, the company is able to track supplies more accurately and, as a result, reduced inventory stocks by approximately one quarter. The system may eventually be used to tie Cannondale information system with its suppliers? Cannondale sales representatives also gather data from retail partners on which models are selling well. They relay that information to the company information system, and managers can switch manufacturing to needed models. This quick response to customer needs is important to Cannondale success. The company has also begun using its corporate Web site to inform prospective customers about tailor-made bicycles. Currently available on the company CAAD5 road frame, the company allows the customer to choose from over 8 million possible frame and color variations. Giving customers such wide choices and ensuring the product they want is in their local store helps solidify their relationships with the company. Cannondale Web site says, ur focus is people mployees, customers, retailers, and our vendors orking together to accomplish our mission.? And Cannondale uses sophisticated information technology systems to link those people into one big network.

Questions

1. In what ways did information technology at Cannondale serve as a knowledge management enabler? (25 points)
2. How does information technology at Cannondale foster creativity? (25 points)

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Please refer to the attached chapter extracted from one of the popular business novels, "THE Goal" by E.M. Goldratt, to answer the following questions. You can answer the questions either in English or in Chinese within the maximal number of words.

請以中文或英文簡短扼要回答以下問題（注意答案的字數限制）。

Q1 (10%) What is a balanced plant? Is a balanced plant the solution of the problem that inventory increases and throughput decreases? (up to 15 words)

Q2 (10%) In the game that Mr. Rogo invented, what is the average number of matches ought to be moved in each run if a maximum of six and a minimum of one can be moved? What happened if we take this value to represent the throughput rate of the process? (up to 15 words)

Q3 (15%) "How am I doing, Mr. Rogo?" "Well, Evan … ever hear the story of the Titanic?" Because Evan played last in each turn, what do you think that Mr. Rogo refered to the story of the Titanic? (up to 30 words)

Q4 (15%) What do you think the reason that the chart going deeper and deeper instead of being a normal sine curve? (up to 30 words)

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"But we're not supposed to be having lunch here," says one of the kids. "We're not supposed to eat until we're farther down the trail, when we reach the Rampage River."

"According to the schedule the troopmaster gave us, we're supposed to eat lunch at 12:00 noon," says Ron.

"And it is now 12:00 noon," Herbie says, pointing to his watch. "So we have to eat lunch."

"But we're supposed to be at Rampage River by now and we're not."

"Who cares?" says Ron. "This is a great spot for lunch. Look around."

Ron has a point. The trail is taking us through a park, and it so happens that we're passing through a picnic area. There are tables, a water pump, garbage cans, barbecue grills—all the necessities. (This is my kind of wilderness I'll have you know.)

"Okay," I say. "Let's just take a vote to see who wants to eat now. Anyone who's hungry, raise your hand."

Everyone raises his hand; it's unanimous. We stop for lunch.

I sit down at one of the tables and ponder a few thoughts as I eat a sandwich. What's bothering me now is that, first of all, there is no real way I could operate a manufacturing plant without having dependent events and statistical fluctuations. I can't get away from that combination. But there must be a way to overcome the effects. I mean, obviously, we'd all go out of business if inventory was always increasing, and throughput was always decreasing.

What if I had a balanced plant, the kind that Jonah was saying managers are constantly trying to achieve, a plant with every resource exactly equal in capacity to demand from the market? In fact, couldn't that be the answer to the problem? If I could get capacity perfectly balanced with demand, wouldn't my excess inventory go away? Wouldn't my shortages of certain parts disappear? And, anyway, how could Jonah be right and everybody else be wrong? Managers have always trimmed capacity to cut costs and increase profits; that's the game.

I'm beginning to think maybe this hiking model has thrown

me off. I mean, sure, it shows me the effect of statistical fluctuations and dependent events in combination. But is it a balanced system? Let's say the demand on us is to walk two miles every hour—no more, no less. Could I adjust the capacity of each kid so he would be able to walk two miles per hour and no faster? If I could, I'd simply keep everyone moving constantly at the pace he should go—by yelling, whip-cracking, money, whatever—and everything would be perfectly balanced.

The problem is how can I realistically trim the capacity of fifteen kids? Maybe I could tie each one's ankles with pieces of rope so that each would only take the same size step. But that's a little kinky. Or maybe I could clone myself fifteen times so I have a troop of Alex Rogos with exactly the same trail-walking capacity. But that isn't practical until we get some advancements in clone technology. Or maybe I could set up some other kind of model, a more controllable one, to let me see beyond any doubt what goes on.

I'm puzzling over how to do this when I notice a kid sitting at one of the other tables, rolling a pair of dice. I guess he's practicing for his next trip to Vegas or something. I don't mind—although I'm sure he won't get any merit badges for shooting craps—but the dice give me an idea. I get up and go over to him.

"Say, mind if I borrow those for a while?" I ask.

The kid shrugs, then hands them over.

I go back to the table again and roll the dice a couple of times. Yes, indeed: statistical fluctuations. Every time I roll the dice, I get a random number that is predictable only within a certain range, specifically numbers one to six on each die. Now what I need next for the model is a set of dependent events.

After scavenging around for a minute or two, I find a box of match sticks (the strike-anywhere kind), and some bowls from the aluminum mess kit. I set the bowls in a line along the length of the table and put the matches at one end. And this gives me a model of a perfectly balanced system.

While I'm setting this up and figuring out how to operate the model, Dave wanders over with a friend of his. They stand by the table and watch me roll the die and move matches around.

"What are you doing?" asks Dave.

"Well, I'm sort of inventing a game," I say.

"A game? Really?" says his friend. "Can we play it, Mr. Rogo?"

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Why not?

"Sure you can," I say.

All of a sudden Dave is interested.

"Hey, can I play too?" he asks.

"Yeah, I guess I'll let you in," I tell him. "In fact, why don't you round up a couple more of the guys to help us do this."

While they go get the others, I figure out the details. The system I've set up is intended to "process" matches. It does this by moving a quantity of match sticks out of their box, and through each of the bowls in succession. The dice determine how many matches can be moved from one bowl to the next. The dice represent the capacity of each resource, each bowl; the set of bowls are my dependent events, my stages of production. Each has exactly the same capacity as the others, but its actual yield will fluctuate somewhat.

In order to keep those fluctuations minimal, however, I decide to use only one of the dice. This allows the fluctuations to range from one to six. So from the first bowl, I can move to the next bowls in line any quantity of matches ranging from a minimum of one to a maximum of six.

Throughput in this system is the speed at which matches come out of the last bowl. Inventory consists of the total number of matches in all of the bowls at any time. And I'm going to assume that market demand is exactly equal to the average number of matches that the system can process. Production capacity of each resource and market demand are perfectly in balance. So that means I now have a model of a perfectly balanced manufacturing plant.

Five of the boys decide to play. Besides Dave, there are Andy, Ben, Chuck, and Evan. Each of them sits behind one of the bowls. I find some paper and a pencil to record what happens. Then I explain what they're supposed to do.

"The idea is to move as many matches as you can from your bowl to the bowl on your right. When it's your turn, you roll the die, and the number that comes up is the number of matches you can move. Got it?"

They all nod. "But you can only move as many matches as you've got in your bowl. So if you roll a five and you only have two matches in your bowl, then you can only move two matches. And if it comes to your turn and you don't have any matches, then naturally you can't move any."

They nod again.

"How many matches do you think we can move through the line each time we go through the cycle?" I ask them.

Perplexity descends over their faces.

"Well, if you're able to move a maximum of six and a minimum of one when it's your turn, what's the average number you ought to be moving?" I ask them.

"Three," says Andy.

"No, it won't be three," I tell them. "The mid-point between one and six isn't three."

I draw some numbers on my paper.

"Here, look," I say, and I show them this:

1 2 3 4 5 6

And I explain that 3.5 is really the average of those six numbers.

"So how many matches do you think each of you should have moved on the average after we've gone through the cycle a number of times?" I ask.

"Three and a half per turn," says Andy.

"And after ten cycles?"

"Thirty-five," says Chuck.

"And after twenty cycles?"

"Seventy," says Ben.

"Okay, let's see if we can do it," I say.

Then I hear a long sigh from the end of the table. Evan looks at me.

"Would you mind if I don't play this game, Mr. Rogo?" he asks.

"How come?"

"Cause I think it's going to be kind of boring," he says.

"Yeah," says Chuck. "Just moving matches around. Like who cares, you know?"

"I think I'd rather go tie some knots," says Evan.

"Tell you what," I say. "Just to make it more interesting, we'll have a reward. Let's say that everybody has a quota of 3.5 matches per turn. Anybody who does better than that, who averages more than 3.5 matches, doesn't have to wash any dishes tonight. But anybody who averages less than 3.5 per turn, has to do extra dishes after dinner."

"Yeah, all right!" says Evan.

"You got it!" says Dave.

They're all excited now. They're practicing rolling the die. Meanwhile, I set up a grid on a sheet of paper. What I plan to do is record the amount that each of them deviates from the average. They all start at zero. If the roll of the die is a 4, 5, or 6 then I'll record—respectively—a gain of .5, 1.5, or 2.5. And if the roll is a 1, 2, or 3 then I'll record a loss of –2.5, –1.5, or –.5 respectively. The deviations, of course, have to be cumulative; if someone is 2.5 above, for example, his starting point on the next turn is 2.5, not zero. That's the way it would happen in the plant.

"Okay, everybody ready?" I ask.

"All set."

I give the die to Andy.

He rolls a two. So he takes two matches from the box and puts them in Ben's bowl. By rolling a two, Andy is down 1.5 from his quota of 3.5 and I note the deviation on the chart.

Ben rolls next and the die comes up as a four.

"Hey, Andy," he says. "I need a couple more matches."

"No, no, no, no," I say. "The game does not work that way. You can only pass the matches that are in your bowl."

"But I've only got two," says Ben.

"Then you can only pass two."

"Oh," says Ben.

And he passes his two matches to Chuck. I record a deviation of –1.5 for him too.

Chuck rolls next. He gets a five. But, again, there are only two matches he can move.

"Hey, this isn't fair!" says Chuck.

"Sure it is," I tell him. "The name of the game is to move matches. If both Andy and Ben had rolled five's, you'd have five matches to pass. But they didn't. So you don't." Chuck gives a dirty look to Andy.

"Next time, roll a bigger number," Chuck says.

"Hey, what could I do!" says Andy.

"Don't worry," Ben says confidently. "We'll catch up."

Chuck passes his measly two matches down to Dave, and I record a deviation of –1.5 for Chuck as well. We watch as Dave rolls the die. His roll is only a one. So he passes one match down to Evan. Then Evan also rolls a one. He takes the one match out of his bowl and puts it on the end of the table. For both Dave and Evan, I write a deviation of –2.5.

"Okay, let's see if we can do better next time," I say.

Andy shakes the die in his hand for what seems like an hour. Everyone is yelling at him to roll. The die goes spinning onto the table. We all look. It's a six.

"All right!"

"Way to go, Andy!"

He takes six match sticks out of the box and hands them to Ben. I record a gain of +2.5 for him, which puts his score at 1.0 on the grid.

Ben takes the die and he too rolls a six. More cheers. He passes all six matches to Chuck. I record the same score for Ben as for Andy.

But Chuck rolls a three. So after he passes three matches to Dave, he still has three left in his bowl. And I note a loss of –0.5 on the chart.

Now Dave rolls the die; it comes up as a six. But he only has four matches to pass—the three that Chuck just passed to him and one from the last round. So he passes four to Evan. I write down a gain of +0.5 for him.

Evan gets a three on the die. So the lone match on the end of the table is joined by three more. Evan still has one left in his bowl. And I record a loss of –0.5 for Evan.

At the end of two rounds, this is what the chart looks like.

	ANDY	BEN	CHUCK	DAVE	EVAN
Turn:	1234567890	1234567890	1234567890	1234567890	1234567890
Roll	26	46	43	16	13
#Moved	26	26	23	14	13
Inventory:		00	03	10	01
Change +/–					
+2					
+1.5					
+1	*	*			
+0.5					
0					
–1					
–1.5	*	*	*		
–2			*	*	
–2.5				*	*
–3					*
–3.5					

We keep going. The die spins on the table and passes from hand to hand. Matches come out of the box and move from bowl to bowl. Andy's rolls are—what else?—very average, no steady run of high or low numbers. He is able to meet the quota and then some. At the other end of the table, it's a different story.

"Hey, let's keep those matches coming."

"Yeah, we need more down here."

"Keep rolling sixes, Andy."

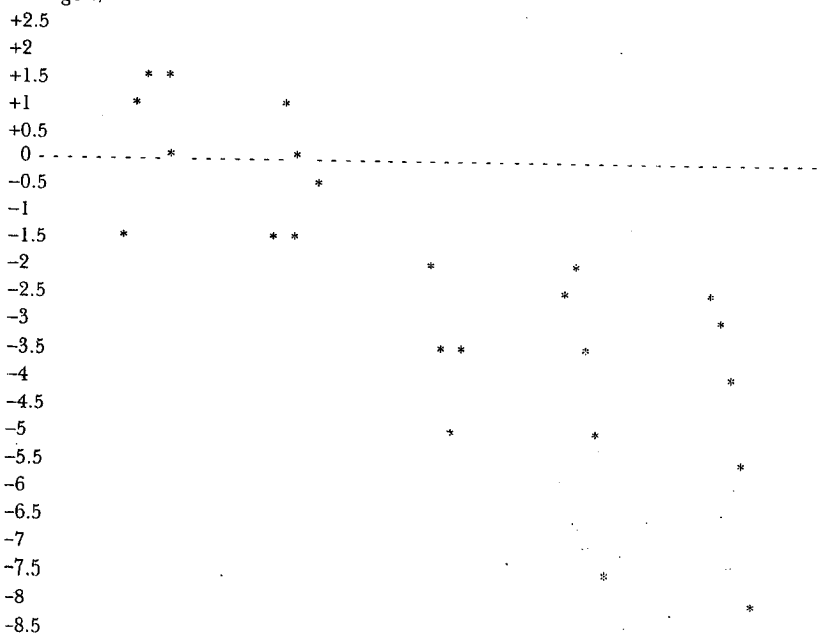
"It isn't Andy, it's Chuck. Look at him, he's got five."

After four turns, I have to add more numbers—negative numbers—to the bottom of the chart. Not for Andy or for Ben or for Chuck, but for Dave and Evan. For them, it looks like there is no bottom deep enough.

After five rounds, the chart looks like this:

	ANDY	BEN	CHUCK	DAVE	EVAN
Turn:	1234567890	1234567890	1234567890	1234567890	1234567890
Roll	26425	46152	43225	16351	13641
#Moved	26452	26152	23225	14221	13321
Inventory:		00303	03252	10004	01000

Change +/–



"How am I doing, Mr. Rogo?" Evan asks me.

"Well, Evan . . . ever hear the story of the Titanic?"

He looks depressed.

"You've got five rounds left," I tell him. "Maybe you can pull through."

"Yeah, remember the law of averages," says Chuck.

"If I have to wash dishes because you guys didn't give me enough matches . . ." says Evan, letting vague implications of threat hang in the air.

"I'm doing my job up here," says Andy.

"Yeah, what's wrong with you guys down there?" asks Ben.

"Hey, I just now got enough of them to pass," says Dave. "I've hardly had any before."

Indeed, some of the inventory which had been stuck in the first three bowls had finally moved to Dave. But now it gets stuck in Dave's bowl. The couple of higher rolls he had in the first five rounds are averaging out. Now he's getting low rolls just when he has inventory to move.

"C'mon, Dave, gimme some matches," says Evan.

Dave rolls a one.

"Aw, Dave! One match!"

"Andy, you hear what we're having for dinner tonight?" asks Ben.

"I think it's spaghetti," says Andy.

"Ah, man, that'll be a mess to clean up."

"Yeah, glad I won't have to do it," says Andy.

"You just wait," says Evan. "You just wait 'til Dave gets some good numbers for a change."

But it doesn't get any better.

"How are we doing now, Mr. Rogo?" asks Evan.

"I think there's a Brillo pad with your name on it."

"All right! No dishes tonight!" shouts Andy.

After ten rounds, this is how the chart looks . . .

I look at the chart. I still can hardly believe it. It was a balanced system. And yet throughput went down. Inventory went up. And operational expense? If there had been carrying costs on the matches, operational expense would have gone up too.

What if this had been a real plant—with real customers? How many units did we manage to ship? We expected to ship thirty-five. But what was our actual throughput? It was only twenty. About half of what we needed. And it was nowhere near

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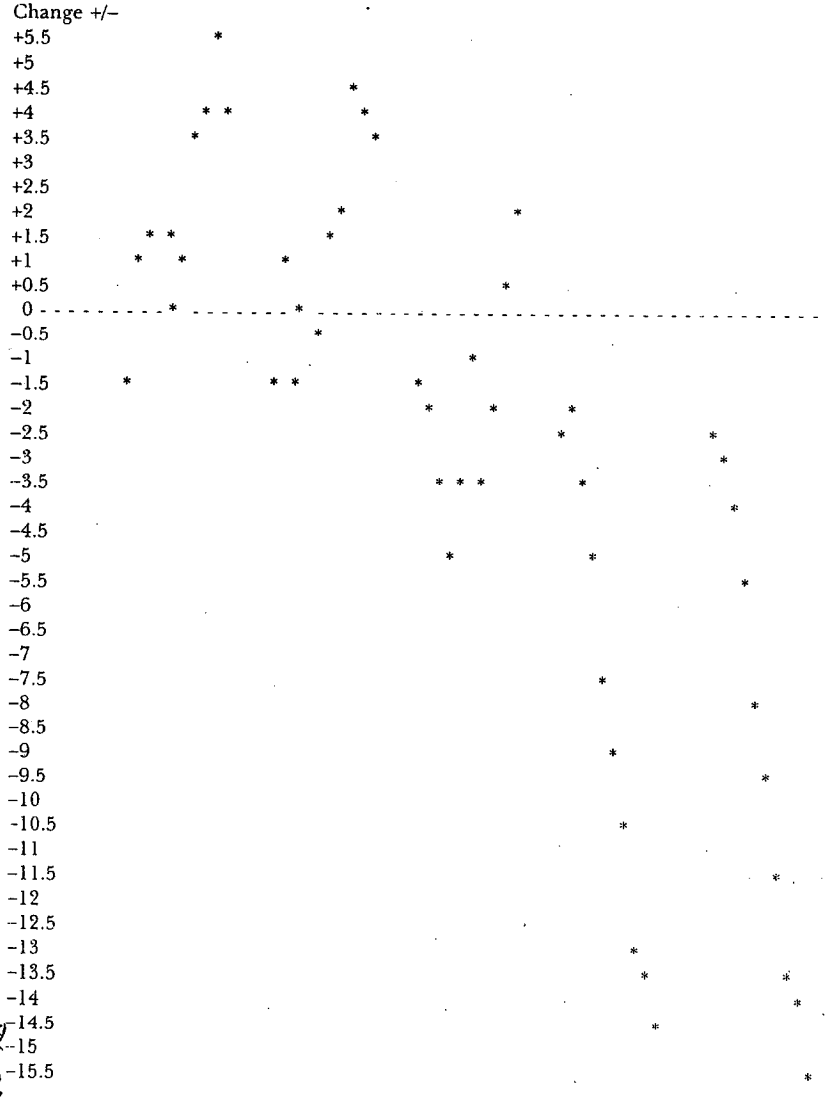
Turn:	ANDY 1234567890	BEN 1234567890	CHUCK 1234567890	DAVE 1234567890	EVAN 1234567890
Roll	2642536452	4615254633	4322561565	1635122132	1364145342
#Moved	2642536452	2615254633	2422561565	1422122132	1332122132
Inventory:		0030313132	0325214510	1000487###	0100000000



Dave's inventory for turns 8,9, and 10 is in double digits, respectively rising to 11 matches, 14 matches, and 17 matches.

the maximum potential of each station. If this had been an actual plant, half of our orders—or more—would have been late. We'd never be able to promise specific delivery dates. And if we did, our credibility with customers would drop through the floor.

All of that sounds familiar, doesn't it?

"Hey, we can't stop now!" Evan is clamoring.

"Yea, let's keep playing," says Dave.

"Okay," says Andy. "What do you want to bet this time? I'll take you on."

"Let's play for who cooks dinner," says Ben.

"Great," says Dave.

"You're on," says Evan.

They roll the die for another twenty rounds, but I run out of paper at the bottom of the page while tracking Dave and Evan. What was I expecting? My initial chart ranged from +6 to –6. I guess I was expecting some fairly regular highs and lows, a normal sine curve. But I didn't get that. Instead, the chart looks like I'm tracing a cross-section of the Grand Canyon. Inventory moves through the system not in manageable flow, but in waves. The mound of matches in Dave's bowl passes to Evan's and onto the table finally—only to be replaced by another accumulating wave. And the system gets further and further behind schedule.

"Want to play again?" asks Andy.

"Yeah, only this time I get your seat," says Evan.

"No way!" says Andy.

Chuck is in the middle shaking his head, already resigned to defeat. Anyway, it's time to head on up the trail again.

"Some game that turned out to be," says Evan.

"Right, some game," I mumble.